NATIONAL HIGHWAYS AUTHORITY OF INDIA

(Ministry of Road Transport & Highways)

Government of India

for

4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).

between

NATIONAL HIGHWAYS AUTHORITY OF INDIA

G-5 & 6, Sector-10, Dwarka, New Delhi 110 075

and

M/s Ambala Kala Amb Highway Private Limited

SCO No. 327-328, Sector-20 Market, HUDA, Kaithal, Haryana, India-136027

VOLUME-I

CONCESSION AGREEMENT

FEBRUARY 2023

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Unique Doc. Reference	:	SUBIN-DLDL78850305705315782986V
Purchased by	:	AMBALA KALA AMB HIGHWAY PRIVATE LIMITED
Description of Document	:	Article 5 General Agreement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	NATIONAL HIGHWAYS AUTHORITY OF INDIA
Second Party	:	AMBALA KALA AMB HIGHWAY PRIVATE LIMITED
Stamp Duty Paid By	:	AMBALA KALA AMB HIGHWAY PRIVATE LIMITED
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

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CONCESSION AGREEMENT

THIS AGREEMENT is entered into on this the 22nd February day of, 2023.

BETWEEN

1 THE NATIONAL HIGHWAYS AUTHORITY OF INDIA, established under the National Highways Authority of India Act 1988, represented by its Chairman and having its principal offices at G-5 & 6, Sector 10, Dwarka, New Delhi-110075 (hereinafter referred to as the **"Authority"** which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) of One Part.

AND

2 M/s Ambala Kala Amb Highway Private Limited, a company incorporated under the provisions of the Companies Act, 2013 with CIN U45209HR2022PTC108559 and having its registered office at SCO No. 327-328, Sector-20 Market, HUDA, Kaithal, Kaithal, Haryana, India, 136027 (hereinafter referred to as the "**Concessionaire**" which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns and substitutes) of the Other Part.

01

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22-Feb-2023 09:58 AM 22-Feb-2023 09:58 AM 22-Feb-2023 09:58 AM AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED

WHEREAS:

(A) The Government of India had entrusted to the Authority the development, maintenance and management of "4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O)" (the "Project") on design, build, operate and transfer (the **"DBOT Annuity" or "Hybrid Annuity"**) basis, which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be made by the Authority, in accordance with the terms and conditions to be set forth in a concession agreement to be entered into.

(B) The Authority had adopted a single stage two envelope bidding process and accordingly invited proposals by its Request for Proposals dated 01.07.2022 (the "**Request for Proposals" or "RFP")** for qualification and short listing of bidders for construction, operation and maintenance of the above referred Project on Hybrid Annuity basis.

(C) The Authority had prescribed the technical and commercial terms and conditions in the RFP, and invited bids comprising technical and financial bids from the bidders for undertaking the Project.

(D) After evaluation of the bids received, the Authority had technically qualified certain bidders including, interalia, the selected bidder M/s DCC Infra Projects Limited and issued its Letter of Award No. NHAI/HR/Ambala-KalaAmb/2022/154-M dated November 28, 2022 (hereinafter called the **"LOA"**) to the Selected Bidder, inter alia, the execution of this Concession Agreement within 45 (forty five) days of the date of issue thereof.

(E) The Selected Bidder has since promoted and incorporated the Concessionaire as a limited liability company under the Companies Act 2013, and has requested the Authority to accept the Concessionaire as the entity which shall undertake and perform the obligations and exercise the rights of the Selected Bidder under the LOA, including the obligation to enter into this Concession Agreement pursuant to the LOA for undertaking the Project.

(F) By its letter dated 29.12.2022 the Concessionaire has also joined in the said request of the Selected Bidder to the Authority to accept it as the entity which shall undertake and perform the obligations and exercise the rights of the Selected Bidder including the obligation to enter into this Concession Agreement pursuant to the LOA. The Concessionaire has further represented to the effect that it has been promoted by the Selected Bidder for the purposes hereof and has delivered to the Authority a legal opinion with respect to the authority of the Concessionaire to enter into this Concession Agreement and the enforceability of the provisions thereof.

(G) The Authority has agreed to the said request of the Selected Bidder and the Concessionaire, and has accordingly agreed to enter into this Concession Agreement with the Concessionaire for implementation of the Project on Hybrid Annuity basis, subject to and on the terms and conditions set forth hereinafter.

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

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₹100

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Certificate No.	:	IN-DL66609226899639V
Certificate Issued Date	:	22-Feb-2023 09:59 AM
Account Reference	:	IMPACC (IV)/ dl788503/ DELHI/ DL-DLH
Unique Doc. Reference	:	SUBIN-DLDL78850305704957793707V
Purchased by	:	AMBALA KALA AMB HIGHWAY PRIVATE LIMITED
Description of Document	:	Article 5 General Agreement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	NATIONAL HIGHWAYS AUTHORITY OF INDIA
Second Party	:	AMBALA KALA AMB HIGHWAY PRIVATE LIMITED
Stamp Duty Paid By	:	AMBALA KALA AMB HIGHWAY PRIVATE LIMITED
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

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रियायत करार

यह करार आज दिनांक 22nd फ़रवरी, 2023 को निम्नलिखित के बीच किया गया

1 भारतीय राष्ट्रीय राजमार्ग प्राधिकरण अधिनियम, 1988 के अधीन स्थापित भारतीय राष्ट्रीय राजमार्ग प्राधिकरण जिसका प्रतिनिधित्व इसके अध्यक्ष करते हैं और जिसका प्रधान कार्यालय जी-5 एवं 6, सेक्टर-10, द्वारका नई दिल्ली-110075 में है (जिसे इसमें इसके पश्चात "प्राधिकरण" कहा गया और जिसकी अभिव्यक्ति में जब तक इसके संदर्भ अथवा अर्थ से असंगत न हो, इसके प्रशासक, उत्तराधिकारी और समुनदेशिती शामिल होंगे) एक पक्ष;

और

2. मैसर्स अंबाला कला अम्ब हाईवे प्राइवेट लिमिटेड, कंपनी अधिनियम 2013 के प्रावधानों के तहत संस्थापित एक कंपनी जिसका सीआईएन CIN U45209HR2022PTC108559 है व पंजीकृत कार्यालय, एससीओ नंबर 327-328, सेक्टर-20 मार्केट, हुडा कैथल, कैथल, हरियाणा-136027 भारत में है (जिसे इसमें इसके पश्चात "**रियायतग्राही**" कहा गया है और जिसकी अभिव्यक्ति में जब तक इसके संदर्भ अथवा अर्थ से असंगत न हो इसके उत्तराधिकारी और अनुमेत समनुदेशिती शामिल होंगे) दूसरा पक्ष।

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2. The onus of checking the legitimacy is on the users of the certificate.
3. In case of any discrepancy please inform the Competent Authority.

AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED AMBALA KALA AMB HIGHWAY PRIVATE LIMITED

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यत:

क. भारत सरकार ने 4-लेन अंबाला-काला अंब खंड एनएच-72 (अंबाला रिंग रोड (डिजाइन चैनेज (-) 0+800) से शहजादपुर तक नए एनएच-344 का हिस्सा और शाहजादपुर से काला अंब (HR/HP सीमा) तक (डिजाइन चेनेज 33+015) नए एनएच-7 का हिस्सा) (डिजाइन की लंबाई 33.815 किमी) NH(O) के तहत हाइब्रिड वार्षिकी मोड पर हरियाणा और पंजाब राज्य मे निर्माण करने का संकल्प लिया था, जिसे किए जाने वाले रियायत करार की निबंधन और शर्तों के अनुसार आंशिक तौर पर रियायतग्राही द्वारा वित्त पोषित किया जाएगा जो कि अपने निवेश और लागत को प्राधिकरण द्वारा किए गए भुगतान के माध्यम से वसूलेगा।

ख. प्राधिकरण ने एक स्तरीय दो लिफाफा बोली प्रक्रिया अपनाई थी और तदनुसार उपर्युक्त परियोजना को हाइब्रिड वार्षिकी आधार पर निर्माण, प्रचालन और अनुरक्षण के लिए योग्यता और बोलीकर्ता के चयन के लिए 01.07.2022 को प्रस्ताव के लिए अनुरोध ("**प्रस्ताव के लिए अनुरोध" अथवा "आरएफपी**")आमंत्रित किए थे।

ग. प्राधिकरण ने आरएफपी में तकनीकी और वाणिज्यिक निबंधन और शर्तें निर्धारित की थी और परियोजना का कार्य हाथ में लेने के लिए बोलीदाताओं से तकनीकी और वित्तीय बोलियों युक्त बोलियां आमंत्रित की थी।

घ. प्राप्त बोलियों के मूल्यांकन के उपरांत, प्राधिकरण ने अन्यों के साथ साथ चयनित बोलीकर्ता सहित कुछ बोलीकर्ताओं को तकनीकी रूप से योग्य माना था तथा चयनित बोलीकर्ता, मैसर्स अंबाला कला अम्ब हाईवे प्राइवेट लिमिटेड की वित्तीय बोली को स्वीकार कर लिया और चयनित बोलीकर्ता को ठेका पत्र सं. NHAI/HR/Ambala-KalaAmb/2022/154-M dated November 28, 2022 (जिसे इसमें इसके पश्चात **"एलओए"** कहा गया है) जारी किया जिसमें अन्य बातों के साथ-साथ इस पत्र के जारी होने के 45 दिन(पैंतालीस दिन) के अन्दर रियायत करार निष्पादित करने की अपेक्षा की गई थी।

ङ. चयनित बोलीकर्ता ने कम्पनी नियम 2013 के अधीन रियायतग्राही को परिसीमित देयता कम्पनी के तौर पर संप्रवर्तित और निगमित कर दिया है और प्राधिकरण को अनुरोध किया है कि रियायतग्राही को निकाय के रूप में स्वीकार किया जाए जो कि एलओए के अनुसरण में परियोजना का कार्य करने के लिए रियायत करार करने के दायित्व सहित एलओए के अंतर्गत कॉन्सोर्शियम के अधिकारों और दायित्वों का निर्वहन और निष्पादन करेगा।

च. दिनांक 29.12.2022 के अपने पत्र द्वारा रियायतग्राही भी चयनित बोलीकर्ता के उक्त अनुरोध में शामिल होगया है कि उसे संस्था के रूप में स्वीकार किया जाए जो कि एलओए के अनुसरण में रियायत करार करने के दायित्व सहित एलओए के अंतर्गत चयनित बोलीकर्ता के अधिकारों और दायित्वों का निर्वहन और निष्पादन करेगा। रियायतग्राही ने आगे इस हेतु अभिवेदन किया है कि उसे चयनित बोलीकर्ता द्वारा इसमें दिए गए उद्देश्यों के लिए संप्रवर्तित किया है तथा प्राधिकरण को रियायतग्राही द्वारा यह रियायत करार किए जाने और उसके प्रावधानों की प्रवर्तनीयता के प्राधिकार के बारे में कानूनी राय सौंपी है ।

छ. प्राधिकरण ने चयनित बोलीकर्ता और रियायतग्राही के उक्त अनुरोध को स्वीकार कर लिया है और तदनुसार इसमें इसके पश्चात दिए गए निबंधन और शर्तों के अधीन हाइब्रिड वार्षिकी आधार पर परियोजना के कार्यान्वयन के लिए रियायतग्राही के साथ यह रियायत करार करने की स्वीकृति दी है ।

अत: अब, पूर्वोक्त तथा संबंधित प्रसंविदाओं और इस करार में उल्लिखित सहमतियों को ध्यान में रखते हुए,जिसकी पर्याप्तता और उपयुक्तता को एतद्द्वारा स्वीकार किया जाता है और एतद्द्वारा कानूनी तौर पर बाध्यकारी हैं, दोनों पक्ष निम्नलिखित के लिए सहमत हो गए हैं:

ARTICLE 1

DEFINITIONS AND INTERPRETATION

1.1 **Definitions**

The words and expressions beginning with capital letters and defined in this Agreement (including those in Article 42) shall, unless the context otherwise requires, have the meaning ascribed thereto herein, and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules.

1.2 **Interpretation**

1.2.1 In this Agreement, unless the context otherwise requires,

(a) references to any legislation or any provision thereof shall include amendment or re-enactment or consolidation of such legislation or any provision thereof so far as such amendment or re-enactment or consolidation applies or is capable of applying to any transaction entered into hereunder;

(b) references to laws of India or Indian law or regulation having the force of law shall include the laws, acts, ordinances, rules, regulations, bye laws or notifications which have the force of law in the territory of India and as from time to time may be amended, modified, supplemented, extended or re-enacted;

(c) references to a "**person**" and words denoting a natural person shall be construed as a reference to any individual, firm, company, corporation, society, trust, government, state or agency of a state or any association or partnership (whether or not having separate legal personality) of two or more of the above and shall include successors and assigns;

(d) the table of contents, headings or sub-headings in this Agreement are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Agreement;

(e) the words **"include" and "including"** are to be construed without limitation and shall be deemed to be followed by **"without limitation"** or **"but not limited to"** whether or not they are followed by such phrases;

(f) references to **"construction"** or **"building"** include, unless the context otherwise requires, investigation, design, engineering, procurement, delivery, transportation, installation, processing, fabrication, testing, commissioning and other activities incidental to the construction, and **"construct"** or **"build"** shall be construed accordingly;

(g) references to "**development**" include, unless the context otherwise requires, construction, renovation, refurbishing, augmentation, upgradation and other activities incidental thereto, and **"develop"** shall be construed accordingly;

(h) any reference to any period of time shall mean a reference to that according to Indian Standard Time;

(i) any reference to day shall mean a reference to a calendar day;

(j) Reference to a **"business day"** shall be construed as reference to a day (other than a Sunday) on which banks in the State are generally open for business;

(k) any reference to month shall mean a reference to a calendar month as per the Gregorian calendar;

(l) references to any date, period or Project Milestone shall mean and include such date, period or Project Milestone as-may be extended pursuant to this Agreement;

(m) any reference to any period commencing **"from"** a specified day or date and **"till"** or **"until"** a specified day or date shall include both such days or dates; provided that if the last day of any period computed under this Agreement is not a business day, then the period shall run until the end of the next business day;

(n) the words importing singular shall include plural and vice versa;

(o) References to any gender shall include the other and the neutral gender;

(p) "**lakh**" means a hundred thousand (100,000) and "crore" means ten million (10,000,000);

(q) **"Indebtedness"** shall be construed so as to include any obligation (whether incurred as principal or surety) for the payment or repayment of money, whether present or future, actual or contingent;

(r) references to the **"winding-up", "dissolution", "insolvency", or "reorganisation"** of a company or corporation shall be construed so as to include any equivalent or analogous proceedings under the law of the jurisdiction in which such company or corporation is incorporated or any jurisdiction in which such company or corporation carries on business including the seeking of liquidation, winding-up, reorganisation, dissolution, arrangement, protection or relief of debtors;

(s) save and except as otherwise provided in this Agreement, any reference, at any time, to any agreement, deed, instrument, license or document of any description shall be construed as reference to that agreement, deed, instrument, license or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Sub-clause (s) shall not operate so as to increase liabilities or obligations of the Authority hereunder or pursuant hereto in any manner whatsoever;

(t) any agreement, consent approval, authorization, notice, communication, information, report or any other correspondence required under or pursuant to this Agreement, from or by any party or the Independent Engineer, shall be valid and effective only if it is routed through NHAI Data Lake (unless the law requires to send such notice, communication, etc, through physical/any other specified mode only) under the hand of a duly authorized representative of such Party or the Independent Engineer, as the case may be, in this behalf and not otherwise;

(u) the Schedules and Recitals to this Agreement and the Request for Proposals (**"RFP"**) forms an integral part of this Agreement and will be in full force and effect as though they were expressly set out in the body of this Agreement;

(v) references to Recitals, Articles, Clauses, Sub-clauses, Provisos or Schedules in this Agreement shall, except where the context otherwise requires, mean references to Recitals, Articles, Clauses, Sub-clauses, Provisos and Schedules of or to this Agreement; reference to an Annex shall, subject to anything to the contrary specified therein, be construed as a reference to an Annex to the Schedule in which such reference occurs; and reference to a Paragraph shall, subject to anything to the contrary specified therein, be construed as a reference to a Paragraph of the Schedule or Annex, as the case may be, in which such reference appears;

(w) the damages payable by either Party to the other of them, as set forth in this Agreement, whether on per diem basis or otherwise, are mutually agreed genuine pre-estimated loss and damage likely to be suffered and incurred by the Party entitled to receive the same and are not by way of penalty (the **"Damages"**); and

(x) Time shall be of the essence in the performance of the Parties' respective obligations. If any time period specified herein is extended, such extended time shall also be of the essence.

1.2.2 Unless expressly provided otherwise in this Agreement, any Documentation required to be provided or furnished by the Concessionaire to the Authority and/ or the Independent Engineer shall be provided free of cost and in three copies, and if the Authority and/or the Independent Engineer is required to return any such Documentation with their comments and/or approval, they shall be entitled to retain two copies thereof.

1.2.3 The rule of construction, if any, that a contract should be interpreted against the parties responsible for the drafting and preparation thereof, shall not apply.

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

1.3 **Measurements and arithmetic conventions**

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

1.4 **Priority of agreements, clauses and schedules**

1.4.1 This Agreement, and all other agreements and documents forming part of or referred to in this agreement are to be taken as mutually explanatory and, unless otherwise expressly provided elsewhere in this Agreement, the priority of this Agreement and other documents and agreements forming part hereof or referred to herein shall, in the event of any conflict between them, be in the following order:

(a) this Agreement; and

(b) all other agreements and documents forming part hereof or referred to herein,

i.e. the Agreement at (a) above shall prevail over the agreements and documents at (b) above.

1.4.2 Subject to provisions of Clause 1.4.1, in case of ambiguities or discrepancies within this Agreement, the following shall apply:

(a) between two or more Clauses of this Agreement, the provisions of a specific Clause relevant to the issue under consideration shall prevail over those in other Clauses;

(b) between the Clauses of this Agreement and the Schedules, the Clauses shall prevail and between Schedules and Annexes, the Schedules shall prevail;

(c) between any two Schedules, the Schedule relevant to the issue shall prevail;

(d) between the written description on the Drawings and the Specifications and Standards, the latter shall prevail;

(e) between the dimension scaled from the Drawing and its specific written dimension, the latter shall prevail; and

(f) between any value written in numerals and that in words, the latter shall prevail.

Part II
The Concession

ARTICLE 2

SCOPE OF THE PROJECT

2.1 Scope of the Project

The scope of the Project (the **"Scope of the Project"**) shall mean and include, during the Concession Period:

(a) construction of the Project on the Site set forth in Schedule-A and as specified in Schedule-B together with provision of Project Facilities as specified in Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D;

(b) operation and maintenance of-the Project in accordance with the provisions of this Agreement; and

(c) performance and fulfillment of all other obligations of the Concessionaire in accordance with the provisions of this Agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the Concessionaire under this Agreement

ARTICLE 3

GRANT OF CONCESSION

3.1 **The Concession**

3.1.1 Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 730 (Seven hundred thirty) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.

3.1.2 Subject to and in accordance with the provisions of this Agreement, the Concession hereby granted shall oblige or entitle (as the case may be) the Concessionaire to:

(a) Right of Way, access and license to the Site for the purpose of and to the extent conferred by the provisions of this Agreement;
(b) finance and construct the Project;
(c) manage, operate and maintain the Project;
(d) perform and fulfill all of the Concessionaire's obligations under and in accordance with this Agreement;
(e) save as otherwise expressly provided in this Agreement, bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under this Agreement; and
(f) neither assign, transfer or sublet or create any lien or encumbrance on this Agreement, or the Concession hereby granted or on the whole or any part of the Project nor transfer, lease or part possession thereof, save and except as expressly permitted by this Agreement or the Substitution Agreement.

ARTICLE 4

CONDITIONS PRECEDENT

4.1 Conditions Precedent

4.1.1 Save and except as expressly provided in Articles 4, 5, 6, 7, 8, 9, 10, 22, 28,38 and 41, or unless the context otherwise requires, the respective rights and obligations of the Parties under this Agreement shall be subject to the satisfaction in full of the conditions precedent specified in this Clause 4.1 (the "**Conditions Precedent**").

4.1.2 The Concessionaire may, upon providing the Performance Security to the Authority in accordance with Article 9, at any time after 30 (thirty) days from the date of this Agreement or on an earlier day acceptable to the Authority, by notice require the Authority to satisfy all of the Conditions Precedent set forth in this Clause 4.1.2 within a period of 120 (one hundred and twenty) days thereafter. The Conditions Precedent required to be satisfied by the Authority shall be deemed to have been fulfilled when the Authority shall have:

(a) procured for the Concessionaire the Right of Way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2;

(b) procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2;

(c) procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees; and

(d) procured approval of the General Arrangement Drawings for the road over bridges/under bridges at level crossings on the Project.

Provided that the Authority shall be entitled to an additional period, not exceeding 90(ninety) days beyond the period of 150 days without being liable for payment of any damages, for fulfillment of the Conditions Precedent set forth in this Clause.

4.1.3 The Conditions Precedent required to be satisfied by the Concessionaire within a period of 150 (one hundred and fifty) days from the date of this Agreement shall be deemed to have been fulfilled when the Concessionaire shall have:

(a) provided Performance Security to the Authority along with the Additional Performance Security, if required in terms of Clause 9.1 and Clause 9.7 of this Agreement. For the avoidance of doubt, it is clarified and agreed that the Concessionaire is required to provide the Performance Security and the Additional Performance Security, if required, within 30 days of signing of this Agreement;

(b) executed and procured execution of the Escrow Agreement;

(c) executed and procured execution of the Substitution Agreement;

(d) procured all the Applicable Permits specified in Part-I of Schedule-E unconditionally or if subject to conditions, then all such conditions required to be fulfilled by the date specified therein shall have been satisfied in full and such Applicable Permits are in full force and effect;

(e) executed the Financing Agreements and delivered to the Authority 3 (three) true copies thereof, duly attested by a Director of the Concessionaire;

(f) delivered to the Authority 3 (three) true copies of the Financial Package and the Financial Model, duly attested by a Director of the Concessionaire, along with 3 (three) soft copies of the Financial Model in MS Excel version or any substitute thereof, which is acceptable to the Senior Lenders; and

(g) delivered to the Authority from the selected bidder, their respective confirmation of the correctness of the representations and warranties set forth in Sub-clauses (k), (l) and (m) of Clause 7.1 of this Agreement.

4.1.4 Each Party shall make all reasonable endeavours to satisfy the Conditions Precedent within the time stipulated and shall provide the other Party with such reasonable cooperation as may be required to assist that Party in satisfying the Conditions Precedent for which that Party is responsible. Subject only to payment of Damages, it is agreed between the Parties that the obligation to fulfill each parties' Conditions Precedent is an independent obligation of the respective Party.

4.1.5 The Parties shall notify each other in writing at least once a month on the progress made in satisfying the Conditions Precedent. Each Party shall promptly inform the other Party when any Condition Precedent for which it is responsible has been satisfied.

4.2 Damages for delay by the Authority

In the event that (i) the Authority does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2% (zero point two per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of the Bid Security and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement. The Damages payable hereunder shall be the sole remedy available to the Concessionaire for delay by the Authority.

Provided further that in the event of delay by the Concessionaire in procuring fulfillment of the Conditions Precedent specified in Clause 4.1.3, no Damages shall be due or payable by the Authority under this Clause 4.2 until the date on which the Concessionaire shall have procured fulfillment of the Conditions Precedent specified in Clause 4.1.3.

4.3 Damages for delay by the Concessionaire

In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent. Provided, however, that the Damages payable hereunder shall be subject to the maximum limit equal to the amount of the Bid Security and upon reaching such limit, the Authority may, in its sole discretion and subject to the provisions of Clause 9.2, terminate the Agreement. Provided further that in the event of delay by the Authority in procuring fulfillment of the Conditions Precedent specified in Clause 4.1.2, no Damages shall be due or payable by the Concessionaire under this Clause

4.3 until the date on which the Authority shall have procured fulfillment of the Conditions Precedent specified in Clause 4.1.2.

4.4 Commencement of Concession Period

The date on which Financial Close is achieved and all the Conditions Precedent specified in Clause 4.1 are satisfied shall be the Appointed Date which shall be the date of commencement of the Concession Period. For the avoidance of doubt, the Parties agree that the Concessionaire may, upon occurrence of the Appointed Date hereunder, by notice convey the particulars thereof to the Authority, and shall thereupon be entitled to commence construction on the Project.

4.5 Deemed Termination upon delay

Without prejudice to the provisions of Clauses 4.2 and 4.3, and subject to the provisions of Clause 9.2, the Parties expressly agree that in the event the Appointed Date does not occur, for any reason whatsoever, before the 1st (first) anniversary of the date of this Agreement or the extended period provided in accordance with this Agreement, all rights, privileges, claims and entitlements of the Concessionaire under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Concessionaire, and the Concession Agreement shall be deemed to have been terminated by mutual agreement of the Parties. Provided, however, that in the event the non-occurrence of the Appointed Date is for reasons attributable to the Concessionaire, the Performance Security and the Additional Performance Security, if any, of the Concessionaire shall be encashed and appropriated by the Authority as Damages thereof.

ARTICLE 5

OBLIGATIONS OF THE CONCESSIONAIRE

5.1 Obligations of the Concessionaire

5.1.1 Subject to and on the terms and conditions of this Agreement, the Concessionaire shall, at its own cost and expense, procure finance for and undertake the design, engineering, procurement, construction, operation and maintenance of the Project and observe, fulfill, comply with and perform all its obligations set out in this Agreement or arising hereunder.

5.1.2 The Concessionaire shall comply with all Applicable Laws and Applicable Permits (including renewals as required) in the performance of its obligations under this Agreement.

5.1.3 Save and except as otherwise provided in this Agreement or Applicable Laws, as the case may be, the Concessionaire shall, in discharge of all its obligations under this Agreement, conform with and adhere to Good Industry Practice at all times.

5.1.4 The Concessionaire shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement:

(a) make, or cause to be made, necessary applications to the relevant Government Instrumentalities with such particulars and details as may be required for obtaining Applicable Permits, other than those set forth in Clause 4.1.2, and obtain and keep in force and effect such Applicable Permits in conformity with Applicable Laws;

(b) procure, as required, the appropriate proprietary rights, licenses, agreements and permissions for materials, methods, processes, know-how and systems used or incorporated into the Project;

(c) perform and fulfill its obligations under the Financing Agreements;

(d) make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement;

(e) upon written request from the Authority, make reasonable efforts to facilitate the acquisition of land and procuring of environmental and forest clearances required for the purposes of the Agreement;

(f) ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this Agreement;

(g) always act in a manner consistent with the provisions of this Agreement and not cause or fail to do any act, deed or thing, whether intentionally or otherwise, which may in any manner be violative of any of the provisions of this Agreement;

(h) support, cooperate with and facilitate the Authority in the implementation and operation of the Project in accordance with the provisions of this Agreement; and

(i) transfer the Project to the Authority upon Termination of this Agreement, in accordance with the provisions of this Agreement.

5.2 Obligations relating to Project Agreements

5.2.1 It is expressly agreed that the Concessionaire shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the Project Agreements or any other agreement, and no default under any Project Agreement or agreement shall excuse the Concessionaire from its obligations or liability hereunder.

5.2.2 The Concessionaire shall submit to the Authority the drafts of all Project Agreements, or any amendments or replacements thereto, for its review and comments, and the Authority shall have the right but not the obligation to undertake such review and provide its comments, if any, to the Concessionaire within 30 (thirty) days of the receipt of such drafts. Within 7 (seven) days of execution of any Project Agreement or amendment thereto, the Concessionaire shall submit to the Authority a true copy thereof, duly attested by a Director of the Concessionaire, for its record. For the avoidance of doubt, it is agreed that the review and comments hereunder shall be limited to ensuring compliance with the terms of this Agreement. It is further agreed that any failure or omission of the Authority to review and/ or comment hereunder shall not be construed or deemed as acceptance of any such agreement or document by the Authority. No review and/ or observation of the Authority and/ or its failure to review and/ or convey its observations on any document shall relieve the Concessionaire of its obligations and liabilities under this Agreement in any manner nor shall the Authority be liable for the same in any manner whatsoever.

5.2.3 The Concessionaire shall not make any addition, replacement or amendments to any of the Financing Agreements without the prior written consent of the Authority if such addition, replacement or amendment has, or may have, the effect of imposing or increasing any financial liability or obligation on the Authority, and in the event that any replacement or amendment is made without such consent, the Concessionaire shall not enforce such replacement or amendment nor permit enforcement thereof against the Authority. For the avoidance of doubt, the Authority acknowledges and agrees that it shall not unreasonably withhold its consent for restructuring or rescheduling of the debt of the Concessionaire and shall respond to the request for consent no later than 30 days from the receipt of such request from the Concessionaire.

5.2.4 The Concessionaire shall procure that each of the Project Agreements contains provisions that entitle the Authority and / or Lenders Representative to step into such agreement, in its sole discretion, in substitution of the Concessionaire in the event of Termination or Suspension (the "Covenant"). Further, it is clarified that in case both the Authority and Lenders' Representative decide to exercise their right to step-in, the Authority shall have the sole right to step into the Project Agreements. For the avoidance of doubt, it is expressly agreed that in the event the Authority does not exercise such rights of substitution within a period not exceeding 90 (ninety) days from the Transfer Date, the Project Agreements shall be deemed to cease to be in force and effect on the Transfer Date without any liability whatsoever on the Authority and the Covenant shall expressly provide for such eventuality. The Concessionaire expressly agrees to include the Covenant in all its Project Agreements and undertakes that it shall, in respect of each of the Project Agreements, procure and deliver to the Authority an acknowledgment and undertaking, in a form acceptable to the Authority, from the counter party(ies) of each of the Project Agreements, where under such counter party(ies) shall acknowledge and accept the Covenant and undertake to be bound by the same and not to seek any relief or remedy whatsoever from the Authority in the event of Termination or Suspension.

5.2.5 Notwithstanding anything to the contrary contained in this Agreement, the Concessionaire agrees and acknowledges that selection or replacement of the EPC Contractor and an O&M Contractor and execution of the EPC Contract and O&M Contract shall be subject to the prior approval of the Authority from national security and public interest perspective, the decision of the Authority in this behalf being final, conclusive and binding on the Concessionaire, and undertakes that it shall not give effect to any such selection or contract without prior approval of the Authority. For the avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the Authority shall endeavor to convey its decision thereon expeditiously and no later than 30 days from the date of receipt of the proposal alongwith the draft agreement by the Authority. It is also agreed that the Authority shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Concessionaire or its Contractors from any liability or obligation under this Agreement.

5.3 Obligations relating to Change in Ownership

5.3.1 The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.

5.3.2 Notwithstanding anything to the contrary contained in this Agreement, the Concessionaire agrees and acknowledges that:

(a) all acquisitions of Equity by an acquirer, either by himself or with any person acting in concert, directly or indirectly, including by transfer of the direct or indirect legal or beneficial ownership or control of any Equity, in aggregate of 25% (twenty five per cent) or more of the total Equity of the Concessionaire; or

(b) acquisition of any control directly or indirectly of the Board of Directors of the Concessionaire by any person either by himself or together with any person or persons acting in concert with him, shall constitute a Change in Ownership requiring prior approval of the Authority from national security and public interest perspective, the decision of the Authority in this behalf being final, conclusive and binding on the Concessionaire, and undertakes that it shall not give effect to any such acquisition of Equity or control of the Board of Directors of the Concessionaire without such prior approval of the Authority. For the avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the Authority shall endeavor to convey its decision thereon expeditiously. It is also agreed that the Authority shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Concessionaire from any liability or obligation under this Agreement.

For the purposes of this Clause 5.3.2:

(i) the expression "acquirer", "control" and "person acting in concert" shall have the meaning ascribed thereto in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeover) Regulations, 2011 or any statutory re-enactment thereof as in force as on the date of acquisition of Equity, or the control of the Board of Directors, as the case may be, of the Concessionaire;

(ii) the indirect transfer or control of legal or beneficial ownership of Equity shall mean transfer of the direct or indirect beneficial ownership or control of any company or

companies whether in India or abroad which results in the acquirer acquiring control over the shares or voting rights of shares of the Concessionaire; and

(iii) power to appoint, whether by contract or by virtue of control or acquisition of shares of any company holding directly or through one or more companies (whether situate in India or abroad) the Equity of the Concessionaire, not less than half of the directors on the Board of Directors of the Concessionaire or of any company, directly or indirectly whether situate in India or abroad, having ultimate control of 25% (twenty five per cent) or more of the Equity of the Concessionaire shall constitute acquisition of control, directly or indirectly, of the Board of Directors of the Concessionaire.

5.4 Obligations relating to employment of foreign nationals

The Concessionaire acknowledges, agrees and undertakes that employment of foreign personnel by the Concessionaire and/or its contractors and their subcontractors shall be subject to grant of requisite regulatory permits and approvals including employment/residential visas and work permits, if any required, and the obligation to apply for and obtain the same shall and will always be of the Concessionaire and, notwithstanding anything to the contrary contained in this Agreement, refusal of or inability to obtain any such permits and approvals by the Concessionaire or any of its contractors or sub-contractors shall not constitute Force Majeure Event, and shall not in any manner excuse the Concessionaire from the performance and discharge of its obligations and liabilities under this Agreement.

5.5 Obligations relating to employment of trained personnel

The Concessionaire shall ensure that the personnel engaged by it in the performance of its obligations under this Agreement are at all times properly trained for their respective function

5.6 Facilities for differently abled and elderly persons

The Concessionaire shall, in conformity with the guidelines issued from time to time by the Ministry of Social Justice and Empowerment, or a substitute thereof, procure a barrier free environment for the differently abled and for elderly persons using the Project.

5.7 Branding of Project

The Project or any part thereof shall not be branded in any manner to advertise, display or reflect the name or identity of the Concessionaire or its shareholders. The Concessionaire undertakes that it shall not, in any manner, use the name or entity of the Project to advertise or display its own identity, brand equity or business interests, including those of its shareholders, save and except as may be necessary in the normal course of business. For the avoidance of doubt, it is agreed that the Concessionaire may display its own name at a spot where other public notices are displayed for the Users. It is further agreed that the Project shall be known, promoted, displayed and advertised by the name of 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).

5.8 Sole purpose of the Concessionaire

The Concessionaire having been set up for the sole purpose of exercising the rights and observing and performing its obligations and liabilities under this Agreement, the Concessionaire or any of its subsidiaries shall not, except with the previous written consent of the Authority, be or become directly or indirectly engaged, concerned or interested in any business other than as envisaged herein.

5.9 Obligations relating to Local Content

The Concessionaire [Class I Local Supplier/ Class II Local Supplier/ Non Local Supplier] undertakes to ensure minimum Local Content in the project Highway of at least [50%/20%] duly complying with the provision of Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India Order No. P-45021/2/2017-PP (BE-II) dated September 16, 2020, as amended or modified till Bid Due Date and the provision under Rule 144(xi) of GFR, 2017.

ARTICLE 6

OBLIGATIONS OF THE AUTHORITY

6.1 Obligations of the Authority

6.1.1 The Authority shall, at its own cost and expense undertake, comply with and perform all its obligations set out in this Agreement or arising hereunder.

6.1.2 The Authority agrees to provide support to the Concessionaire and undertakes to observe, comply with and perform, subject to and in accordance with the provisions of this Agreement and Applicable Laws, the following

(a) upon written request from the Concessionaire, and subject to the Concessionaire complying with Applicable Laws, provide reasonable support and assistance to the Concessionaire in procuring Applicable Permits required from any Government Instrumentality for implementation and operation of the Project;

(b) upon written request from the Concessionaire, provide reasonable assistance to the Concessionaire in obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favorable to the Concessionaire than those generally available to commercial customers receiving substantially equivalent services;

(c) procure that no barriers are erected or placed on or about the Project by any Government Instrumentality or persons claiming through or under it, except for reasons of Emergency, national security or law and order;

(d) Deleted

(e) Subject to and in accordance with Applicable Laws, grant to the Concessionaire the authority to regulate use of the Project;

(f) Assist the Concessionaire in procuring police assistance for regulation of Users, removal of trespassers and security on or at the Project;

(g) Not do or omit to do any act, deed or thing which may in any manner is violating of any of the provisions of this Agreement;

(h) support, cooperate with and facilitate the Concessionaire in the implementation and operation of the Project in accordance with the provisions of this Agreement;

(i) upon written request from the Concessionaire and subject to the provisions of Clause 5.4, provide reasonable assistance to the Concessionaire and any expatriate personnel of the Concessionaire or its Contractors to obtain applicable visas and work permits for discharging their respective obligations under this Agreement and the Project Agreements;

(j) undertake rehabilitation and resettlement of persons affected by construction of the Project and bear all costs and expense in respect thereof, save and except as otherwise provided in this Agreement; and

(k) subject to the Concessionaire complying with Applicable Laws, provide reasonable support and assistance to the Concessionaire in procuring approvals, other than

approval of the General Approval Drawings of the Railway authorities for construction of such road over bridges/under bridges.

6.2 Maintenance obligations prior to Appointed Date

6.2.1 During the Development Period, the Concessionaire shall maintain the existing Project Highway, in such a manner so as to ensure that the road is in pothole free condition and also to ensure that the quality of service and safety are maintained and in the event of any material deterioration or damage other than normal wear and tear, the Concessionaire shall undertake repair thereof. It is deemed that the Concessionaire has made necessary provisions for inclusion of costs related to maintenance during the Development Period in its Bid. Provided that in case Appointed Date is not achieved and the Concession Agreement is terminated prior to achievement of Appointed Date, the Concessionaire shall be reimbursed the cost of maintenance during Development Period by the Authority after due certification by the Authorized Representative of the Authority. For the purpose of such reimbursement, the lump sum per kilometer rate of reimbursement for a period of 1 (one) year would be **Nil** and shall be paid on a pro-rata basis for the period concerned. For the avoidance of doubt, the Concessionaire would be reimbursed the cost of maintenance only in case of termination prior to Appointed Date and only if it maintains the Project as envisaged in this Clause 6.2.1.

6.2.2 In case of failure of the Concessionaire to undertake maintenance or repair of the Project, the Authority shall undertake maintenance or repair of the Project Highway at the cost and expense of the Concessionaire and recover the said cost as determined by the Independent Engineer from the Bid Security or the Performance security, as the case may be, submitted by the Concessionaire. For the avoidance of doubt, the Concessionaire shall undertake repairs only for ensuring safe operation of the Project Highway and in the event of excessive deterioration or damage caused due to unforeseen events such as floods or torrential rain the Authority shall undertake special repairs at its own cost and expense.

6.2.3 During the Development Period, the Concessionaire shall protect the Project Highway from any and all occupations, encroachments or Encumbrances, and shall not place or create nor permit any Contractor or other person claiming through or under the Concessionaire to place or create any Encumbrance or security interest over all or any part of the Project Highway or under this Agreement, save and except as otherwise expressly set forth in this Agreement. Further, the Concessionaire shall perform its obligations in a manner that two existing lanes of the Project Highway or an alternative thereof are open to traffic at all times during the Development Period.

6.3 Obligations relating to refinancing

Upon request made by the Concessionaire to this effect, the Authority shall, in conformity with any regulations or guidelines that may be notified by the Government or the Reserve Bank of India, as the case may be, permit and enable the Concessionaire to secure refinancing on such terms as may be agreed upon between the Concessionaire and the entity providing such refinancing; provided, however, that the refinancing hereunder shall always be subject to the prior consent of the Authority, which consent shall not be unreasonably withheld. The Authority shall endeavor to convey its decision on such request of the Concessionaire within 30 days of receipt of the proposal by the Authority.

ARTICLE 7

REPRESENTATIONS AND WARRANTIES

7.1 Representations and warranties of the Concessionaire

The Concessionaire represents and warrants to the Authority that:

(a) It is duly organized and validly existing under the laws of India, and has full power and authority to execute and perform its obligations under this Agreement and to carry out the transactions contemplated hereby;

(b) it has taken all necessary corporate and other actions under Applicable Laws to authorise the execution and delivery of this Agreement and to validly exercise its rights and perform its obligations under this Agreement;

(c) the selected bidder and its Associates have the financial standing and resources to fund the required Equity and to raise the debt necessary for undertaking and implementing the Project in accordance with this Agreement;

(d) this Agreement constitutes its legal, valid and binding obligation, enforceable against it in accordance with the terms hereof, and its obligations under this Agreement -will be legally valid, binding and enforceable obligations against it in accordance with the terms hereof;

(e) it is subject to the laws of India, and hereby expressly and irrevocably waives any immunity in any jurisdiction in respect of this Agreement or matters arising hereunder including any obligation, liability or responsibility hereunder;

(f) The information furnished in the Bid and as updated on or before the date of this Agreement is true and accurate in all respects as on the date of this Agreement;

(g) the execution, delivery and performance of this Agreement will not conflict with, result in the breach of, constitute a default under, or accelerate performance required by any of the terms of its Memorandum and Articles of Association {or those of any member of the Consortium} or any Applicable Laws or any covenant, contract, agreement, arrangement, understanding, decree or order to which it is a party or by which it or any of its properties or assets is bound or affected;

(h) there are no actions, suits, proceedings, or investigations pending or, to its knowledge, threatened against it at law or in equity before any court or before any other judicial, quasi-judicial or other authority, the outcome of which may result in the breach of this Agreement or which individually or in the aggregate may result in any material impairment of its ability to perform any of its obligations under this Agreement;

(i) it has no knowledge of any violation or default with respect to any order, writ, injunction or decree of any court or Government Instrumentality which may result in any material adverse effect on its ability to perform its obligations under this Agreement and no fact or circumstance exists which may give rise to such proceedings that would adversely affect the performance of its obligations under this Agreement;

(j) it has complied with Applicable Laws in all material respects and has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities which in the aggregate have or may have a material adverse effect on its ability to perform its obligations under this Agreement;

(k) it shall at no time undertake or permit any Change in Ownership except in accordance with the provisions of Clause 5.3 and that the selected bidder, together with its Associates, hold not less than 51% (fifty-one percent) of its issued and paid up Equity as on the date of this Agreement; and that each Consortium Member whose technical and financial capacity was evaluated for the purposes of pre-qualification and short-listing in response to the Request for Proposals shall hold at least 26% (twenty six per cent) of Equity during the Construction Period and six months thereafter along with its Associates;

Provided further that any such request made under Clause 7.1(k) and / or Article 42, at the option of the Authority, may be required to be accompanied by a suitable no objection letter from Senior Lenders

(l) the selected bidder is duly organized and validly existing under the laws of the jurisdiction of its incorporation or registration, as the case may be, and has requested the Authority to enter into this Agreement with the Concessionaire pursuant to the Letter of Award, and has agreed to and unconditionally accepted the terms and conditions set forth in this Agreement;

(m) all its rights and interests in the Project shall pass to and vest in the Authority on the Transfer Date free and clear of all liens, claims and Encumbrances, without any further act or deed on its part or that of the Authority, and that none of the Project Assets shall be acquired by it Subject to any agreement under which a security interest or other lien or Encumbrance is retained by any person, save and except as expressly provided in this Agreement;

(n) no representation or warranty by it contained herein or in any other document furnished by it to the Authority or to any Government Instrumentality in relation to Applicable Permits contains or will contain any untrue or misleading statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading;

(o) no sums, in cash or kind, have been paid or will be paid, by it or on its behalf, to any person by way of fees, commission or otherwise for securing the Concession or entering into this Agreement or for influencing or attempting to influence any officer or employee of the Authority in connection therewith;

(p) all information provided by the selected bidder in response to the Request for Proposals or otherwise, is to the best of its knowledge and belief, true and accurate in all material respects; and

(q) All undertakings and obligations of the Concessionaire arising from the Request for Proposals or otherwise shall be binding on the Concessionaire as if they form part of this Agreement.

7.2 Representations and warranties of the Authority

The Authority represents and warrants to the Concessionaire that:

(a) it has full power and authority to execute, deliver and perform its obligations under this Agreement and to carry out the transactions contemplated herein and that it has taken all actions necessary to execute this Agreement, exercise its rights and perform its obligations, under this Agreement;

(b) It has taken all necessary actions under Applicable Laws to authorize the execution, delivery and performance of this Agreement;

(c) It has the financial standing and capacity to perform its obligations under this Agreement;

(d) This Agreement constitutes a legal, valid and binding obligation enforceable against it in accordance with the terms hereof;

(e) it has no knowledge of any violation or default with respect to any order, writ, injunction or any decree of any court or any legally binding order of any Government Instrumentality which may result in any material adverse effect on the Authority's ability to perform its obligations under this Agreement;

(f) It has complied with Applicable Laws in all material respects;

(g) It has the right, power and authority to manage and operate the Project; and

(h) It shall procure good and valid right to the Site, and has power and authority to grant a license in respect thereto to the Concessionaire.

7.3 Disclosure

In the event that any occurrence or circumstance comes to the attention of either Party that renders any of its aforesaid representations or warranties untrue or incorrect, such Party shall immediately notify the other Party of the same. Such notification shall not have the effect of remedying any breach of the representation or warranty that has been found to be untrue or incorrect nor shall it adversely affect or waive any right, remedy or obligation of either Party under this Agreement.

ARTICLE 8

DISCLAIMER

8.1 Disclaimer

8.1.1 The Concessionaire acknowledges that prior to the execution of this Agreement, the Concessionaire has, after a complete and careful examination, made an independent evaluation of the Request for Proposals, Scope of the Project, Specifications and Standards, Site, existing structures, local conditions, physical qualities of ground, subsoil and geology, and all information provided by the Authority or obtained, procured or gathered otherwise, and has determined to its satisfaction the accuracy or otherwise thereof and the nature and extent of difficulties, risks and hazards as are likely to arise or may be faced by it in the course of performance of its obligations hereunder. The Authority makes no representation whatsoever, express, implicit or otherwise, regarding the accuracy, adequacy, correctness, reliability and/or completeness of any assessment, assumptions, statement or information provided by it and the Concessionaire confirms that it shall have no claim whatsoever against the Authority in this regard.

8.1.2 The Concessionaire acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth in Clause 8.1.1 above and hereby acknowledges and agrees that the Authority shall not be liable for the same in any manner whatsoever to the Concessionaire, {the Consortium Members and their} Associates or any person claiming through or under any of them.

8.1.3 The Parties agree that any mistake or error in or relating to any of the matters set forth in Clause 8.1.1 above shall not vitiate this Agreement, or render it voidable.

8.1.4 In the event that either Party becomes aware of any mistake or error relating to any of the matters set forth in Clause 8.1.1 above, that Party shall immediately notify the other Party, specifying the mistake or error; provided, however, that a failure on part of the Authority to give any notice pursuant to this Clause 8.1.4 shall not prejudice the disclaimer of the Authority contained in Clause 8.1.1 and shall not in any manner shift to the Authority any risks assumed by the Concessionaire pursuant to this Agreement.

8.1.5 Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.

Part III
Development and Operations

ARTICLE 9

PERFORMANCE SECURITY

9.1 Performance Security

9.1.1 The Concessionaire shall, for the performance of its obligations hereunder, provide to the Authority no later than 30(thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank for a sum equivalent to Rs. 18,87,48,000/- (Rupees Eighteen Crore Eighty Seven Lakh and Forty Eight Thousand Only)[1] in the form set forth in Schedule-F (the **"Performance Security").** Until such time the Performance Security is provided by the Concessionaire pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security pursuant hereto, the Authority shall release the Bid Security to the Concessionaire.

9.1.2 Notwithstanding anything to the contrary contained in this Agreement, in the event Performance Security is not provided by the Concessionaire within a period of 30(thirty) days from the date of this Agreement, the Authority may encash the Bid Security and appropriate the proceeds thereof as Damages, and thereupon all rights, privileges, claims and entitlements of the Concessionaire under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Concessionaire, and this Agreement shall be deemed to have been terminated by mutual agreement of the Parties.

9.2 Appropriation of Performance Security

Upon occurrence of a Concessionaire Default or failure to meet any Condition Precedent, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate from the Performance Security the amounts due to it for and in respect of such Concessionaire Default or for failure to meet any Condition Precedent. Upon such encashment and appropriation from the Performance Security, the Concessionaire shall, within 15 (fifteen) days thereof, replenish, in case of partial appropriation, to the original level of the Performance Security, and in case of appropriation of the entire Performance Security provide a fresh Performance Security, as the case may be, failing which the Authority shall be entitled to terminate this Agreement in accordance with Article 31.

Provided that upon appropriation on account of Concessionaire's Default the Concessionaire shall replenish the Performance Security and upon such replenishment or furnishing of a fresh Performance Security, as the case may be, the Concessionaire shall be entitled to an additional Cure Period of 120 (one hundred and twenty) days for remedying the Concessionaire Default, save and except as provided in Clause 4.5 of this Agreement, and in the event of the Concessionaire not curing its default within such Cure Period, the Authority shall be entitled to encash and appropriate such Performance Security as Damages, and to terminate this Agreement in accordance with Article 31.

9.3 Release of Performance Security

The Performance Security shall remain in force and effect for a period of one year from the Appointed Date, but shall be released earlier upon the Concessionaire expending on Project

[1]Calculated @ 3% (three per cent) of the Bid Project Cost

construction an aggregate sum that is not less than 30% (thirty per cent) of the Bid Project Cost; provided, however, that the Performance Security shall not be released and shall be kept alive by the Concessionaire if the Concessionaire is in breach of this Agreement. Upon request made by the Concessionaire for release of the Performance Security along with the particulars which establish satisfaction of the requirements specified in this Clause 9.3, the Authority shall release the Performance Security forthwith.

9.4 Deleted

9.5 Deleted

9.6 References to Performance Security

References to Performance Security occurring in this Agreement for and in respect of any period prior to the delivery of the Performance Security by the Concessionaire to the Authority, or in respect of any period subsequent to the expiry or release thereof, as the case may be, shall be construed solely for the purposes of calculating the amount of Damages payable by the Concessionaire.

9.7 Additional Performance Security

The Concessionaire shall alongwith the Performance Security provide to the Authority an irrevocable and unconditional guarantee from a Bank for a sum equivalent to Rs. ***** crore (Rupees ***** crore) in the form set forth in Schedule-F (the "Additional Performance Security"), to be modified, mutatis mutandis, for this purpose as security to the Authority if the Bid Project Cost of the Selected Bidder is lower by more than 10% with respect to the Estimated Project Cost. The requirement of submitting the Additional Performance Security shall be a Condition Precedent. Failure to maintain the Additional Performance Security shall be treated as Concessionaire Default as per Clause 31.1.1

9.8 Appropriation and Release of Additional Performance Security

Notwithstanding anything contrary contained in this Agreement, if this Agreement is terminated, except for Authority Default or due to the Force Majeure, prior to achievement of the III (third) Project Milestone, the Authority shall have the right to encash the Additional Performance Security in addition to the Performance Security. However, the Additional Performance Security shall be released upon achievement of Project Milestone – III as defined in Schedule G and shall be released immediately and no later than 30 (thirty) days from the certification of achievement of Project Milestone- III.

ARTICLE 10

RIGHT OF WAY

10.1 The Site

The site of the Project shall comprise the real estate described in Schedule-A and in respect of which the Right of Way shall be provided and granted by the Authority to the Concessionaire as a licensee under and in accordance with this Agreement (**the "Site"**). For the avoidance of doubt, it is hereby acknowledged and agreed that references to the Site shall be construed as references to the real estate required for the Project as set forth in Schedule-A.

10.2 License, Access and Right of Way

10.2.1 The Authority hereby grants to the Concessionaire access to the Site for carrying out any surveys, investigations and soil tests that the Concessionaire may deem necessary during the Development Period, it being expressly agreed and understood that the Authority shall have no liability whatsoever in respect of survey, investigations and tests carried out or work undertaken by the Concessionaire on or about the Site pursuant hereto in the event of Termination or otherwise.

10.2.2 In consideration of the Project, this Agreement and the covenants and warranties on the part of the Concessionaire herein contained, the Authority, in accordance with the terms and conditions set forth herein, hereby grants to the Concessionaire, commencing from the Appointed Date, leave and license rights in respect of all the land (along with any buildings, constructions or immovable assets, if any, thereon) comprising the Site which is described, delineated and shown in Schedule-A hereto (the **"Licensed Premises"**), on an "as is where is" basis, free of any Encumbrances, to develop, operate and maintain the said Licensed Premises, together with all and singular rights, liberties, privileges, easements and appurtenances whatsoever to the said Licensed Premises, hereditaments or premises or any part thereof belonging to or in any way appurtenant thereto or enjoyed therewith, for the duration of the Concession Period and, for the purposes permitted under this Agreement, and for no other purpose whatsoever.

10.2.3 The license, access and right of way granted by this Agreement to the Concessionaire shall always be subject to existing rights of way and the Concessionaire shall perform its obligations in a manner that Green Field Highway or an alternative thereof are open to traffic at all times during the Construction Period.

10.2.4 It is expressly agreed that the license granted hereunder shall terminate automatically and forthwith, without the need for any action to be taken by the Authority to terminate the license, upon the Termination of this Agreement for any reason whatsoever. For the avoidance of doubt, the Parties expressly agree that notwithstanding any temporary or permanent structures erected on the Site by the Concessionaire or its sub-licensees, the license in respect of the Site shall automatically terminate, without any further act of the Parties, upon Termination of this Agreement.

10.2.5 The Concessionaire hereby irrevocably appoints the Authority (acting directly or through a nominee) to be its true and lawful attorney, to execute and sign in the name of the Concessionaire a transfer or surrender of the license granted hereunder at any time after the Concession Period has expired or has been terminated earlier in terms hereof, a sufficient

proof of which will be the declaration of any duly authorized officer of the Authority, and the Concessionaire consents to it being registered for this purpose.

10.2.6 It is expressly agreed that trees on the Site are property of the Authority except that the Concessionaire shall be entitled to exercise usufructory rights thereon during the Concession Period.

10.3 Procurement of the Site

10.3.1 Pursuant to the notice specified in Clause 4.1.2, the Authority Representative and the Concessionaire shall, on a mutually agreed date and time, inspect the Site and prepare a memorandum containing an inventory of the Site including the vacant and unencumbered land, buildings, structures, road works, trees and any other immovable property on or attached to the Site. Such memorandum shall have appended thereto an appendix (the **"Appendix"**) specifying in reasonable detail those parts of the Site to which vacant access and Right of Way has not been granted to the Concessionaire. Signing of the memorandum, in 2 (two) counterparts (each of which shall constitute an original), by the authorized representatives of the Parties shall, subject to the provisions of Clause 10.2.2, be deemed to constitute a valid license and Right of Way to the Concessionaire for free and unrestricted use and development of the vacant and unencumbered Site during the Concession Period under and in accordance with the provisions of this Agreement and for no other purpose whatsoever. For the avoidance of doubt, it is agreed that valid license and Right of Way with respect to the parts of the Site as set forth in the Appendix shall be deemed to have been granted to the Concessionaire upon vacant access thereto being provided by the Authority to the Concessionaire.

10.3.2 Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointed Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the Project to the extent of at least 80% (eighty per cent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payment of Damages solely under the provisions of Clause 4.2. For the avoidance of doubt, the Authority acknowledges and agrees that the Appendix shall not include any land which may prevent the construction of any critical element of the Project without which the Completion Certificate or Provisional Certificate may not be granted. The Authority further acknowledges and agrees that prior to the Appointed Date, it shall have procured issuance of the statutory notification under Applicable Laws for vesting of all land comprising the Project in the Government and has taken possession of at least 80% (eighty per cent) of the length thereof, save and except stray plots of land which the Parties mutually agree to exclude from such vesting prior to the Appointed Date. The Parties also acknowledge and agree that the conditions specified in this Clause 10.3.2 shall not be modified or waived by either Party.

10.3.3 On and after signing the memorandum referred to in Clause 10.3.1, and until the Transfer Date, the Concessionaire shall maintain a round-the-clock vigil over the Site and shall ensure and procure that no encroachment thereon takes place, and in the event of any encroachment or occupation on any part thereof, the Concessionaire shall report such encroachment or occupation forthwith to the Authority and undertake its removal at its cost and expenses.

10.3.4 The Authority shall make best efforts to procure and grant, no later than 90 (ninety) days from the Appointed Date, the Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Re. 1 (Rupee one) per day for every 10 (ten) square meters or part thereof, commencing from the 91st (ninety first) day of the Appointed Date and until such Right of Way is procured or 180 (one hundred and eighty) days from the Appointed Date whichever is earlier. The Damages payable in terms of this clause shall be the sole remedy available to the Concessionaire and the Authority shall not be liable for any consequential loss or damage to the Concessionaire. In the event, the Authority is unable to provide the remaining Site within 180 (one hundred and eighty days) from the Appointed Date, the remaining Site of the Project Highway shall be removed from the scope of the work under the provision of Change of Scope.

10.3.5 Upon receiving Right of Way in respect of any land included in the Appendix, the Concessionaire shall complete the Construction Works thereon within a reasonable period to be determined by the Independent Engineer in accordance with Good Industry Practice; provided that the issue of Provisional Certificate shall not be affected or delayed on account of vacant access to any part of the Site not being granted to the Concessionaire or any construction on such part of the Site remaining incomplete on the date of Tests on account of the delay or denial of such access thereto. For the avoidance of doubt, it is expressly agreed that Construction Works on all lands for which Right of Way is granted within 146 (one hundred and forty six) days of the Appointed Date shall be completed on or before the Scheduled Completion Date. It is further agreed that the obligation of the Concessionaire to complete the affected Construction Works shall subsist so long as the Authority continues to pay the Damages specified herein, and upon the Authority ceasing to pay such Damages after giving 60 (sixty) days' notice thereof to the Concessionaire, the obligation of the Concessionaire to complete such works on such part of the Site shall cease forthwith. It is also expressly agreed that completion of the respective Construction Works within the time determined by the Independent Engineer hereunder shall be deemed to be Project Milestones for the purposes of levy and recovery of Damages under and in accordance with the provisions of Clause 12.3.2.

10.3.6 The Authority shall procure the additional land required for construction of works specified in Change of Scope Order issued under Article 16, in accordance with the provisions of this Agreement, and upon procurement thereof, such land shall form part of the Site. In case of any additional land required for Toll Plazas, Traffic Aid Posts, Medical Aid Posts, under passes and over passes or for construction of works specified in Change of Scope Order issued under Article 16, in accordance with this Agreement and upon procurement, such land shall form part of the Site; provided also that the land to be acquired by the Authority hereunder as a part of the Site shall be deemed to be included in the Appendix referred to in this Clause 10.3 and dealt with in accordance with the provisions thereof. For the avoidance of doubt, it is agreed that the minimum area of land to be acquired for the Toll Plaza and approach roads thereof shall conform to the provisions of Schedule - B and Schedule - C.

10.3.7 The Parties expressly agree that the obligation to provide land for 80% (eighty per cent) of the Site shall mean and imply provision of land that shall enable the Concessionaire to undertake construction on at least 80% (eighty per cent) of the length of the Project.

10.4 Site to be free from Encumbrances

Subject to the provisions of Clause 10.3, the Site shall be made available by the Authority to the Concessionaire pursuant hereto free from all Encumbrances and occupations and without the Concessionaire being required to make any payment to the Authority on account of any costs, compensation, expenses and charges for the acquisition and use of such Site for the duration of the Concession Period, except insofar as otherwise expressly provided in this Agreement. For the avoidance of doubt, it is agreed that existing rights of way, easements, privileges, liberties and appurtenances to the Licensed Premises shall not be deemed to be Encumbrances. It is further agreed that the Concessionaire accepts and undertakes to bear any and all risks arising out of the inadequacy or physical condition of the Site.

10.5 Protection of Site from Encumbrances

During the Concession Period, the Concessionaire shall protect the Site from any and all occupations, encroachments or Encumbrances, and shall not place or create nor permit any Contractor or other person claiming through or under the Concessionaire to place or create any Encumbrance or security interest over all or any part of the Site or the Project Assets, or on any rights of the Concessionaire therein or under this Agreement, save and except as otherwise expressly set forth in this Agreement.

10.6 Special/temporary right of way

The Concessionaire shall bear all costs and charges for any special or temporary right of way required by it in connection with access to the Site. The Concessionaire shall obtain at its 0cost such facilities on or outside the Site as may be required by it for the purposes of the Project and the performance of its obligations under this Agreement.

10.7 Access to the Authority and Independent Engineer

T0he license, right of way and right to the Site granted to the Concessionaire hereunder shall always be subject to the right of access of the Authority and the Independent Engineer and their employees and agents for inspection, viewing and exercise of their rights and performance of their obligations under this Agreement.

10.8 Geological and archaeological finds

It is expressly agreed that mining, geological or archaeological rights do not form part of the license granted to the Concessionaire under this Agreement and the Concessionaire hereby acknowledges that it shall not have any mining rights or interest in the underlying minerals, fossils, antiquities, structures or other remnants or things either of particular geological or archaeological interest and that such rights, interest and property on or under the Site shall vest in and belong to the Authority or the concerned Government Instrumentality. The Concessionaire shall take all reasonable precautions to prevent its workmen or any other person from removing or damaging such interest or property and shall inform the Authority forthwith of the discovery thereof and comply with such instructions as the Authority or the concerned Government Instrumentality may reasonably give for the removal of such property. For the avoidance of doubt, it is agreed that any reasonable expenses incurred by the Concessionaire hereunder shall be reimbursed by the Authority. It is also agreed that the Authority shall procure that the instructions hereunder are issued by the concerned Government - Instrumentality within a reasonable period so as

to enable the Concessionaire to continue its Construction Works with such modifications as may be deemed necessary.

10.9 Land for wayside amenities

10.9.1 The additional land earmarked for this purpose in Schedule-A shall be utilized by the Concessionaire for provision of wayside amenities which may include public toilets, rest areas, cafeteria, motels, medical facilities and other facilities or amenities for Users of the Project Highway.

10.9.2 The Concessionaire may procure additional land at its own cost and expense for construction and operation of additional facilities and the Authority shall have no obligation or liability in respect thereof. For the avoidance of doubt, the Parties agree that any land acquired by the Concessionaire under this Clause shall be retained by it after the Transfer Date and the Authority shall have no right or lien on such land at any time during or after the Concession Period. The Parties further agree that the Concessionaire shall seek prior consent of the Authority to connect any Additional Facility to the Project and such consent shall not be unreasonably withheld.

ARTICLE 11

UTILITIES, ASSOCIATED ROADS AND TREES

11.1 Existing utilities and roads

Notwithstanding anything to the contrary contained herein, the Concessionaire shall ensure that the respective entities owning the existing roads, right of way or utilities on, under or above the Site are enabled by it to keep such utilities in continuous satisfactory use, if necessary, by providing suitable temporary or permanent diversions with the authority of the controlling body of that road, right of way or utility, and the Authority shall, upon written request from the Concessionaire, initiate and undertake at the Concessionaire's cost, legal proceedings for acquisition of any right of way necessary for such diversion.

11.2 Shifting of obstructing utilities

11.2.1 The Concessionaire shall, subject to Applicable Laws and with assistance of the Authority, undertake shifting of any utility (including electric lines, water pipes and telephone cables), to an appropriate location or alignment, if such utility or obstruction adversely affects the execution of Works or Maintenance of the Project Highway in accordance with this Agreement, as per the scope given in Schedule B and in accordance with applicable standards and specifications of concerned utility owning entity. The cost of shifting of such, utilities indicated in Schedule-B is payable to the Concessionaire as part of Bid Project Cost. Cost of shifting utilities not included in the Schedule-B, if any, shall be treated as Change of Scope. The Authority will provide assistance to the Concessionaire for obtaining the estimates for shifting of such utilities from the entity owning such electric lines, water pipes or telephone cables, as the case may be. The Concessionaire shall execute such utility shifting works under the supervision of utility owning agency and Independent Engineer (IE) in accordance with the provision of agreement. The supervision charges only shall be paid by the Authority to the Utility Owning Entity. In the event of any delay in shifting thereof, the Concessionaire shall be responsible for failure to perform any of its obligation here under if such failure is not as a direct consequence of delay on the part of the entity owning such electric lines, water pipes or telephones cables, as the case may be.

The dismantled material/scrap of existing Utility to be shifted/dismantled shall belong to the Concessionaire who would be free to dispose-off the dismantled material as deemed fit by them.

The work of shifting of utilities can be taken up by the Concessionaire any time after signing of the Agreement

11.2.2 In case Appointed Dated is not achieved and the Concession Agreement is terminated prior to achievement of Appointed Dated, the Concessionaire shall be reimbursed the cost of utility shifting carried out during Development Period by the Authority after due certification by the Authorized Representative of the Authority. For the purpose of such reimbursement, the rates in the approved estimates by the concerned utility department shall be paid as per actual work carried out at site. For the avoidance of doubt, the Concessionaire would be reimbursed the cost of utility shifting only in case of termination prior to Appointed Date and only if it carry out the utility shifting as envisaged in Clause 11.2.1.

11.3 New utilities and roads

The Concessionaire shall allow, subject to such conditions as the Authority may specify, access to, and use of the Site for laying telephone lines, water pipes, electric cables or other public utilities. Where such access or use causes any financial loss to the Concessionaire, it may require the user of the Site to pay compensation or damages as per Applicable Laws. For the avoidance of doubt, it is agreed that use of the Site under this Clause 11.3 shall not in any manner relieve the Concessionaire of its obligation to maintain the Project in accordance with this Agreement and any damage caused by such use shall be restored forthwith.

11.4 Felling of trees

The Authority shall assist the Concessionaire in obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees cause a material adverse effect on the construction, operation or maintenance of the Project Highway. The cost of such felling shall be borne by the Authority, and in the event of any delay in felling thereof for reasons beyond the control of the Concessionaire, it shall be excused for failure to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees. For the avoidance of doubt, the Parties hereto agree that the felled trees shall be deemed to be owned by the Authority and shall be disposed in such manner and subject to such conditions as the Authority may in its sole discretion deem appropriate.

ARTICLE 12

CONSTRUCTION OF THE PROJECT

12.1 Obligations prior to commencement of construction

In addition to its obligations of maintaining the Project Highway during the Development Period, prior to commencement of Construction Works, the Concessionaire shall:

(a) submit to the Authority and the Independent Engineer its detailed design, construction methodology, quality assurance procedures, and the procurement, engineering and construction time schedule for completion of the Project in accordance with the Project Completion Schedule as set forth in Schedule-G;

(b) Appoint its representative duly authorized to deal with the Authority in respect of all matters under or arising out of or relating to this Agreement;

(c) undertake, do and perform all such acts, deeds and things as may be necessary or required before commencement of construction under and in accordance with this Agreement, Applicable Laws and Applicable Permits; and

(d) Make its own arrangements for quarrying and procurement of materials needed for the Project under and in accordance with Applicable Laws and Applicable Permits.

12.2 Drawings

In respect of the Concessionaire's obligations relating to the Drawings of the Project as set forth in Schedule-H, the following shall apply:

(a) The Concessionaire shall prepare and submit, with reasonable promptness and in such sequence as is consistent with the Project Completion Schedule, 3 (three) copies each of all Drawings to the Independent Engineer for review.

(b) By submitting the Drawings for review to the Independent Engineer, the Concessionaire shall be deemed to have represented that it has determined and verified that the design and engineering, including the field construction criteria related thereto, are in conformity with the Scope of the Project, Specifications and Standards, Applicable Laws and Good Industry Practice.

(c) Within 15 (fifteen) days of the receipt of the Drawings, the Independent Engineer shall review the same and convey its observations to the Concessionaire with particular reference to their conformity or otherwise with the Scope of the Project and the Specifications and Standards. The Concessionaire shall not be obliged to await the observations of the Independent Engineer on the Drawings submitted pursuant hereto beyond the said 15 (fifteen) days period and may begin or continue Construction Works at its own discretion and risk.

(d) If the aforesaid observations of the Independent Engineer indicate that the Drawings are not in conformity with the Scope of the Project or the Specifications and Standards, such Drawings shall be revised by the Concessionaire and resubmitted to the Independent Engineer for review. The Independent Engineer shall give its observations, if any, within 7 (seven) days of receipt of the revised Drawings.

(e) No review and/or observation of the Independent Engineer and/or its failure to review and/or convey its observations on any Drawings shall relieve the Concessionaire of its obligations and liabilities under this Agreement in any manner nor shall the Independent Engineer or the Authority be liable for the same in any manner.

(f) Without prejudice to the foregoing provisions of this Clause 12.2, the Concessionaire shall submit to the Authority for review and comments, its Drawings relating to alignment of the Project, finished road level and general arrangement drawings of major bridges, flyovers and grade separators, and the Authority shall have the right but not the obligation to undertake such review and provide its comments, if any, within 30 (thirty) days of the receipt of such Drawings. The provisions of this Clause 12.2 shall apply mutatis mutandis to the review and comments hereunder.

(g) Within 90 (ninety) days of COD, the Concessionaire shall furnish to the Authority and the Independent Engineer a complete set of as-built Drawings, in 2 (two) hard copies and in its editable digital format or in such other medium or manner as may be acceptable to the Authority, reflecting the Project as actually designed, engineered and constructed, including an as- built survey illustrating the layout of the Project and setback lines, if any, of the buildings and structures forming part of Project Facilities.

12.3 Construction of the Project

12.3.1 On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The 730th (seven hundred and thirtieth) day from the Appointed Date shall be the scheduled date for completion of the Project (the **"Scheduled Completion Date"**) and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.

12.3.2 The Concessionaire shall construct the Project in accordance with the Project Completion Schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Project Milestone in Schedule-G, unless such failure has occurred due to Force Majeure or for reasons attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one per cent) of the amount of Performance Security for delay of each day until such Project Milestone is achieved; provided that if any or all Project Milestones or the Scheduled Completion Date are extended in accordance with the provisions of this Agreement, the dates set forth in Schedule-G shall be deemed to be modified accordingly and the provisions of this Agreement shall apply as if Schedule-G has been amended as above; provided further that in the event COD is achieved on or before the Scheduled Completion Date, the Damages paid under this Clause 12.3.2 shall be refunded by the Authority to the Concessionaire, but without any interest thereon. For the avoidance of doubt, it is agreed that recovery of Damages under this Clause 12.3.2 shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.

12.3.3 In the event that the Project is not completed and COD does not occur within 270 (two hundred and seventy) days from the Scheduled Completion Date, unless the delay is on account of reasons attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.

12.4 Maintenance during Construction Period

12.4.1 During the Construction Period, the Concessionaire shall maintain, at its cost, the existing Project Highway to ensure that the road is in pothole free condition is maintained, and shall undertake the necessary repair and maintenance works for this purpose; provided that the Concessionaire may, at its cost, interrupt and divert the Users and other persons if such interruption and diversion is necessary for the efficient progress of Construction Works and conforms to Good Industry Practice; provided further that such interruption and diversion shall be undertaken by the Concessionaire only with the prior written approval of the Independent Engineer which approval shall not be unreasonably withheld. Further, in case the Scheduled Completion Date gets extended due to delay attributable solely to the Authority, the Concessionaire shall be liable to maintain the Project Highway for such extended period and shall be entitled to receive reimbursement of cost of maintenance for such extended period at the rate specified in Clause 6.2.1. For the avoidance of doubt, it is agreed that the Concessionaire shall at all times be responsible for ensuring safe operation of the Project.

12.4.2 In the event of default by the Concessionaire in discharging the obligations specified in Clause 12.4.1, the Authority may levy and recover Damages equal to 0.2% (zero point two per cent) of the Performance Security for each day of default hereunder.

12.4.3 The Parties expressly agree that pursuant to the provisions of Clause 12.4.1, the Concessionaire shall, about 7 (seven) days prior to the date of this Agreement and with prior notice to the Authority and alongwith the Authority's Representative, undertake video recording of the condition and status of the Project, which recording shall be compiled into a 3 (three)-hour digital video disc or any substitute thereof, and shall provide 3 (three) copies of such recording to the Authority within 2 (two) days of the date of this Agreement. The Authority may, in its discretion, undertake another video recording in the presence of the Concessionaire's representative, within 7 (seven) days of the date of this Agreement, and substitute its video recording for the video recording undertaken by the Concessionaire. The Parties further agree that such video recording shall constitute evidence of the status and condition of the Project as on the date of such recording.

12.5 Deleted

ARTICLE 13

MONITORING OF CONSTRUCTION

13.1 Monthly progress reports

During the Construction Period, the Concessionaire shall, no later than 7 (seven) days after the close of each month, furnish to the Authority and the Independent Engineer a monthly report on physical and financial progress of the Construction Works and shall promptly give such other relevant information as may be required by the Independent Engineer.

13.2 Inspection

During the Construction Period, the Independent Engineer shall inspect the Project at least once a month and make a report of such inspection (the **"Inspection Report"**) stating in reasonable detail the defects or deficiencies, if any, with particular reference to the Project Completion Schedule, Scope of the Project and Specifications and Standards. It shall send a copy of the Inspection Report to the Authority and the Concessionaire within 7 (seven) days of such inspection and upon receipt thereof, the Concessionaire shall rectify and remedy the defects or deficiencies, if any, stated in the Inspection Report. Such inspection or submission of Inspection Report by the Independent Engineer shall not relieve or absolve the Concessionaire of its obligations and liabilities hereunder in any manner whatsoever.

13.3 Tests

13.3.1 For determining that the Construction Works conform to the Specifications and Standards, the Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests, at such time and frequency and in such manner as may be specified by the Independent Engineer from time to time, in accordance with Good Industry Practice for quality assurance. The size of sample for such tests shall, to the extent possible, not exceed 10% (ten per cent) of the quantity and/or number of tests required by Good Industry Practice for the construction works undertaken by the Authority through their contractors. The Concessionaire shall, with due diligence, carry out or cause to be carried out all the tests in accordance with the instructions of the Independent Engineer and furnish the results thereof to the Independent Engineer. One half of the costs incurred on such tests, and to the extent certified by the Independent Engineer as reasonable, shall be reimbursed by the Authority to the Concessionaire. Provided, however, that the Independent Engineer may, instead of carrying out the tests specified hereunder, at its option decide to witness, or participate in, any of the tests to be undertaken by the Concessionaire for its own quality assurance in accordance with Good Industry Practice, and in such an event, the Concessionaire shall cooperate with, and provide the necessary assistance to, the Independent Engineer for discharging its functions hereunder. For the avoidance of doubt, the costs to be incurred on any test which is undertaken for determining the rectification of any defect or deficiency in construction shall be borne solely by the Concessionaire.

13.3.2 In the event that results of any tests conducted under this Clause 13.3 establish any defects or deficiencies in the Construction Works, the Concessionaire shall carry out remedial measures and furnish a report to the Independent Engineer in this behalf. The Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests to determine that such remedial measures have brought the Construction Works into compliance with the Specifications and Standards, and the procedure set forth in this Clause 13.3 shall be repeated until such Construction Works conform to the Specifications and

Standards. For the avoidance of doubt, it is agreed that tests pursuant to this Clause 13.3 shall be undertaken in addition to and independent of the tests that shall be carried out by the Concessionaire for its own quality assurance in accordance with Good Industry Practice. It is also agreed that a copy of the results of such tests shall be sent by the Concessionaire to the Independent Engineer forthwith.

13.4 Delays during construction

Without prejudice to the provisions of Clause 12.3.2, if the Concessionaire does not achieve any of the Project Milestones or the Independent Engineer shall have reasonably determined that the rate of progress of Construction Works is such that the Project is not likely to be completed by the Scheduled Completion Date, it shall notify the Concessionaire to this effect, and the Concessionaire shall, within 15 (fifteen) days of such notice, by a communication inform the Independent Engineer in reasonable detail about the steps it proposes to take to expedite progress and the period within which it shall achieve COD.

13.5 Suspension of unsafe Construction Works

13.5.1 Upon recommendation of the Independent Engineer to this effect, the Authority may by notice require the Concessionaire to suspend forthwith the whole or any part of the Construction Works if, in the reasonable opinion of the Authority, Such work threatens the safety of the Users and pedestrians. Provided, however, that in case of an emergency, the Authority may suo moto issue the notice referred to hereinabove.

13.5.2 The Concessionaire shall, pursuant to the notice under Clause 13.5.1, suspend the Construction Works or any part thereof for such time and in such manner as may be specified by the Authority and thereupon carry out remedial measures to secure the safety of suspended works and the Users. The Concessionaire may by notice require the Independent Engineer to inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked. Upon receiving the recommendations of the Independent Engineer, the Authority shall either revoke such suspension or instruct the Concessionaire to carry out such other and further remedial measures as may be necessary in the reasonable opinion of the Authority, and the procedure set forth in this Clause 13.5 shall be repeated until the suspension hereunder is revoked.

13.5.3 Subject to the provisions of Clause 28.7, all reasonable costs incurred for maintaining and protecting the Construction Works or part thereof during the period of suspension (the **"Preservation Costs"**) shall be borne by the Concessionaire; provided that if the suspension has occurred as a result of any breach of this Agreement by the Authority, the Preservation Costs shall be borne by the Authority.

13.5.4 If suspension of Construction Works is for reasons not attributable to the Concessionaire, the Independent Engineer shall determine any extension of the dates set forth in the Project Completion Schedule to which the Concessionaire is reasonably entitled, and shall notify the Authority accordingly whereupon the Authority shall extend such Project Completion Schedule dates in accordance with the recommendations of the Independent Engineer.

13.6 Drone Video recording

The Concessionaire shall carryout video recording of each project every month since award of work till completion of construction and biannually during O&M period.

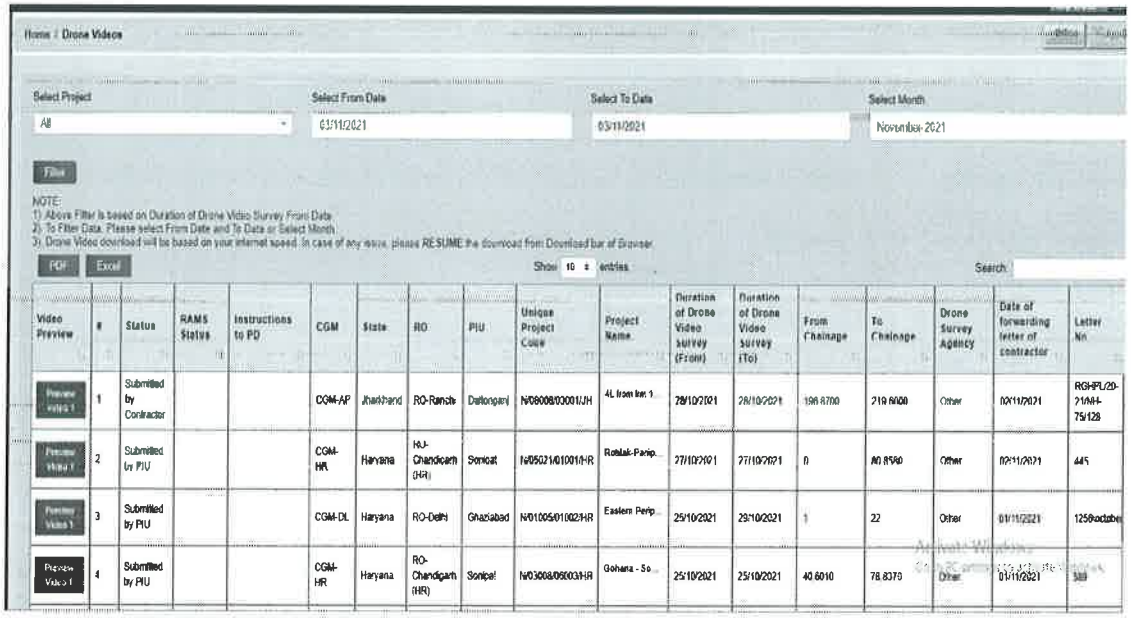
Authority has finalized specifications/methodology for video recording and identified zone–wise agencies & rates for the same. The concessionaire may use these agencies so as to ensure uniformity in data collection. Recording shall have to be drone in the presence of Team Leader of Independent Engineer. Recording of previous videos and current running side by side shall be loaded on Data Lake (https://datalakeg.nhai.gov.in/nhai) for easily capturing various developments during the month (a sample screenshot is attached herewith and also loaded on Data Lake along with a sample video for guidance) before submission of their invoice. Capturing Ortho-image for approx. 10% equivalent length of critical structures or any other specific area should be decided by the ROs/ PDs and be conveyed to the Drone Agency in the site-specific work order. Independent Engineer shall ensure that the features and quality of drone video is acceptable and video is not distorted/tampered with.

Independent Engineer shall analyse these drone videos and give their comments in its digital MPRs covering inter-alia but not limited to the encumbrances/lands not available, sites of COS demands, progress of project, mobilisation of plant & equipment, mobilisation of camp sites, progress on rectification of NCRs etc. along with the proposed action plan. Project Director of NHAI shall cross-check drone videos during the monthly physical inspections and notify the discrepancies noticed, if any, between drone video, on Independent Engineer comments and ground reality. The discrepancies shall be examined and addressed through joint site inspections.

As per the policy, the Network Survey Vehicle (NSV) survey needs to be carried out twice in a year on completed project. Therefore, PDs should plan biannually drone based video recording during O&M period in such a manner so that there is no overlap and digital data of O&M period is available in regular intervals (quarterly) through NSV and drone videography.

Notwithstanding anything to the contrary contained in this document, the Concessionaire shall also develop a Project specific website, where Concessionaire needs to upload Video and time stamp pictures every week regarding progress. The website must be accessible to the public. In addition, PDs/ ROs can also undertake need based drone videography as and when required. PD shall ensure development of a project specific website by the Concessionaire. In case of default on this account, the PD shall withhold an amount equivalent to Rs. 5 Lacs plus (drone rate X length of project X no. of defaulting week) from the dues to the Concessionaire.

As the drone videos/ reports will be permanent record on Data Lake and will be used as evidences during dispute resolution process before Arbitral Tribunals/ Courts including Supreme Court, the drone video shall be carried out carefully and correctly without distortions/ tampering by all parties concerned. The amount spent on recording shall be charged to Concessionaire to the extent covered in the agreement.



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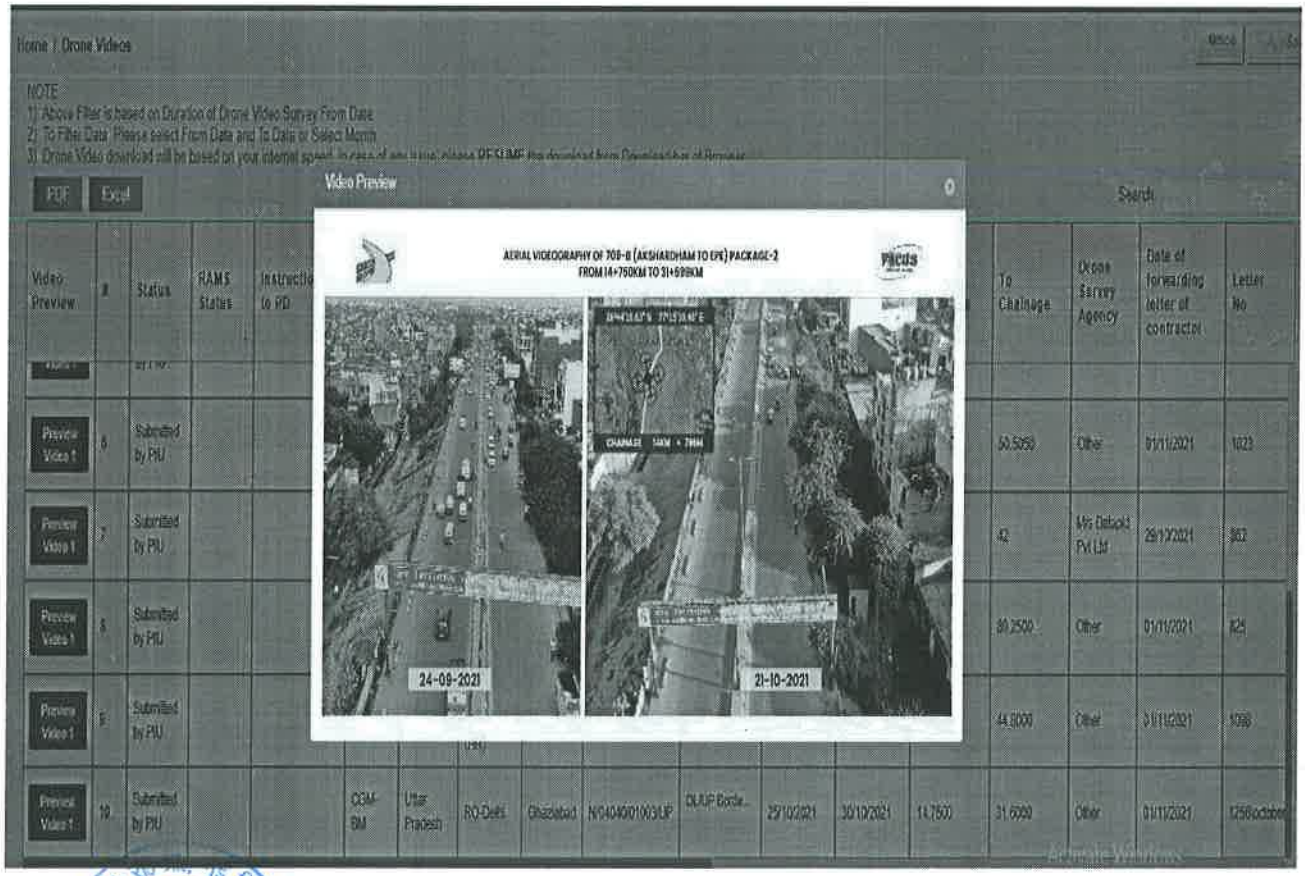
Video Preview	#	Status	RAMS Status	Instructions to PD	CGM	State	RO	PIU	Unique Project Code	Project Name	Duration of Drone Video survey (From)	Duration of Drone Video survey (To)	From Chainage	To Chainage	Drone Survey Agency	Date of forwarding letter of contractor	Letter No
Preview Video 1	1	Submitted by Contractor			CGM-AP	Jharkhand	RO-Ranchi	Dattongani	N/08008/03001/JH	4L from km 1	28/10/2021	28/10/2021	196.8700	219.6000	Other	02/11/2021	RGHPL/20-21/NH-75/128
Preview Video 1	2	Submitted by PIU			CGM-HR	Haryana	HJ-Chandigarh (HR)	Sonipat	N/05021/01001/HR	Rohtak-Panip...	27/10/2021	27/10/2021	0	80.8560	Other	02/11/2021	445
Preview Video 1	3	Submitted by PIU			CGM-DL	Haryana	RO-Delhi	Ghaziabad	N/01005/01002/HR	Eastern Perip...	25/10/2021	25/10/2021	1	22	Other	01/11/2021	1258/octobe
Preview Video 1	4	Submitted by PIU			CGM-HR	Haryana	RO-Chandigarh (HR)	Sonipat	N/03008/05003/HR	Gohana - So...	25/10/2021	25/10/2021	40.6010	78.8370	Other	01/11/2021	589



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Video Preview

Video Preview	#	Status	RAMS Status	Instructions to PD	CGM	State	RO	PIU	Unique Project Code	Project Name	Duration of Drone Video survey (From)	Duration of Drone Video survey (To)	From Chainage	To Chainage	Drone Survey Agency	Date of forwarding letter of contractor	Letter No
Preview Video 1	8	Submitted by PIU												50.5050	Other	01/11/2021	1023
Preview Video 1	7	Submitted by PIU												42	M/s Balkrishna Pvt Ltd	29/10/2021	963
Preview Video 1	6	Submitted by PIU												30.2500	Other	01/11/2021	825
Preview Video 1	5	Submitted by PIU												44.5000	Other	01/11/2021	1099
Preview Video 1	10	Submitted by PIU			CGM-BM	Uttar Pradesh	RO-Delhi	Ghaziabad	N/04040/01003/UP	DUUP Borde...	25/10/2021	30/10/2021	14.7500	31.5000	Other	01/11/2021	1258/octobe

ARTICLE 14

COMPLETION CERTIFICATE

14.1 Tests

14.1.1 No later than 30 (thirty) days prior to the likely completion of the Project, the Concessionaire shall notify the Independent Engineer of its intent to subject the Project to Tests. The date and time of each of the Tests shall be determined by the Independent Engineer in consultation with the Concessionaire, and notified to the Authority who may designate its representative to witness the Tests. The Concessionaire shall provide such assistance as the Independent Engineer may reasonably require for conducting the Tests. In the event of the Concessionaire and the Independent Engineer failing to mutually agree on the dates for conducting the Tests, the Concessionaire shall fix the dates by not less than 10 (ten) days' notice to the Independent Engineer, and in the event the Independent Engineer delays the Tests hereunder, the Authority shall impose exemplary penalties on the Independent Engineer and shall ensure that Tests are completed in time either by the Independent Engineer or any substitute thereof.

14.1.2 All Tests shall be conducted in accordance with Schedule-I at the cost and expense of the Concessionaire. The Independent Engineer shall observe, monitor and review the results of the Tests to determine compliance of the Project with Specifications and Standards and if it is reasonably anticipated or determined by the Independent Engineer during the course of any Test that the performance of the Project or any part thereof does not meet the Specifications and Standards, it shall have the right to suspend or delay such Test and require the Concessionaire to remedy and rectify the defects or deficiencies. Upon completion of each Test, the Independent Engineer shall provide to the Concessionaire and the Authority copies of all Test data including detailed Test results. For the avoidance of doubt, it is expressly agreed that the Independent Engineer may require the Concessionaire to carry out or cause to be carried out additional Tests, in accordance with Good Industry Practice, for determining the compliance of the Project with Specifications and Standards.

14.2 Completion Certificate

Upon completion of Construction Works and the Independent Engineer determining the Tests to be successful, it shall forthwith issue to the Concessionaire and the Authority a certificate substantially in the form set forth in Schedule-J (the **"Completion Certificate"**).

14.3 Provisional Certificate

14.3.1 Subject to the provisions of Clause 14.3.2, the Independent Engineer may, at the request of the Concessionaire, issue a provisional certificate of completion substantially in the form set forth in Schedule-J (the **"Provisional Certificate"**) if the Tests are successful and the Project can be safely and reliably placed in commercial operation though certain works or things forming part thereof are outstanding and not yet complete. In such an event, the Provisional Certificate shall have appended thereto a list of outstanding items signed jointly by the Independent Engineer and the Concessionaire (the **"Punch List"**); provided that the Independent Engineer shall not withhold the Provisional Certificate for reason of any work remaining incomplete if the delay in completion thereof is attributable to the Authority; provided further that the Punch List shall also include the cost of completion for each of the outstanding items.

14.3.2 The Parties hereto expressly agree that a Provisional Certificate under this Clause 14.3 may, upon request of the Concessionaire to this effect, be issued for operating part of the Project, if the Concessionaire has completed construction of 100% (Hundred per cent) of the Site made available to the Concessionaire up to 146 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be construed accordingly.

14.4 Completion of Punch List items

14.4.1 All items in the Punch List shall be completed by the Concessionaire within 90 (ninety) days of the date of issue of the Provisional Certificate and for any delay thereafter, other than for reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to recover Damages from the Concessionaire to be calculated and paid for each day of delay until all items are completed, at the lower of (a) 0.1% (zero point one per cent) of the Performance Security, and (b) 0.2% (zero point two per cent) of the cost of completing such items as estimated by the Independent Engineer. Subject to payment of such Damages, the Concessionaire shall be entitled to a further period not exceeding 120 (one hundred and twenty) days for completion of the Punch List items. For the avoidance of doubt, it is agreed that if completion of any item is delayed for reasons solely attributable to the Authority or due to Force Majeure, the completion date thereof shall be determined by the Independent Engineer in accordance with Good Industry Practice, and such completion date shall be deemed to be the date of issue of the Provisional Certificate for the purposes of Damages, if any, payable for such item under this Clause 14.4.1.

14.4.2 Upon completion of all Punch List items, the Independent Engineer shall issue the Completion Certificate. Failure of the Concessionaire to complete all the Punch List items within the time set forth in Clause 14.4.1 for any reason, other than conditions constituting Force Majeure or for reasons solely attributable to the Authority, shall entitle the Authority to terminate this Agreement.

14.5 Withholding of Provisional or Completion Certificate

14.5.1 If the Independent Engineer determines that the Project or any part thereof does not conform to the provisions of this Agreement and cannot be safely and reliably placed in commercial operation, it shall forthwith make a report in this behalf and send copies thereof to the Authority and the Concessionaire. Upon receipt of such a report from the Independent Engineer and after conducting its own inspection, if the Authority is of the opinion that the Project is not fit and safe for commercial service, it shall, within 7 (seven) days of receiving the aforesaid report, notify the Concessionaire of the defects and deficiencies in the Project and direct the Independent Engineer to withhold issuance of the Provisional Certificate or Completion Certificate, as the case may be. Upon receipt of such notice, the Concessionaire shall remedy and rectify such defects or deficiencies and thereupon Tests shall be undertaken in accordance with this Article 14. Such procedure shall be repeated as necessary until the defects or deficiencies are rectified.

14.5.2 Notwithstanding anything to the contrary contained in Clause 14.5.1, the Authority may, at any time after receiving a report from the Independent Engineer under that Clause, direct the Independent Engineer to issue a Provisional Certificate under Clause 14.3, and such direction shall be complied forthwith.

14.6 Rescheduling of Tests

If the Independent Engineer certifies to the Authority and the Concessionaire that it is unable to issue the Completion Certificate or Provisional Certificate, as the case may be, because of events or circumstances on account of which the Tests could not be held or had to be suspended, the Concessionaire shall be entitled to re-schedule the Tests and hold the same as soon as reasonably practicable.

ARTICLE 15

ENTRY INTO COMMERCIAL SERVICE

15.1 Commercial Operation Date (COD)

15.1.1 The Project shall be deemed to be complete when the Completion Certificate or the Provisional Certificate, as the case may be, is issued under the provisions of Article 14, and accordingly the commercial operation date of the Project shall be the date on which such Completion Certificate or the Provisional Certificate is issued (the **"COD"**). The Project shall enter into commercial service on COD whereupon the Concessionaire shall be entitled to demand and collect Annuity Payments in accordance with the provisions of this Agreement.

15.2 Damages for delay

Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled Completion Date, unless the delay is on account of reasons attributable to the Authority or due to Force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% (zero point two per cent) of the amount of Performance Security for delay of each day until COD is achieved. Upon failure of the Concessionaire to pay the said Damages, the same shall be paid along with interest of Bank Rate plus 3% and shall be deducted from the 1st (first) Annuity Payment. In case the Damages and the interest thereof are more than the 1st Annuity payment then the balance Damages along with interest thereof shall be recovered from any further amount due and payable to the Concessionaire excluding O&M Payments but including interest to be paid on reducing balance of the Completion Cost remaining to be paid along with the 1st Annuity or from further Annuity payments.

ARTICLE 16

CHANGE OF SCOPE

16.1 Change of Scope

16.1.1 The Authority may, notwithstanding anything to the contrary contained in this Agreement, require the provision of additional works and services which are not included in the Scope of the Project as contemplated by this Agreement (the **"Change of Scope"**). Any such Change of Scope shall be made in accordance with the provisions of this Article 16 and the costs thereof shall be expended by the Concessionaire and reimbursed to it by the Authority in accordance with Clause 16.3.

16.1.2 If the Concessionaire determines at any time that a Change of Scope is necessary for providing safer and improved services to the Users, it shall by notice in writing require the Authority to consider such Change of Scope. The Authority shall, within 15 (fifteen) days of receipt of such notice, either accept such Change of Scope with modifications, if any, and initiate proceedings therefor in accordance with this Article 16 or inform the Concessionaire in writing of its reasons for not accepting such Change of Scope, which decision of the Authority shall be final and binding.

16.1.3 Any works or services which are provided under and in accordance with this Article 16 shall form part of the Project and the provisions of this Agreement shall apply mutatis mutandis to such works or services.

16.2 Procedure for Change of Scope

16.2.1 In the event of the Authority determining that a Change of Scope is necessary, it shall issue to the Concessionaire a notice specifying in reasonable detail the works and services contemplated thereunder (the **"Change of Scope Notice"**).

16.2.2 Upon receipt of a Change of Scope Notice, the Concessionaire shall, with due diligence, provide to the Authority such information as is necessary, together with preliminary Documentation in support of:

(a) the impact, if any, which the Change of Scope is likely to have on the Project Completion Schedule if the works or services are required to be carried out during the Construction Period; and

(b) the options for implementing the proposed Change of Scope and the effect, if any, each such option would have on the costs and time thereof, including a detailed breakdown by work classifications specifying the material and labour costs calculated in accordance with the schedule of rates applicable to the works assigned by the Authority to its contractors, along with the proposed premium/discount on such rates; provided that the cost incurred by the Concessionaire in providing such information shall be reimbursed by the Authority to the extent such cost is certified by the Independent Engineer as reasonable.

16.2.3 Upon receipt of information set forth in Clause 16.2.2, if the Authority decides to proceed with the Change of Scope, it shall convey its preferred option to the Concessionaire, and the Parties shall, with assistance of the Independent Engineer, thereupon make good faith efforts to agree upon the time and costs for implementation thereof. Upon reaching an agreement, the Authority shall issue an order **(the "Change of Scope Order")** requiring

the Concessionaire to proceed with the performance thereof. In the event that the Parties are unable to agree, the Authority may, by issuing a Change of Scope Order, require the Concessionaire to proceed with the performance thereof pending resolution of the Dispute, or carry out the works in accordance with Clause 16.5.

16.2.4 The provisions of this Agreement, insofar as they relate to Construction Works and Tests, shall apply mutatis mutandis to the works undertaken by the Concessionaire under this Article 16.

16.3 Payment for Change of Scope

Within 7 (seven) days of issuing a Change of Scope Order, the Authority shall make an advance payment to the Concessionaire in a sum equal to 20% (twenty per cent) of the cost of Change of Scope as agreed hereunder, and in the event of a Dispute, 20% (twenty per cent) of the cost assessed by the Independent Engineer. The Concessionaire shall, after commencement of work, present to the Authority bills for payment in respect of the works in progress or completed works, as the case may be, supported by such Documentation as is reasonably sufficient for the Authority to determine the accuracy thereof. Within 30 (thirty) days of receipt of such bills, the Authority shall disburse to the Concessionaire such amounts as are certified by the Independent Engineer as reasonable and after making a proportionate deduction for the advance payment made hereunder, and in the event of any Dispute, final adjustments thereto shall be made under and in accordance with the Dispute Resolution Procedure.

16.4 Restrictions on certain works

16.4.1 Notwithstanding anything to the contrary contained in this Article 16, but subject to the provisions of Clause 16.4.2, the Authority shall not require the Concessionaire to undertake any works or services if such works or services are likely to delay completion of the Project by the Scheduled Completion Date; provided that in the event that the Authority considers such works or services to be essential, it may issue a Change of Scope Order, subject to the condition that the works forming part of or affected by such Change of Scope Order shall not be reckoned for purposes of determining completion of the Project and issuing the Provisional Certificate.

16.4.2 Notwithstanding anything to the contrary contained in this Article 16, the Concessionaire shall be entitled to nullify any Change of Scope Order if it causes the cumulative costs relating to all the Change of Scope Orders to exceed 10% (ten per cent) of the Bid Project Cost in any continuous period of 3 (three) years immediately preceding the date of such Change of Scope Order or if such cumulative costs exceed 25% (twenty five per cent) of the Bid Project Cost at any time during the Concession Period.

16.5 Power of the Authority to undertake works

16.5.1 Notwithstanding anything to the contrary contained in Clauses 16.1.1 and 16.3, the Authority may, after giving notice to the Concessionaire and considering its reply thereto, award any works or services, contemplated under Clause 16.1.1, to any person on the basis of open competitive bidding; provided that the Concessionaire shall have the option of matching the first ranked bid in terms of the selection criteria, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if it has participated in the bidding process and its bid does not exceed the first ranked bid by more than 10% (ten per cent) thereof. It is also

agreed that the Concessionaire shall provide access, assistance and cooperation to the person who undertakes the works or services hereunder.

16.5.2 The works undertaken in accordance with this Clause 16.5 shall conform to the Specifications and Standards and shall be carried out in a manner that minimizes disruption in operation of the Project. The provisions of this Agreement, insofar as they relate to Construction Works and Tests, shall apply mutatis mutandis to the works carried out under this Clause 16.5.

16.6 Reduction in Scope of the Project

16.6.1 If the Concessionaire shall have failed to complete any Construction Works on account of Force Majeure or for reasons attributable to the Authority or under the provision of Clause 10.3.4 of this Agreement, the Authority shall follow the following process for calculation of total cost of reduced Scope

I. On direction by the Authority, the Independent Engineer to assess the civil cost of the reduced Scope, as per the schedule of rates applicable on the Bid Due Date.
II. The civil cost of the reduced Scope shall be multiplied by the 1.04 to arrive at the estimated cost of reduced Scope.
III. The estimated cost of reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.

On or before a Payment Milestone immediately succeeding the date of finalization of such Reduction in Scope, the Bid Project Cost shall be reduced by the Total Cost of Reduced Scope and all payments made or to be made to the Concessionaire shall be suitably adjusted and recoveries, if any, shall be made from the payment to be released on that Payment Milestone immediately succeeding the date of finalization of Reduction in Scope.

For the avoidance of doubt, it is agreed that upon the Reduction of Scope and revision of Bid Project Cost, all references to Bid Project Cost would mean the revised Bid Project Cost and all the payments would be calculated as per the revised Bid Project Cost.

16.6.2 For determining the obligations of the Concessionaire under this Clause 16.6, the provisions of Clauses 16.1, 16.2 and 16.4 shall apply mutatis mutandis, and upon issue of Change of Scope Order by the Authority hereunder, the Concessionaire shall pay forthwith the sum specified therein.

16.7 Effect of Change in Scope on the O&M Costs

Pursuant to the provisions if this Article 16, if the Change in Scope leads to a reduction or increase in the length of the Project Highway, the O&M Payments as provided in Clause 23.7 shall be reduced or increased in proportion to the reduction or increase in the length of the Project Highway.

ARTICLE 17

OPERATION AND MAINTENANCE

17.1 O&M obligations of the Concessionaire

17.1.1 During the Operation Period, the Concessionaire shall operate and maintain the Project in accordance with this Agreement either by itself, or through the O&M Contractor and if required, modify, repair or otherwise make improvements to the Project to comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and conform to Specifications and Standards and Good Industry Practice. The obligations of the Concessionaire hereunder shall include:

(a) Procuring and ensuring safe, smooth and uninterrupted use of the Project, including prevention of loss or damage thereto, during normal operating conditions;

(b) Minimizing disruption in the event of accidents or other incidents affecting the safety and use of the Project by providing a rapid and effective response and maintaining liaison with emergency services of the State;

(c) Carrying out periodic preventive maintenance of the Project;

(d) undertaking routine maintenance including prompt repairs of potholes, cracks, joints, drains, embankments, structures, markings, lighting, signage and other control devices;

(e) Undertaking major maintenance such as resurfacing, repairs to structures, and repairs and refurbishment of system and equipment;

(f) Preventing, with the assistance of concerned law enforcement agencies, any unauthorized use of the Project;

(g) Preventing, with the assistance of the concerned law enforcement agencies, any encroachments on, or unauthorized entry to the Project;

(h) Protection of the environment and provision of equipment and materials thereof;

(i) operation and maintenance of all communication, control and administrative systems necessary for the efficient operation of the Project and for providing safe, smooth and uninterrupted use of the Project;

(j) **Deleted**

(k) Maintaining a public relations unit to interface with and attend to suggestions from the Users, government agencies, media and other agencies; and

(l) Complying with Safety Requirements in accordance with Article 18.

17.1.2 The Concessionaire shall remove promptly from the Project all surplus construction machinery and materials, waste materials (including hazardous materials and waste water), rubbish and other debris (including, without limitation, accident debris) and keep the Project in a clean, tidy and orderly condition, and in conformity with Applicable Laws, Applicable Permits and Good Industry Practice. For the avoidance of doubt, it is agreed that the debris and material excavated shall be carried to and deposited at the Location identified by the Authority and/or Independent Engineer.

17.1.3 The Concessionaire shall maintain, in conformity with Good Industry Practice, all stretches of approach roads.

17.2 Maintenance Requirements

The Concessionaire shall procure that at all times during the Operation Period; the Project conforms to the maintenance requirements set forth in Schedule-K (the **"Maintenance Requirements"**).

17.3 Maintenance Manual

17.3.1 No later than 90 (ninety) days prior to the Scheduled Completion Date, the Concessionaire shall, in consultation with the Independent Engineer, evolve a repair and maintenance manual (the **"Maintenance Manual"**) for the regular and preventive maintenance of the Project in conformity with the Specifications and Standards, Maintenance Requirements, Safety Requirements and Good Industry Practice, and shall provide 5 (five) copies thereof to the Authority and 2 (two) copies to the Independent Engineer. The Maintenance Manual shall be revised and updated once every 3 (three) years and the provisions of this Clause shall apply, mutatis mutandis, to such revision.

17.3.2 Without prejudice to the provision of Clause 17.3.1, the Maintenance Manual shall, in particular, include provisions for maintenance of Project Assets and shall provide for life cycle maintenance, routine maintenance and reactive maintenance which may be reasonably necessary for maintenance and repair of The Project Assets, including replacement thereof, such that their overall condition conforms to Good Industry Practice.

17.4 Maintenance Program

17.4.1 On or before COD and no later than 45 (forty five) days prior to the beginning of each Accounting Year during the Operation Period, as the case may be, the Concessionaire shall provide to the Authority and the Independent Engineer, its proposed annual program of preventive, urgent and other scheduled maintenance (the **"Maintenance Program"**) to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements. Such Maintenance Program shall include:

(a) preventive maintenance schedule;

(b) arrangements and procedures for carrying out urgent repairs;

(c) Criteria to be adopted for deciding maintenance needs;

(d) Intervals and procedures for carrying out inspection of all elements of the Project;

(e) Intervals at which the Concessionaire shall carry out periodic maintenance;

(f) Arrangements and procedures for carrying out safety related measures; and

(g) Intervals for major maintenance works and the scope thereof.

17.4.2 Within 15 (fifteen) days of receipt of the Maintenance Program, the Independent Engineer shall review the same and convey its comments to the Concessionaire with particular reference to its conformity with the Maintenance Requirements, Maintenance Manual and Safety Requirements.

17.4.3 The Concessionaire may modify the Maintenance Program as may be reasonable in the circumstances, and the procedure specified in Clauses 17.4.1 and 17.4.2 shall apply mutatis mutandis to such modifications.

17.5 Safety, breakdowns and accidents

17.5.1 The Concessionaire shall ensure safe conditions for the Users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good Industry Practice.

17.5.2 The Concessionaire's responsibility for rescue operations on the Project shall be limited to an initial response to any particular incident until such time as the competent authority takes charge and shall include prompt removal of vehicles or debris or any other obstruction, which may endanger or interrupt the use of the Project. For this purpose, it shall maintain and operate a round-the-clock rescue post with equipment in accordance with Good Industry Practice.

17.6 De-commissioning due to Emergency

17.6.1 If, in the reasonable opinion of the Concessionaire, there exists an Emergency which warrants de-commissioning and closure of the whole or any part of the Project, the Concessionaire shall be entitled to de-commission and close the whole or any part of the Project for so long as such Emergency and the consequences thereof warrant; provided that such de-commissioning and particulars thereof shall be notified by the Concessionaire to the Authority Without any delay, and the Concessionaire shall diligently carry out and abide by any reasonable directions that the Authority may give for dealing with such Emergency.

17.6.2 The Concessionaire shall re-commission the Project or the affected part thereof as quickly as practicable after the circumstances leading to its de-commissioning and closure have ceased to exist or have so abated as to enable the Concessionaire to re-commission the Project and shall notify the Authority of the same without any delay.

17.6.3 Any decommissioning or closure of any part of the Project and the re- commissioning thereof shall, as soon as practicable, be brought to the notice of affected persons by means of public announcements/notice.

17.7 Project closure

17.7.1 Save and except as provided in Clause 17.6, the Concessionaire shall not close any part of the Project for undertaking maintenance or repair works not forming part of the Maintenance Program, except with the prior written approval of the Independent Engineer. Such approval shall be sought by the Concessionaire through a written request to be made to the Independent Engineer, and a copy thereof furnished to the Authority, at least 7 (seven) days before the proposed closure and shall be accompanied by particulars thereof. Within 3 (three) days of receiving such request, the Independent Engineer shall grant permission with such modifications as it may deem reasonable and necessary in conformity with the Maintenance Manual and Maintenance Program and a copy of such permission shall be sent to the Authority.

17.7.2 The provisions of Clause 17.7.1 shall not apply to de-commissioning under Clause 17.6.1 or to any closure for a period not exceeding 2 (two) hours in a day at any time of the day

and 6 (six) hours in a day at a time specified by the Independent Engineer as off-peak hours when usage of the Project is comparatively lower.

17.7.3 Upon receiving the permission pursuant to Clause 17.7.1, the Concessionaire shall be entitled to close the designated part of the Project for the period specified therein, and in the event of any delay in re-opening such part, the Concessionaire shall pay Damages to the Authority calculated at the rate of 0.5 % (zero point Five per cent) of the Performance Security, for each day of delay until that part of the Project has been re-opened for use.

17.8 Damages for breach of maintenance obligations

17.8.1 In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% (two per cent) of the Performance Security, and (b) 0.1% (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.

17.8.2 The Damages set forth in Clause 17.8.1 may be assessed and specified forthwith by the Independent Engineer; provided that the Authority may, in its discretion, demand a smaller sum as Damages, if in its opinion, the breach has been cured promptly and the Concessionaire is otherwise in compliance with its obligations hereunder. The Concessionaire shall pay such Damages forthwith and in the event that it contests such Damages, the Dispute Resolution Procedure shall apply.

17.9 Authority's right to take remedial measures

17.9.1 In the event the Concessionaire does not maintain and/or repair the Project or any part thereof in conformity with the Maintenance Requirements, the Maintenance Manual or the Maintenance Program, as the case may be, and fails to commence remedial works within 15 (fifteen) days of receipt of the O&M Inspection Report or a notice in this behalf from the Authority or the Independent Engineer, as the case may be, the Authority shall, without prejudice to its rights under this Agreement including Termination thereof, be entitled to undertake such remedial measures at the risk and cost of the Concessionaire, and to recover its cost from the Concessionaire. In addition to recovery of the aforesaid cost, a sum equal to 20% (twenty per cent) of such cost shall be paid by the Concessionaire to the Authority as Damages. For the avoidance of doubt, the right of the Authority under this Clause 17.9.1 shall be without prejudice to its rights and remedies provided under Clause 17.8.

17.9.2 The Authority shall have the right, and the Concessionaire hereby expressly grants to the Authority the right, to recover the costs and Damages specified in Clause 17.9.1 directly from the Escrow Account as if such costs and Damages were O&M Expenses, and for that purpose, the Concessionaire hereby agrees to give irrevocable instructions to the Escrow Bank to make payment from the Escrow Account in accordance with the instructions of the Authority under this Clause 17.9.2 and debit the same to O&M Expenses.

17.10 Overriding powers of the Authority

17.10.1 If in the reasonable opinion of the Authority, the Concessionaire is in material breach of its obligations under this Agreement and, in particular, the Maintenance Requirements, and such breach is causing or likely to cause material hardship or danger to the Users, the

Authority may, without prejudice to any of its rights under this Agreement including Termination thereof, by notice require the Concessionaire to take reasonable measures immediately for rectifying or removing such hardship or danger, as the case may be.

17.10.2 In the event that the Concessionaire, upon notice under Clause 17.10.1, fails to rectify or remove any hardship or danger within a reasonable period, the Authority may exercise overriding powers under this Clause 17.10.2 and take over the performance of any or all the obligations of the Concessionaire to the extent deemed necessary by it for rectifying or removing such hardship or danger; provided that the exercise of such overriding powers by the Authority shall be of no greater scope and of no longer duration than is reasonably required hereunder; provided further that any costs and expenses incurred by the Authority in discharge of its obligations hereunder shall be deemed to be O&M Expenses, and the Authority shall be entitled to recover them from the Concessionaire in accordance with the provisions of Clause 17.9 along with the Damages specified therein.

17.10.3 In the event of a national emergency, civil commotion or any other act specified in Clause 28.3, the Authority may take over the performance of any or all the obligations of the Concessionaire to the extent deemed necessary by it, and exercise such control over the Project or give such directions to the Concessionaire as may be deemed necessary; provided that the exercise of such overriding powers by the Authority shall be of no greater scope and of no longer duration than is reasonably required in the circumstances which caused the exercise of such overriding power by the Authority. For the avoidance of doubt, it is agreed that the consequences of such action shall be dealt in accordance with the provisions of Article 28. It is also agreed that the Concessionaire shall comply with such instructions as the Authority may issue in pursuance of the provisions of this Clause 17.10, and shall provide assistance and cooperation to the Authority, on a best effort basis, for performance of its obligations hereunder.

17.11 Restoration of loss or damage to the Project

Save and except as otherwise expressly provided in this Agreement, in the event that the Project or any part thereof suffers any loss or damage during the Concession Period from any cause whatsoever, the Concessionaire shall, at its cost and expense, rectify and remedy such loss or damage forthwith so that the Project conforms to the provisions of this Agreement.

17.12 Modifications to the Project

The Concessionaire shall not carry out any material modifications to the Project, save and except where such modifications are necessary for the Project to operate in conformity with the Specifications and Standards, Maintenance Requirements, Good Industry Practice and Applicable Laws; provided that the Concessionaire shall notify the Independent Engineer of the proposed modifications along with particulars thereof at least 15 (fifteen) days before commencing work on such modifications and shall reasonably consider any suggestions that the Independent Engineer may make within 15 (fifteen) days of receiving the Concessionaire's proposal. For the avoidance of doubt, all modifications made hereunder shall comply with the Safety Requirements, Specifications and Standards, Applicable Laws and the provisions of this Agreement.

17.13 Excuse from performance of obligations

The Concessionaire shall not be considered in breach of its obligations under this Agreement if any part of the Project is not available to Users on account of any of the following for the duration thereof:

(a) an event of Force Majeure;

(b) measures taken to ensure the safe use of the Project except when unsafe conditions occurred because of failure of the Concessionaire to perform its obligations under this Agreement; or

(c) compliance with a request from the Authority or the directions of any Government Instrumentality, the effect of which is to close all or any part of the Project:

Provided, that any such non-availability and particulars thereof shall be notified by the Concessionaire to the Authority and the Independent Engineer without any delay;

Provided further that the Concessionaire shall keep all unaffected parts of the Project open to Users, provided they can be operated safely.

17.14 Deleted

17.15 Installation and operation of CCTV

The Concessionaire shall install and operate a closed circuit television system to monitor such parts of the Project as may be necessary and expedient for a safe, secure and smooth operation thereof.

17.16 Advertising on the Site

The Concessionaire shall not undertake or permit any form of commercial advertising, display or hoarding at any place on the Site.

ARTICLE 18

SAFETY REQUIREMENTS

18.1 Safety Requirements

18.1.1 The Concessionaire shall comply with the provisions of this Agreement, Applicable Laws and Applicable Permits and conform to Good Industry Practice for securing the safety of the Users. In particular, the Concessionaire shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project, and shall comply with the safety requirements set forth in Schedule-L (the **"Safety Requirements"**).

18.1.2 The Authority shall appoint an experienced and qualified firm or organization (the **"Safety Consultant"**) for carrying out safety audit of the Project in accordance with the Safety Requirements, and shall take all other actions necessary for securing compliance with the Safety Requirements.

18.2 Expenditure on Safety Requirements

All costs and expenses arising out of or relating to Safety Requirements shall be borne by the Concessionaire to the extent such costs and expenses form part of the works and services included in the Scope of the Project, and works and services, if any, not forming part of the Scope of the Project shall be undertaken and funded in accordance with the provisions of Article 16.

ARTICLE 19

MONITORING OF OPERATION AND MAINTENANCE

19.1 Monthly status reports

19.1.1 During the Operation Period, the Concessionaire shall, no later than 7 (seven) days after the close of each month, furnish to the Authority and the Independent Engineer a monthly report stating in reasonable detail the condition of the Project including its compliance or otherwise with the Maintenance Requirements, Maintenance Manual, Maintenance Program and Safety Requirements, and shall promptly give such other relevant information as may be required by the Independent Engineer or the Authority. In particular, such report shall separately identify and state in reasonable detail the defects and deficiencies that require rectification.

19.1.2 During the Operation Period, the Concessionaire shall, no later than 10 (ten) days after the close of each month, furnish a monthly management report which shall include a summary of:

(a) key performance indicators achieved in the month, along with an analysis of reasons for failures, if any, and proposals to remedy the same;

(b) key operational hurdles and deliverables in the succeeding month along with strategies for addressing the same and for otherwise improving the Project's operational performance; and

(c) key financial parameters for the month, as benchmarked against the monthly budget and the reasons for shortfall, if any, and proposals to remedy the same.

19.2 Inspection

The Independent Engineer shall inspect the Project at least once a month. It shall make a report of such inspection (the **"O&M Inspection Report"**) stating in reasonable detail the defects or deficiencies, if any, with particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Program and Safety Requirements, and send a copy thereof to the Authority and the Concessionaire within 7 (seven) days of such inspection.

19.3 Tests

For determining that the Project conforms to the Maintenance Requirements, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice. The Concessionaire shall, with due diligence, carry out or cause to be carried out all such tests in accordance with the instructions of the Independent Engineer and furnish the results of such tests forthwith to the Independent Engineer. One half of the costs incurred on such tests, and to the extent certified by the Independent Engineer as reasonable, shall be reimbursed by the Authority to the Concessionaire.

19.4 Remedial measures

19.4.1 The Concessionaire shall repair or rectify the defects or deficiencies, if any, set forth in the O&M Inspection Report or in the test results referred to in Clause and furnish a report in respect thereof to the Independent Engineer and the Authority within 15 (fifteen) days of receiving the O&M Inspection Report or the test results, as the case may be; provided that

where the remedying of such defects or deficiencies is likely to take more than 15 (fifteen) days, the Concessionaire shall submit progress reports of the repair works once every week until such works are completed in conformity with this Agreement.

19.4.2 The Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests, at its own cost, to determine that such remedial measures have brought the Project into compliance with the Maintenance Requirements and the procedure set forth in this Clause 19.4 shall be repeated until the Project conforms to the Maintenance Requirements. In the event that remedial measures are not completed by the Concessionaire in conformity with the provisions of this Agreement, the Authority shall be entitled to recover Damages from the Concessionaire under and in accordance with the provisions of Clause 17.8.

19.5 Reports of unusual occurrence

The Concessionaire shall, prior to the close of each day, send to the Authority and the Independent Engineer, by facsimile or e-mail, a report stating accidents and unusual occurrences on the Project relating to the safety and security of the Users and the Project. A weekly and monthly summary of such reports shall also be sent within 3 (three) days of the closing of each week and month, as the case may be. For the purposes of this Clause 19.5, accidents and unusual occurrences on the Project shall include:

(a) Death or injury to any person;

(b) Damaged or dislodged fixed equipment;

(c) Any damage or obstruction on the Project, which results in slow down of the services being provided by the Concessionaire;

(d) Disablement of any equipment during operation;

(e) Communication failure affecting the operation of the Project;

(f) Smoke or fire;

(g) Flooding of the Project; and

(h) Such other relevant information as may be required by the Authority or the Independent Engineer.

ARTICLE 20

REGULATION AND MANAGEMENT

20.1 Traffic regulation by the Concessionaire

The Concessionaire shall regulate traffic on the Project in accordance with Applicable Laws, and subject to the supervision and control of the State authorities or a substitute thereof empowered in this behalf under Applicable Laws.

20.2 Police assistance

For regulating the use of Project in accordance with Applicable Laws and this Agreement, the Authority shall assist the Concessionaire in procuring police assistance from the State Police Department or a substitute thereof. The police assistance shall include setting up of a traffic aid post (the **"Traffic Aid Post"**) at each of the Toll Plazas with a mobile Police squad for round-the-clock patrolling of the Project.

20.3 Buildings for Traffic Aid Posts

The Concessionaire shall, in accordance with the type designs prescribed for such police outpost buildings by the State Government or a substitute thereof, construct at its own cost and expense, buildings not exceeding 25 (twenty five) square metres of plinth area, for each of the Traffic Aid Posts, and hand them over to the Authority no later than 60 (sixty) days prior to the Scheduled Completion Date. The Traffic Aid Post[s] shall be deemed to be part of the Site and shall vest in the Authority.

20.4 Medical Aid Posts

For providing emergency medical aid during- the Operation Period, as set forth in this Agreement, the Concessionaire shall assist the State Government or a substitute thereof to be designated by the Authority in setting up and operating a medical aid post (the **"Medical Aid** Post") at the Site for victims of accidents on the Project at each of the Toll Plazas with round-the-clock ambulance services for victims of accidents on the Project Highway.

20.5 Buildings for Medical Aid Posts

The Concessionaire shall, at its cost and in accordance with the type designs prescribed for such buildings by the State Medical Department (or a substitute thereof to be designated by the Authority), construct an aid post building and 2 (two) residential quarters, and hand them over to the Authority, no later than 30 (thirty) days prior to Scheduled Completion Date. The Medical Aid Post(s) shall be deemed to be part of the Site and shall vest in the Authority.

20.6 Computer systems and network

The Concessionaire shall install, operate and maintain a computer system with round-the-clock connections to the networks of the Authority and other related entities for exchange of data and information useful or necessary for efficient and transparent regulation and management of traffic. For this purpose, it shall follow such protocol for Electronic Data Interchange (the **"EDI"**) as the Authority may specify.

20.7 Recurring expenditure on Police assistance

On or before the Scheduled Four-Laning Date, the Concessionaire shall provide to the State Police Department or a substitute thereof one Jeep or similar vehicle in good working condition along with chauffeurs for round-the-clock patrolling as set forth in Clause 20.2 and shall meet the operating costs of such vehicle including the salaries and allowances of the chauffeurs.

20.8 Recurring expenditure on Medical Aid Posts

On or before COD, the Concessionaire shall provide to the State Medical Department or a substitute thereof to be designated by the Authority one ambulance in good working condition along with chauffeurs for round-the-clock ambulance services as set forth in Clause 21.4 and meet the operating costs of such ambulance including the salaries and allowances of the chauffeurs. The Concessionaire shall also reimburse to the State Medical Department (or a substitute thereof to be designated by the Authority) the actual expenditure incurred by it in each Accounting Year on the medical equipment, and the pay and allowances of up to 2 (two) medical personnel deployed exclusively for the Medical Aid Posts and ambulance, and shall maintain the Medical Aid Post buildings in accordance with Good Industry Practice. For the avoidance of doubt, it is agreed that the Concessionaire shall not be liable for any other expenditure incurred by the State Medical Department or a substitute thereof to be designated by the Authority.

ARTICLE 21

INDEPENDENT ENGINEER

21.1 Appointment of Independent Engineer

The Authority shall appoint a consulting engineering firm substantially in accordance with the selection criteria set forth in Schedule-M, to be the independent consultant under this Agreement (the **"Independent Engineer"**). The appointment shall be made no later than 60 (sixty) days from the date of this Agreement and shall be for a period of Construction Period plus six (6) months). On expiry or termination of the aforesaid appointment, the Authority shall appoint an Independent Engineer for a further term of 3 (three) years in accordance with the provisions of Schedule-M, and such procedure shall be repeated after expiry of each appointment.

21.2 Duties and functions

21.2.1 The Independent Engineer shall discharge its duties and functions substantially in accordance with the terms of reference set forth in Schedule-N.

21.2.2 The Independent Engineer shall submit regular periodic reports (at least once every month) to the Authority in respect of its duties and functions set forth in Schedule-N.

21.2.3 A true copy of all communications sent by the Authority to the Independent Engineer and by the Independent Engineer to the Authority shall be sent forthwith by the Independent Engineer to the Concessionaire.

21.2.4 A true copy of all communications sent by the Independent Engineer to the Concessionaire and by the Concessionaire to the Independent Engineer shall be sent forthwith by the Independent Engineer to the Authority.

21.3 Remuneration

The remuneration, cost and expenses of the Independent Engineer shall be paid by the Authority and subject to the limits set forth in Schedule-M, one-half of such remuneration, cost and expenses shall be reimbursed by the Concessionaire to the Authority within 15 (fifteen) days of receiving a statement of expenditure from the Authority.

21.4 Termination of appointment

21.4.1 The Authority may, in its discretion, terminate the appointment of the Independent Engineer at any time, but only after appointment of another Independent Engineer in accordance with Clause 21.1.

21.4.2 If the Concessionaire has reason to believe that the Independent Engineer is not discharging its duties and functions in a fair, efficient and diligent manner, it may make a written representation to the Authority and seek termination of the appointment of the Independent Engineer. Upon receipt of such representation, the Authority shall hold a tripartite meeting with the Concessionaire and Independent Engineer for an amicable resolution of the Dispute, and if any difference or disagreement between the Authority and the Concessionaire remains unresolved, the Dispute shall be settled in accordance with the Dispute Resolution Procedure. In the event that the appointment of the Independent Engineer is terminated hereunder, the Authority shall appoint forthwith another Independent Engineer in accordance with Clause 21.1.

21.5 Authorized signatories

The Authority shall require the Independent Engineer to designate and notify to the Authority and the Concessionaire up to 2 (two) persons employed in its firm to sign for and on behalf of the Independent Engineer, and any communication or document required to be signed by the Independent Engineer shall be valid and effective only if signed by any of the designated persons; provided that the Independent Engineer may, by notice in writing, substitute any of the designated persons by any of its employees.

21.6 Dispute resolution

If either Party disputes any advice, instruction, decision, direction or award of the Independent Engineer, or, as the case may be, the assertion or failure to assert jurisdiction, the Dispute shall be resolved in accordance with the Dispute Resolution Procedure.

21.7 Interim arrangement

In the event that the Authority does not appoint an Independent Engineer, or the Independent Engineer so appointed has relinquished its functions or defaulted in discharge thereof, the Authority may, in the interim, designate and authorize any person to discharge the functions of the Independent Engineer in accordance with the provisions of this Agreement, save and except that such person shall not exercise any functions relating to review, comment, approval or inspection as specified in this Agreement for and in respect of the Independent Engineer, and such functions shall be discharged as and when an Independent Engineer is appointed in accordance with the provisions of this Agreement. Provided, however, that nothing contained in this Clause 21.7 shall in any manner restrict the rights of the Authority to enforce compliance of the provisions of this Agreement.

Part IV
Financial Covenants

ARTICLE 22

FINANCIAL CLOSE

22.1 Financial Close

22.1.1 The Concessionaire hereby agrees and undertakes that it shall achieve Financial Close for an amount not lower than either:

i. Total Project Cost; or
ii. 10% less than (Estimated Project Cost minus 40% Bid Project Cost).

within 150 (one hundred and fifty) days from the date of this Agreement. In the event of delay in achieving the Financial Close, the Concessionaire shall be entitled to a further period not exceeding 120 (one hundred twenty) days, subject to payment of Damages to the Authority in a sum calculated at the rate of 0.05% (zero point zero five per cent)of the Performance Security for each day of delay, provided that the Damages specified herein shall be payable every week in advance and the period beyond the said 150 (one hundred and fifty) days shall be granted only to the extent of Damages so paid. In the event of delay in achieving the Financial Close beyond 270 (two hundred and seventy) days from the date of this Agreement, the Concessionaire shall be entitled to a further period not exceeding 95 (ninety five) days, subject to payment of Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one per cent) of the Performance Security for each day of delay, provided that the Damages specified herein shall be payable every week in advance and the period beyond the said 270 (two hundred and seventy) days shall be granted only to the extent of Damages so paid; provided further that no Damages shall be payable if such delay in Financial Close has occurred due to Force Majeure. For the avoidance of doubt, the Damages payable hereunder by the Concessionaire shall be in addition to the Damages, if any, due and payable under the provisions of Clause 4.3.

22.1.2 The Concessionaire shall, upon occurrence of Financial Close, notify the Authority forthwith, and shall have provided to the Authority, at least 2 (two) days prior to the Financial Close, 3 (three) true copies of the Financial Package and the Financial Model, duly attested by a Director of the Concessionaire, along with 3 (three) soft copies of the Financial Model in MS Excel version or any substitute thereof, which is acceptable to the Senior Lenders.

22.2 Termination due to failure to achieve Financial Close

22.2.1 Notwithstanding anything to the contrary contained in this Agreement, but subject to Clause 28.6.1, in the event that Financial Close does not occur, for any reason whatsoever, within the period set forth in Clause 22.1.1 or the extended period provided thereunder, all rights, privileges, claims and entitlements of the Concessionaire under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Concessionaire, and the Concession Agreement shall be deemed to have been terminated by mutual agreement of the Parties.

22.2.2 Upon Termination under Clause 22.2.1, the Authority shall be entitled to encash the Bid Security and appropriate the proceeds thereof as Damages; provided, however, that if Financial Close has not occurred due to Force Majeure, it shall, upon Termination, release the Bid Security or Performance Security, as the case may be. For the avoidance of doubt, it is expressly agreed that if the Bid Security shall have been substituted by the Performance

Security, the Authority shall be entitled to encash there from an amount equal to the Bid Security.

For the avoidance of doubt, it is expressly agreed that if the Performance Security has been submitted by the Concessionaire, the Authority shall be entitled to encash there from an amount equal to the 1% of Estimated Project Cost mentioned in the RFP and appropriate the proceeds thereof as Damages.

ARTICLE 23

PAYMENT OF BID PROJECT COST

23.1 Bid Project Cost

The Parties expressly agree that the cost of construction of the Project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire, shall be deemed to be Rs. 6,29,16,00,000/- (Rupees Six Hundred Twenty Nine Crore and Sixteen Lakh only) (The **"Bid Project Cost "**)[£]. The Parties further agree that the Bid Project Cost specified hereinabove for payment to the Concessionaire shall be inclusive of the cost of construction, interest during construction, working capital, physical contingencies and all other costs, expenses and charges for and in respect of construction of the Project, save and except any additional costs arising on account of variation in Price Index, Change of Scope, Change in Law, Force Majeure or breach of this Agreement, which costs shall be due and payable to the Concessionaire in accordance with the provisions of the Agreement. The Bid Project Cost shall be exclusive of GST, which shall be paid to the Concessionaire by the Authority at the applicable rates. For the avoidance of doubt, the Bid Project Cost specified herein represents the amount due and payable by the Authority to the Concessionaire and may be less than, equal to, or more than the Estimated Project Cost.

23.2 Adjusted Bid Project Cost

23.2.1 The Bid Project Cost specified in Clause 23.1 shall be revised from time to time in accordance with the provisions of this Clause 23.2 to reflect the variation in Price Index occurring after the Reference Index Date immediately preceding the Bid Date.

23.2.2 The Bid Project Cost adjusted for variation between the Price Index occurring between the Reference Index Date preceding the Bid Date and the Reference Index Date immediately preceding the Appointed Date shall be deemed to be the Bid Project Cost at commencement of construction.

23.2.3 For every month occurring after the Appointed Date, the Authority shall compute the variation in Price Index occurring between the Reference Index Date preceding the Bid Date and the Reference Index Date preceding the date of Invoice, and shall express the latter as a multiple of the former (the "**Price Index Multiple**"). All Invoices to be submitted by the Concessionaire to the Authority for and in respect of the Construction Period shall be the product of the relevant proportion of the Bid Project Cost and the Price Index Multiple applicable on the date of Invoice. For the avoidance of doubt and by way of illustration, if (a) the Price Index on the Reference Index Date preceding the Bid Date, say January 31, 2016, is 200 (two hundred); (b) the Invoice is submitted on October 15, 2017; and (c) the Price Index as on September 30, 2017 is 210 (two hundred and ten), then the Price Index Multiple for determination of the amount due in respect of such Invoice shall be 1.05 (one point zero five).

23.3 Payment of Bid Project Cost

23.3.1 40% (forty per cent) of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire in 10 (ten) equal installments of 4% (four per cent) each during the Construction Period in accordance with the provisions of Clause 23.4.

[£] Bid Project Cost shall be the amount specified in the Bid of the selected Bidder.

23.3.2 The remaining Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable in 30 (thirty) biannual installments commencing from the 180th (one hundred and eightieth) day of COD in accordance with the provisions of Clause 23.6.

23.4 Payment during Construction Period

Upon receiving a report from the Independent Engineer certifying the achievement of the below mentioned Payment Milestones[2], the Authority shall disburse, within 15 (fifteen) days of the receipt of each such report, an installment equal to **4% (four per cent)** of the Bid Project Cost, adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of that report.

For the purpose of this Clause 23.4, the Payment Milestone for release of payment during Construction Period shall be as under:

a) I (first) Payment Milestone - On achievement of 5% Physical Progress
b) II (second) Payment Milestone - On achievement of 10% Physical Progress
c) III (third) Payment Milestone – On achievement of 20% Physical Progress
d) IV (fourth) Payment Milestone - On achievement of 30% Physical Progress
e) V (fifth) Payment Milestone – On achievement of 40% Physical Progress
f) VI (sixth) Payment Milestone – On achievement of 50% Physical Progress
g) VII (seventh) Payment Milestone – On achievement of 60% Physical Progress
h) VIII (eighth) Payment Milestone – On achievement of 70% Physical Progress
i) IX (nineth) Payment Milestone – On achievement of 80% Physical Progress
j) X (tenth) Payment Milestone – On achievement of 90% Physical Progress

Provided that in case of Change of Scope, the Physical Progress shall be recalculated to account for the changed scope.

23.5 Bonus on early completion

In the event that the Concessionaire shall achieve COD on or more than 30 (thirty) days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% (Zero point five per cent) of 60 % (Sixty per cent) of the Bid Project Cost for the first30 (thirty) days by which COD shall precede the Scheduled Completion Date and thereafter the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 (thirty) days period. The Bonus shall be due and payable to the Concessionaire alongwith the 1st(first) Annuity Payment.

23.6 Annuity Payments during Operation Period

23.6.1 The (the "Completion Cost" shall be the summation of A, B, C, D, E, F, G, H, I, J and K below:

A. 5% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 5% Physical Progress.

[2] Independent Engineer, during finalization of design, shall upfront decide weightages of all the items in due consultation with the Authority responsible for making payments and recommended percentage physical progress achievements based on the above decided weightages for the entire construction period. The weightages shall be fixed as per format in Annexure – I of Schedule G of this Agreement.

B. Another 5% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 10% Physical Progress.

C. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 20% Physical Progress.

D. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 30% Physical Progress.

E. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 40% Physical Progress.

F. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 50% Physical Progress.

G. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 60% Physical Progress.

H. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 70% Physical Progress.

I. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 80% Physical Progress.

J. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 90% Physical Progress.

K. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the COD.

The Parties acknowledge and agree that the Authority has paid a portion of the Completion Cost as payments during Construction Period pursuant to Clause 23.4 of this Agreement. The balance Completion Cost remaining shall be due and payable during the Operation Period in accordance with the provisions of Clause 23.6.2.

23.6.2 The Completion Cost remaining to be paid in pursuance of the provisions of Clause 23.6.1 shall be due and payable in biannual installments over a period of 15 (fifteen) years commencing from COD, (the **"Annuity Payments"**). The 1st (first) installment of Annuity Payments shall be due and payable within 15 (fifteen) days of the 180th(one hundred and eightieth) day of COD and the remaining installments shall be due and payable within 15 (fifteen) days of completion of each of the successive six months ("the **Annuity Payment Date"**). For the avoidance of doubt, the last Annuity Payment Date would be adjusted to in such a way that it falls at the end of the Operations Period.

23.6.3 Each of the Annuity Payments due and payable during the years following the COD shall be as under[3]:

Annuity following the COD	Percentage of Completion Cost remaining to be paid on COD

[3] The schedule may be customized based on the duration of the Operations Period

1st Annuity	2.10%
2nd Annuity	2.17%
3rd Annuity	2.24%
4th Annuity	2.31%
5th Annuity	2.38%
6th Annuity	2.45%
7th Annuity	2.52%
8th Annuity	2.60%
9th Annuity	2.68%
10th Annuity	2.76%
11th Annuity	2.84%
12th Annuity	2.93%
13th Annuity	3.02%
14th Annuity	3.11%
15th Annuity	3.20%
16th Annuity	3.30%
17th Annuity	3.40%
18th Annuity	3.50%
19th Annuity	3.61%
20th Annuity	3.72%
21st Annuity	3.83%
22nd Annuity	3.94%
23rd Annuity	4.06%
24th Annuity	4.18%
25th Annuity	4.25%
26th Annuity	4.25%
27th Annuity	4.44%
28th Annuity	4.71%
29th Annuity	4.75%
30th Annuity	4.75%

Each of the biannual installments payable hereunder shall be paid along with interest as specified in Clause 23.6.4.

23.6.4 Interest shall be due and payable on the reducing balance of Completion Cost at an interest rate equal to the average of one year MCLR of top 5 Scheduled Commercial Banks[4] plus 1.25%. Such interest shall be due and payable biannually along with each installment specified in Clause 23.6.3. For the avoidance of doubt and by way of illustration, the Parties agree that interest on the Completion Cost remaining to be paid, calculated from COD and until the 180th (one hundred and eightieth) day of COD, shall be due and payable to the Concessionaire along with the first Annuity Payment and interest on **[5]% (** per cent) of the Percentage of Completion Cost remaining to be paid on COD, calculated from first Annuity payment date and until the 1st (first) anniversary of COD, shall be due and payable along with the second Annuity Payment due and payable under this Agreement. The Parties further agree that interest shall be calculated based on the number of days a particular average of one year MCLR of top 5 Scheduled Commercial Banks was applicable during

[4] The authority shall declare the list of Top 5 Scheduled Commercial Banks on 1st September every calendar year based on the balance sheet size as declared in their annual reports. The 1 year MCLRof the top 5 scheduled commercial banks shall be taken at the start of every quarter.

[5] To be finalized on the basis of the outstanding Completion Cost Annuity pursuant to the payment of 1st Annuity as provided in the Annuity payment schedule in Clause 23.6.3

the period of calculation. For the purpose of illustration, assuming that the balance capital cost remaining to be paid is Rs 100 crores on the 1st Annuity Payment Date, the applicable average of one year MCLR of top 5 Scheduled Commercial Banks for the first 75 days is 8% and thereafter it is revised to 7.5% and remains unchanged till the 2nd Annuity Payment Date, the interest would be calculated as ((100*9.25%*75)/365)+((100*8.75%*105)/365). For the avoidance of doubt[6], the Interest would be calculated on simple interest basis and no compounding of the same would be undertaken.

23.7 O&M Payments

23.7.1 The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; For the performance of its Maintenance obligations, a lump sum financial support in the form of biannual payments shall be due and payable by the Authority.

(a) For flexible pavement including structures: no maintenance charges shall be paid for the first year; 0.40% of the Bid Project Cost each for the second, third and fourth year;0.80% of the Bid Project Cost each for the subsequent years till laying of the renewal layer or end of concession period, whichever is earlier. The requirement for the renewal layer shall be worked out based on the survey and investigation of the existing pavement and the cost of such renewal works shall be made separately to the Concessionaire @ 2.4% of Bid Project Cost. After laying of the renewal layer, the Concessionaire shall be paid @ 0.40% of the original Bid Project Cost each for the next four years and @0.80% of the original Bid Project Cost each till laying of the second renewal layer or end of concession period, whichever is earlier. After laying of the renewal layer, the Concessionaire shall be paid @ 0.40% of the original Bid Project Cost each for the remaining years till the end of concession period. For the avoidance of doubt, it is clarified that if there is any requirement of renewal layer during the initial 5 years & during 5 years after laying of first renewal layer than the cost of such renewal layer of and any requirement of structural layer during the concession period shall be borne solely by concessionaire.

(b) For Flexible perpetual pavement including structures: no maintenance charges shall be paid for the first year; 0.40% of the Bid Project cost each for the second, third and fourth year; 0.60% of the Bid Project cost each for the subsequent years till laying of the renewal layer or end of concession period, whichever is earlier. The requirement for the renewal layer shall be worked out based in the survey and investigation of the existing pavement and the cost of such renewal works shall be made separately to the concessionaire @ 2.4% of Bid Project Cost. After laying of the renewal layer, the concessionaire shall be paid at 0.40% of the original Bid Project cost each for the next four years; 0.60% of the original Bid Project cost each till laying of the second renewal layer or end of concession period, whichever is earlier. After laying of the renewal layer, the concessionaire shall be paid at 0.40% of the original Bid Project cost each for the remaining years till the end of concession period. For the avoidance of Doubt, it is clarified that if there is any requirement of renewal layer during the initial 5 years and during the 5 years after laying of first renewal layer then the cost

[6] Assuming that the total number of days between 1st Annuity payment date and 2nd Annuity date are 180. In case the number of days are different the calculation may be appropriately changed

of such renewal layer and any requirement of structural layer during the concession period shall be borne solely by concessionaire.

(c) For rigid pavement including structures: no maintenance charges shall be paid for the first year; 0.20% of the Bid Project Cost each for the second, third & fourth year, 0.40% of the Bid Project Cost each for fifth, sixth, seventh & eighth year, 0.60% of the Bid Project Cost each till the end of concession period.

(d) For stand-alone Bridge/ Tunnel works: the concessionaire shall be paid no maintenance charges shall be paid for the first year; 0.20% of the Bid Project Cost each for the next five years, 0.40% of the Bid Project Cost each for the remaining years till the end of concession period.

The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt, it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.

23.7.2 Above amount for the performance of Contractors' Maintenance obligations shall be, inclusive of all taxes (except GST, which shall be payable at applicable rates). The amount payable for maintenance shall be adjusted on account of variation of Price Index. It is further agreed that the Bid Project Cost hereunder shall be reckoned with reference to the amount specified in Clause 23.1, which shall be adjusted to the extent of Change of Scope and Reduction in Scope, but shall not include any price adjustments in pursuance of variation of Price Index.

23.7.3 Deleted

23.8 Mobilization Advance

The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10% (ten per cent) of the Bid Project Cost (the **"Mobilization Advance"**). This advance payment shall be made in two equal instalments. The Concessionaire may request the Authority for the first instalment of the advance payment at any time after the Appointed Date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The Concessionaire may request the Authority for the second instalment of the advance payment at any time, after 60(sixty) days from the Appointed Date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The first and second instalments of the Mobilization Advance shall be paid by the Authority within 30 (thirty) days of receipt of the respective requests in this behalf from the Concessionaire. The rate of interest on the Mobilization Advance shall be equal to the average of one year MCLR of top 5 Scheduled Commercial Banks[7] plus 1.25%, compounded annually. The Mobilization Advance shall be deducted by the Authority in 8 (eight) equal instalments from each of the payments to be made by the Authority to the Concessionaire in accordance with the provisions of Clause 23.4 and the interest thereon shall be recovered from the 9th (ninth) and 10th (tenth) instalments.

[7] The authority shall declare the list of Top 5 Scheduled Commercial Banks on 1st September every calendar year based on the balance sheet size as declared in their annual reports. The 1year MCLR of the top 5 scheduled commercial banks shall be taken at the start of every quarter.

As the advance get recovered from the running bills/ stage payments, the Bank Guarantee for the amount equivalent to the amount of advance recovered may be released on the request of the Concessionaire.

The Concessionaire would be at liberty to either submit a substitute Bank Guarantee for the residual amount or multiple BGs for such residual amount in replacement of the existing BG.

23.9 Treatment of incomplete works

23.9.1 The Parties acknowledge and agree that in the event COD occurs upon issuance of a Provisional Certificate, the Annuity Payments and O&M Payments specified in this Article 23 shall be made as if all works comprising the Project have been completed. The works remaining incomplete shall be completed by the Concessionaire in accordance with the provisions of this Agreement and thereupon, the Completion Certificate shall be issued forthwith.

23.9.2 In the event the Authority determines that any incomplete works referred to in Clause 23.9.1 are not required to be completed for any reason, it shall modify the Scope of the Project in accordance with the provisions of Article 16 and the Completion Cost, Annuity Payments and O&M Payments shall be reduced on account of such Change of Scope as per the provisions of Article 16.

ARTICLE 24

Deleted

ARTICLE 25

ESCROW ACCOUNT

25.1 Escrow Account

25.1.1 The Concessionaire shall, prior to the Appointed Date, open and establish an Escrow Account with a Bank (the **"Escrow Bank"**) in accordance with this Agreement read with the Escrow Agreement.

25.1.2 The nature and scope of the Escrow Account are fully described in the agreement (the **"Escrow Agreement"**) to be entered into amongst the Concessionaire, the Authority, the Escrow Bank and the Senior Lenders through the Lenders' Representative, which shall be substantially in the form set forth in Schedule-O.

25.2 Deposits into Escrow Account

The Concessionaire shall deposit or cause to be deposited the following inflows and receipts into the Escrow Account:

(a) All funds constituting the Financial Package;

(b) All revenues from or in respect of the Project, including the proceeds of any rentals, deposits, capital receipts or insurance claims; and

(c) All payments by the Authority, after deduction of any outstanding payments.

25.3 Withdrawals during Concession Period

25.3.1 The Concessionaire shall, at the time of opening the Escrow Account, give irrevocable instructions, by way of an Escrow Agreement, to the Escrow Bank instructing, *inter alia*, that deposits in the Escrow Account shall be appropriated in the following order every month, or at shorter intervals as necessary, and if not due in a month then appropriated proportionately in such month and retained in the Escrow Account and paid out therefrom in the month when due:

(a) All taxes due and payable by the Concessionaire for and in respect of the Project;

(b) Deleted;

(c) All payments relating to construction of the Project, subject to and in accordance with the conditions, if any, set forth in the Financing Agreements;

(d) O&M Expenses, subject to the ceiling, if any, set forth in the Financing Agreements;

(e) O&M Expenses and other costs and expenses incurred by the Authority in accordance with the provisions of this Agreement, and certified by the Authority as due and payable to it;

(f) Any amounts due and payable to the Authority (other than under Clause 9.5);

(g) Monthly proportionate provision of Debt Service due in an Accounting Year;

(h) All payments and Damages certified by the Authority as due and payable to it by the Concessionaire;

(i) Monthly proportionate provision of debt service payments due in an Accounting Year in respect of Subordinated Debt;

(j) Any reserve requirements set forth in the Financing Agreements; and

(k) Balance, if any, in accordance with the instructions of the Concessionaire.

25.3.2 The Concessionaire shall not in any manner modify the order of payment specified in Clause 25.3.1, except with the prior written approval of the Authority.

25.4 Withdrawals upon Termination

25.4.1 Notwithstanding anything to the contrary contained in this Agreement, all amounts standing to the credit of the Escrow Account shall, upon Termination, be appropriated in the following order:

(a) All taxes due and payable by the Concessionaire for and in respect of the Project;

(b) Deleted;

(c) Percentage of Debt Due excluding Subordinated Debt if required to be as per the terms of this Agreement;

(d) Outstanding payments due to the Authority;

(e) All payments and Damages certified by the Authority as due and payable to it by the Concessionaire;

(f) Retention and payments relating to the liability for defects and deficiencies set forth in Article 33;

(g) Outstanding Debt Service including the balance of Debt Due;

(h) Outstanding Subordinated Debt;

(i) Incurred or accrued O&M Expenses;

(j) Any other payments required to be made under this Agreement; and

(k) Balance, if any, in accordance with the instructions of the Concessionaire:

Provided that no appropriations shall be made under Sub-clause (k) of this Clause 25.4.1 until a Vesting Certificate has been issued by the Authority under the provisions of Article 32.

25.4.2 The provisions of this Article 25 and the instructions contained in the Escrow Agreement shall remain in full force and effect until the obligations set forth in Clause 25.4.1 have been discharged.

ARTICLE 26

INSURANCE

26.1 Insurance during Concession Period

The Concessionaire shall effect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable Laws, and such insurances as may be necessary or prudent in accordance with Good Industry Practice. The Concessionaire shall also effect and maintain such insurances as may be necessary for mitigating the risks that may devolve on the Authority as a consequence of any act or omission of the Concessionaire during the Construction Period. The Concessionaire shall procure that in each insurance policy, the Authority shall be a co-insured and that the insurer shall pay the proceeds of insurance into the Escrow Account. For the avoidance of doubt, the level of insurance to be maintained by the Concessionaire after repayment of Senior Lenders' dues in full shall be determined on the same principles as applicable for determining the level of insurance prior to such repayment of Senior Lenders' dues.

26.2 Insurance Cover

Without prejudice to the provisions contained in Clause 26.1, the Concessionaire shall, during the Operation Period, procure and maintain Insurance Cover including but not limited to the following:

(a) Loss, damage or destruction of the Project Assets, including assets handed over by the Authority to the Concessionaire, at replacement value;

(b) Comprehensive third party liability insurance including injury to or death of personnel of the Authority or others caused by the Project;

(c) The Concessionaire's general liability arising out of the Concession;

(d) Liability to third parties for goods or property damage;

(e) Workmen's compensation insurance; and

(f) any other insurance that may be necessary to protect the Concessionaire and its employees, including all Force Majeure Events that are insurable at commercially reasonable premiums and not otherwise covered in items(a) to (e) above.

26.3 Notices to the Authority

No later than 45 (forty five) days prior to commencement of the Construction Period or the Operation Period, as the case may be, the Concessionaire shall by notice furnish to the Authority, in reasonable detail, information in respect of the insurances that it proposes to effect and maintain in accordance with this Article 26. Within 30 (thirty) days of receipt of such notice, the Authority may require the Concessionaire to effect and maintain such other insurances as may be necessary pursuant hereto, and in the event of any difference or disagreement relating to any such insurance, the Dispute Resolution Procedure shall apply.

26.4 Evidence of Insurance Cover

All insurances obtained by the Concessionaire in accordance with this Article 26 shall be maintained with insurers on terms consistent with Good Industry Practice. Within 15

(fifteen) days of obtaining any insurance cover, the Concessionaire shall furnish to the Authority, notarized true copies of the certificate(s) of insurance, copies of insurance policies and premium payment receipts in respect of such insurance, and no such insurance shall be cancelled, modified, or allowed to expire or lapse until the expiration of at least 45 (forty five) days after notice of such proposed cancellation, modification or nonrenewal has been delivered by the Concessionaire to the Authority.

26.5 Remedy for failure to insure

If the Concessionaire shall fail to effect and keep in force all insurances for which it is responsible pursuant hereto, the Authority shall have the option to either keep in force any such insurances, and pay such premier and recover the costs thereof from the Concessionaire, or in the event of computation of a Termination Payment, treat an amount equal to the Insurance Cover as deemed to have been received by the Concessionaire.

26.6 Waiver of subrogation

All insurance policies in respect of the insurance obtained by the Concessionaire pursuant to this Article 26 shall include a waiver of any and all rights of subrogation or recovery of the insurers thereunder against, inter alia, the Authority, and its assigns, successors, undertakings and their subsidiaries, affiliates, employees, insurers and underwriters, and of any right of the insurers to any set-off or counterclaim or any other deduction, whether by attachment or otherwise, in respect of any liability of any such person insured under any such policy or in any way connected with any loss, liability or obligation covered by such policies of insurance.

26.7 Concessionaire's waiver

The Concessionaire hereby further releases, assigns and waives any and all rights of subrogation or recovery against, inter alia, the Authority and its assigns, undertakings and their subsidiaries, affiliates, employees, successors, insurers and underwriters, which the Concessionaire may otherwise have or acquire in or from or in any way connected with any loss, liability or obligation covered by policies of insurance maintained or required to be maintained by the Concessionaire pursuant to this Agreement (other than third party liability insurance policies) or because of deductible clauses in or inadequacy of limits of any such policies of insurance.

26.8 Application of insurance proceeds

The proceeds from all insurance claims, except life and injury, shall be paid to the Concessionaire by credit to the Escrow Account and it shall, notwithstanding anything to the contrary contained in Clause 25.3, apply such proceeds for any necessary repair, reconstruction, reinstatement, replacement, improvement or delivery of the Project, and the balance remaining, if any, shall be applied in accordance with the provisions contained in this behalf in the Financing Agreements.

26.9 Compliance with conditions of insurance policies

The Concessionaire expressly acknowledges and undertakes to fully indemnify the Authority from and against all losses and claims arising from the Concessionaire's failure to comply with conditions imposed by the insurance policies affected in accordance with this Agreement.

ARTICLE 27

ACCOUNTS AND AUDIT

27.1 Audited accounts

27.1.1 The Concessionaire shall maintain books of accounts recording all its receipts (including all revenues derived/collected by it from or on account of the Project and/or its use), income, expenditure, payments (including payments from the Escrow Account), assets and liabilities, in accordance with this Agreement, Good Industry Practice, Applicable Laws and Applicable Permits. The Concessionaire shall provide 2 (two) copies of its Balance Sheet, Cash Flow Statement and Profit and Loss Account, along with a report thereon by its Statutory Auditors, within 180 (one hundred and eighty) days of the close of the Accounting Year to which they pertain and such audited accounts, save and except where expressly provided to the contrary, shall form the basis of payments by either Party under this Agreement. The Authority shall have the right to inspect the records of the Concessionaire during office hours and require copies of relevant extracts of books of accounts, duly certified by the Statutory Auditors, to be provided to the Authority for verification of basis of payments, and in the event of any discrepancy or error being found, the same shall be rectified and such rectified account shall form the basis of payments by either Party under this Agreement.

27.1.2 The Concessionaire shall, within 30 (thirty) days of the close of each quarter of an Accounting Year, furnish to the Authority its unaudited financial results in respect of the preceding quarter, in the manner and form prescribed by the Securities and Exchange Board of India for publication of quarterly results by the companies listed on a stock exchange.

27.1.3 On or before the thirty-first day of May each Year, the Concessionaire shall provide to the Authority, for the preceding Accounting Year, a statement duly audited by its Statutory Auditors giving summarized information on revenues derived from the Project,] and such other information as the Authority may reasonably require.

27.2 Appointment of auditors

27.2.1 The Concessionaire shall appoint, and have during the subsistence of this Agreement as its Statutory Auditors, a firm chosen by it from the mutually agreed list of 5 (five) reputable firms of chartered accountants (the **"Panel of Chartered Accountants"**), such list to be prepared substantially in accordance with the criteria set forth in Schedule-P. All fees and expenses of the Statutory Auditors shall be borne by the Concessionaire.

27.2.2 The Concessionaire may terminate the appointment of its Statutory Auditors after a notice of 45 (forty five) days to the Authority, subject to the replacement Statutory Auditors being appointed from the Panel of Chartered Accountants.

27.2.3 Notwithstanding anything to the contrary contained in this Agreement, the Authority shall have the right, but not the obligation, to appoint at its cost from time to time and at any time, another firm (the **"Additional Auditors"**) from the Panel of Chartered Accountants to audit and verify all those matters, expenses, costs, realizations and things which the Statutory Auditors are required to do, undertake or certify pursuant to this Agreement.

27.3 Certification of claims by Statutory Auditors

Any claim or document provided by the Concessionaire to the Authority in connection with or relating to receipts, income, payments, costs, expenses, accounts or audit, and any matter incidental thereto shall be valid and effective only if certified by its Statutory Auditors. For the avoidance of doubt, such certification shall not be required for exchange of information in the normal course of business including the submission of any periodic information in pursuance of the provisions of this Agreement, save and except where such certification is expressly provided.

27.4 Set-off

In the event any amount is due and payable by the Authority to the Concessionaire, it may set-off any sums payable to it by the Concessionaire and pay the balance remaining. Any exercise by the Authority of its rights under this Clause 27.4 shall be without prejudice to any other rights or remedies available to it under this Agreement or otherwise.

27.5 Dispute resolution

In the event of there being any difference between the findings of the Additional Auditors or the Concurrent Auditors, as the case may be, and the certification provided by the Statutory Auditors, such Auditors shall meet to resolve the differences and if they are unable to resolve the same, such Dispute shall be resolved by the Authority by recourse to the Dispute Resolution Procedure.

Part V
Force Majeure and Termination

ARTICLE 28

FORCE MAJEURE

28.1 Force Majeure

As used in this Agreement, the expression "Force Majeure" or "Force Majeure Event" shall, save and except as expressly provided otherwise, mean occurrence in India of any or all of Non-Political Event, Indirect Political Event and Political Event, as defined in Clauses 28.2, 28.3 and 28.4 respectively, if it affects the performance by the Party claiming the benefit of Force Majeure (the "Affected Party") of its obligations under this Agreement and which act or event (a) is beyond the reasonable control of the Affected Party, and (b) the Affected Party could not have prevented or overcome by exercise of due diligence and following Good Industry Practice, and (c) has Material Adverse Effect on the Affected Party.

28.2 Non-Political Event

A Non-Political Event shall mean one or more of the following acts or events:

(a) act of God, epidemic, extremely adverse weather conditions, lightning, earthquake, landslide, cyclone, flood, volcanic eruption, chemical or radioactive contamination or ionizing radiation, fire or explosion (to the extent of contamination or radiation or fire or explosion originating from a source external to the Site);

(b) strikes or boycotts (other than those involving the Concessionaire, Contractors or their respective employees/representatives, or attributable to any act or omission of any of them) interrupting supplies and services to the Project for a continuous period of 24 (twenty four) hours and an aggregate period exceeding 7 (seven) days in an Accounting Year, and not being an Indirect Political Event set forth in Clause 28.3;

(c) any failure or delay of a Contractor but only to the extent caused by another Non-Political Event and which does not result in any offsetting compensation being payable to the Concessionaire by or on behalf of such Contractor;

(d) any judgment or order of any court of competent jurisdiction or statutory authority made against the Concessionaire in any proceedings for reasons other than (i) failure of the Concessionaire to comply with any Applicable Law or Applicable Permit, or (ii) on account of breach of any Applicable Law or Applicable Permit or of any contract, or (iii) enforcement of this Agreement, or (iv) exercise of any of its rights under this Agreement by the Authority;

(e) The discovery of geological conditions, toxic contamination or archaeological remains on the Site that could not reasonably have been expected to be discovered through a site inspection; or

(f) Any event or circumstances of a nature analogous to any of the foregoing.

28.3 Indirect Political Event

An Indirect Political Event shall mean one or more of the following acts or events:

(a) An act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, riot, insurrection, terrorist or military action, civil commotion or politically motivated sabotage;

(b) any political or economic upheaval, disturbance, movement, struggle or similar occurrence which could not have been anticipated or foreseen by a prudent person and which causes the construction or operation of the Project to be financially unviable or otherwise not feasible;

(c) industry-wide or State-wide strikes or industrial action for a continuous period of 24 (twenty four) hours and exceeding an aggregate period of 7 (seven) days in an Accounting Year;

(d) Deleted

(e) failure of the Authority to permit the Concessionaire to continue its Construction Works, with or without modifications, in the event of stoppage of such works after discovery of any geological or archaeological finds or for any other reason;

(f) Any failure or delay of a Contractor to the extent caused by any Indirect Political Event and which does not result in any offsetting compensation being payable to the Concessionaire by or on behalf of such Contractor;

(g) Any Indirect Political Event that causes a Non-Political Event; or

(h) Any event or circumstances of a nature analogous to any of the foregoing.

28.4 Political Event

A Political Event shall mean one or more of the following acts or events by or on account of any Government Instrumentality:

(a) Change in Law, only if consequences thereof cannot be dealt with under and in accordance with the provisions of Article 35 and its effect, in financial terms, exceeds the sum specified in Clause 35.1;

(b) Compulsory acquisition in national interest or expropriation of any Project Assets or rights of the Concessionaire or of the Contractors;

(c) unlawful or unauthorized or without jurisdiction revocation of, or refusal to renew or grant without valid cause, any clearance, license, permit, authorization, no objection certificate, consent, approval or exemption required by the Concessionaire or any of the Contractors to perform their respective obligations under this Agreement and the Project Agreements; provided that such delay, modification, denial, refusal or revocation did not result from the Concessionaire's or any Contractor's inability or failure to comply with any condition relating to grant, maintenance or renewal of such clearance, license, authorization, no objection certificate, exemption, consent, approval or permit;

(d) any failure or delay of a Contractor but only to the extent caused by another Political Event and which does not result in any offsetting compensation being payable to the Concessionaire by or on behalf of such Contractor; or

(e) Any event or circumstance of a nature analogous to any of the foregoing.

28.5 Duty to report Force Majeure Event

28.5.1 Upon occurrence of a Force Majeure Event, the Affected Party shall by notice report such occurrence to the other Party forthwith. Any notice pursuant hereto shall include full particulars of:

(a) The nature and extent of each Force Majeure Event which is the subject of any claim for relief under this Article 28 with evidence in support thereof;

(b) The estimated duration and the effect or probable effect which such Force Majeure Event is having or will have on the Affected Party's performance of its obligations under this Agreement;

(c) the measures which the Affected Party is taking or proposes to take for alleviating the impact of such Force Majeure Event; an

(d) Any other information relevant to the Affected Party's claim.

28.5.2 The Affected Party shall not be entitled to any relief for or in respect of a Force Majeure Event unless it shall have notified the other Party of the occurrence of the Force Majeure Event as soon as reasonably practicable, and in any event no later than 7 (seven) days after the Affected Party knew, or ought reasonably to have known, of its occurrence, and shall have given particulars of the probable material effect that the Force Majeure Event is likely to have on the performance of its obligations under this Agreement.

28.5.3 For so long as the Affected Party continues to claim to be materially affected by such Force Majeure Event, it shall provide the other Party with regular (and not less than weekly) reports containing information as required by Clause 28.5.1, and such other information as the other Party may reasonably request the Affected Party to provide.

28.6 Effect of Force Majeure Event on the Concession

28.6.1 Upon the occurrence of any Force Majeure Event prior to the Appointed Date, the period set forth in Clause 4.1 for fulfillment of Conditions Precedent and in Clause 22.1.1 for achieving Financial Close shall be extended by a period equal in length to the duration of the Force Majeure Event.

28.6.2 at any time after the Appointed Date, if any Force Majeure Event occurs:

(a) before COD, the Construction Period and the dates set forth in the Project Completion Schedule shall be extended by a period equal in length to the duration for which such Force Majeure Event subsists; or

(b) After COD, the Concessionaire shall be entitled to receive Annuity Payments plus interest due and payable under this Agreement.

Provided any payment to be made under this clause shall be subject to deduction of outstanding dues of the Authority, if any.

28.7 Allocation of costs arising out of Force Majeure

28.7.1 Upon occurrence of any Force Majeure Event prior to the Appointed Date, the Parties shall bear their respective costs and no Party shall be required to pay to the other Party any costs thereof.

28.7.2 Upon occurrence of a Force Majeure Event after the Appointed Date, the costs incurred and attributable to such event and directly relating to the Project (the **"Force Majeure Costs"**) shall be allocated and paid as follows:

(a) upon occurrence of a Non-Political Event, the Parties shall bear their respective Force Majeure Costs and neither Party shall be required to pay to the other Party any costs thereof;

(b) upon occurrence of an Indirect Political Event, all Force Majeure Costs attributable to such Indirect Political Event, and not exceeding the Insurance Cover for such Indirect Political Event, shall be borne by the Concessionaire, and to the extent Force Majeure Costs exceed such Insurance Cover, one half of such excess amount shall be reimbursed by the Authority to the Concessionaire; and

(c) Upon occurrence of a Political Event, all Force Majeure Costs attributable to such Political Event shall be reimbursed by the Authority to the Concessionaire.

For the avoidance of doubt, Force Majeure Costs may include interest payments on Debt Due, O&M Expenses, any increase in the cost of Construction Works on account of inflation and all other costs directly attributable to the Force Majeure Event, but shall not include any costs which are expressly covered under any provision of this Agreement or debt repayment obligations, and for determining such costs, information contained in the Financial Package may be relied upon to the extent that such information is relevant.

28.7.3 Save and except as expressly provided in this Article 28, neither Party shall be liable in any manner whatsoever to the other Party in respect of any loss, damage, cost, expense, claims, demands and proceedings relating to or arising out of occurrence or existence of any Force Majeure Event or exercise of any right pursuant hereto.

28.8 Termination Notice for Force Majeure Event

If a Force Majeure Event subsists for a period of 180 (one hundred and eighty) days or more within a continuous period of 365 (three hundred and sixty five)days, either Party may in its discretion terminate this Agreement by issuing a Termination Notice to the other Party without being liable in any manner whatsoever, save as provided in this Article 28, and upon issue of such Termination Notice, this Agreement shall, notwithstanding anything to the contrary contained herein, stand terminated forthwith; provided that before issuing such Termination Notice, the Party intending to issue the Termination Notice shall inform the other Party of such intention and grant 15 (fifteen) day's time to make a representation, and may after the expiry of such 15 (fifteen) days period, whether or not it is in receipt of such representation, in its sole discretion issue the Termination Notice.

28.9 Termination Payment for Force Majeure Event

28.9.1 If Termination is on account of a Non-Political Event, the Authority shall make a Termination Payment to the Concessionaire in an amount to be calculated as under:

(i) Prior to COD:

Payment Milestone	Basis of calculation for termination payment
1st Payment Milestone	90% Debt Due or 0.68% of Bid Project Cost , whichever is lower
2nd Payment Milestone	90% Debt Due or 1.35% of Bid Project Cost , whichever is lower
3rd Payment Milestone	90% Debt Due or 5.40% of Bid Project Cost , whichever is lower
4th Payment Milestone	90% Debt Due or 9.45% of Bid Project Cost , whichever is lower
5th Payment Milestone	90% Debt Due or 13.50% of Bid Project Cost , whichever is lower
6th Payment Milestone	90% Debt Due or 17.55% of Bid Project Cost , whichever is lower
7th Payment Milestone	90% Debt Due or 21.60% of Bid Project Cost , whichever is lower

8th Payment Milestone	90% Debt Due or 25.65% of Bid Project Cost , whichever is lower
9th Payment Milestone	90% Debt Due or 29.70% of Bid Project Cost , whichever is lower
10th Payment Milestone	90% Debt Due or 33.75% of Bid Project Cost , whichever is lower

For the avoidance of doubt, it is clarified that in case of termination happening in between two Payment Milestones, for the purpose of calculation of Debt Due, the milestone achieved would only be considered; provided further the above payment so calculated above shall be reduced by Insurance Cover.

(ii) In case Termination occurs on or after COD, the Authority shall make a Termination Payment to the Concessionaire in an amount equal to 75% (seventy five percent) of Annuity Payments remaining unpaid for and in respect of the remaining Concession Period, including interest thereon up to the Transfer Date. Provided further the above payment so calculated above shall be reduced by Insurance Cover.

28.9.2 If Termination is on account of an Indirect Political Event, the Authority shall make a Termination Payment to the Concessionaire in an amount equal to:

(i) In case termination occurs prior to COD:

(a) Debt Due payment calculated as per the table below less Insurance Cover; provided that if any insurance claims forming part of the Insurance Cover are not admitted and paid, then 80% (eighty per cent) of such unpaid claims shall be included in the computation of Debt Due. Further the Debt Due would be calculated as per the table provided below:

Payment Milestone	Basis of calculation for Debt Due payment
1st Payment Milestone	Debt Due or 0.75% of Bid Project Cost , whichever is lower
2nd Payment Milestone	Debt Due or 1.50% of Bid Project Cost , whichever is lower
3nd Payment Milestone	Debt Due or 6.00% of Bid Project Cost , whichever is lower
4th Payment Milestone	Debt Due or 10.50% of Bid Project Cost , whichever is lower
5th Payment Milestone	Debt Due or 15.00% of Bid Project Cost , whichever is lower
6th Payment Milestone	Debt Due or 19.50% of Bid Project Cost , whichever is lower
7th Payment Milestone	Debt Due or 24.00% of Bid Project Cost , whichever is lower
8th Payment Milestone	Debt Due or 28.50% of Bid Project Cost , whichever is lower
9th Payment Milestone	Debt Due or 33.00% of Bid Project Cost , whichever is lower
10th Payment Milestone	Debt Due or 37.50% of Bid Project Cost , whichever is lower

For the avoidance of doubt, it is clarified that in case of termination happening in between two Payment Milestones, for the purpose of calculation of Debt Due, the milestone achieved would only be considered; and

(b) 110% (one hundred and ten per cent) of the Adjusted Equity;

(ii) In case Termination occurs on or after COD, the Authority shall make a Termination Payment to the Concessionaire in an amount equal to 90% (ninety percent) of Annuity Payments remaining unpaid for and in respect of the remaining Concession Period, including interest thereon up to the Transfer Date.

28.9.3 If Termination is on account of a Political Event, the Authority shall make a Termination Payment to the Concessionaire in an amount that would be payable under Clause 31.3.3 as if it were an Authority Default.

28.10 Dispute resolution

In the event that the Parties are unable to agree in good faith about the occurrence or existence of a Force Majeure Event, such Dispute shall be finally settled in accordance with the Dispute Resolution Procedure; provided that the burden of proof as to the occurrence or existence of such Force Majeure Event shall be upon the Party claiming relief and/or excuse on account of such Force Majeure Event

28.11 Excuse from performance of obligations

If the Affected Party is rendered wholly or partially unable to perform its obligations under this Agreement because of a Force Majeure Event, it shall be excused from performance of such of its obligations to the extent it is unable to perform on account of such Force Majeure Event; provided that:

(a) The suspension of performance shall be of no greater scope and of no longer duration than is reasonably required by the Force Majeure Event;

(b) the Affected Party shall make all reasonable efforts to mitigate or limit damage to the other Party arising out of or as a result of the existence or occurrence of such Force Majeure Event and to cure the same with due diligence; and

(c) When the Affected Party is able to resume performance of its obligations under this Agreement, it shall give to the other Party notice to that effect and shall promptly resume performance of its obligations hereunder.

28.12 Deleted

ARTICLE 29

COMPENSATION FOR BREACH OF AGREEMENT

29.1 Compensation for default by the Concessionaire

Subject to the provisions of Clause 29.4, in the event of the Concessionaire being in material breach or default of this Agreement, it shall pay to the Authority by way of compensation, all direct costs suffered or incurred by the Authority as a consequence of such material breach or default, within 30 (thirty) days of receipt of the demand supported by necessary particulars thereof; provided that no compensation shall be payable under this Clause 29.1 for any material breach or default in respect of which Damages are expressly specified and payable under this Agreement or for any consequential losses incurred by the Authority.

29.2 Compensation for default by the Authority

Subject to the provisions of Clause 29.4, in the event of the Authority being in material breach or default of this Agreement at any time after the Appointed Date, it shall pay to the Concessionaire by way of compensation, all direct costs suffered or incurred by the Concessionaire as a consequence of such material breach or default within 30 (thirty) days of receipt of the demand supported by necessary particulars thereof; provided that no such compensation shall be payable for any material breach or default in respect of which Damages have been expressly specified in this Agreement. For the avoidance of doubt, compensation payable may include interest payments on debt, O&M Expenses, any increase in capital costs on account of inflation and all other costs directly attributable to such material breach or default but shall not include loss of Annuity Payments, debt repayment obligations or other consequential losses, loss of profit, EPC Contractors claims, and for determining such compensation, information contained in the Financial Package and the Financial Model may be relied upon to the extent it is relevant.

29.3 Deleted

29.4 Mitigation of costs and damage

The Affected Party shall make all reasonable efforts to mitigate or limit the costs and damage arising out of or as a result of breach of Agreement by the other Party.

ARTICLE 30

SUSPENSION OF CONCESSIONAIRE'S RIGHTS

30.1 Suspension upon Concessionaire Default

Upon occurrence of a Concessionaire Default, the Authority shall be entitled, without prejudice to its other rights and remedies under this Agreement including its rights of Termination hereunder, to (a) suspend all rights of the Concessionaire under this Agreement, and pursuant hereto, and (b) exercise such rights itself and perform the obligations hereunder or authorize any other person to exercise or perform the same on its behalf during such suspension (the "Suspension"). Suspension hereunder shall be effective forthwith upon issue of notice by the Authority to the Concessionaire and may extend up to a period not exceeding 180 (one hundred and eighty) days from the date of issue of such notice; provided that upon written request from the Concessionaire and the Lenders' Representative, the Authority shall extend the aforesaid period of 180 (one hundred and eighty) days by a further period not exceeding 90 (ninety) days.

30.2 Authority to act on behalf of Concessionaire

30.2.1 During the period of Suspension, the Authority shall, on behalf of the Concessionaire, collect all revenues under and in accordance with this Agreement and deposit the same in the Escrow Account. The Authority shall be entitled to make withdrawals from the Escrow Account for meeting the O&M Expenses and for meeting the costs incurred by it for remedying and rectifying the cause of Suspension, and thereafter for defraying the expenses specified in Clause25.3.

30.2.2 During the period of Suspension hereunder, all rights and liabilities vested in the Concessionaire in accordance with the provisions of this Agreement shall continue to vest in the Concessionaire and all things done or actions taken, including expenditure incurred by the Authority for discharging the obligations of the Concessionaire under and in accordance with this Agreement and the Project Agreements, shall be deemed to have been done or taken for and on behalf of the Concessionaire and the Concessionaire undertakes to indemnify the Authority for all costs incurred- during such period. The Concessionaire hereby licenses and sub-licenses respectively, the Authority or any other person authorized by it under Clause 30.1 to use during Suspension, all Intellectual Property belonging to or licensed to the Concessionaire with respect to the Project and its design, engineering, construction, operation and maintenance, and which is used or created by the Concessionaire in performing its obligations under the Agreement.

30.3 Revocation of Suspension

30.3.1 In the event that the Authority shall have rectified or removed the cause of Suspension within a period not exceeding 90 (ninety) days from the date of Suspension, it shall revoke the Suspension forthwith and restore all rights of the Concessionaire under this Agreement. For the avoidance of doubt, the Parties expressly agree that the Authority may, in its discretion, revoke the Suspension at any time, whether or not the cause of Suspension has been rectified or removed hereunder.

30.3.2 Upon the Concessionaire having cured the Concessionaire Default within a period not exceeding 90 (ninety) days from the date of Suspension, the Authority shall revoke the Suspension forthwith and restore all rights of the Concessionaire under this Agreement.

30.4 Substitution of Concessionaire

At any time during the period of Suspension, the Lenders' Representative, on behalf of Senior Lenders, shall be entitled to substitute the Concessionaire under and in accordance with the Substitution Agreement, and upon receipt of notice thereunder from the Lenders' Representative, the Authority shall withhold Termination for a period not exceeding 180 (one hundred and eighty) days from the date of Suspension, and any extension thereof under Clause 30.1, for enabling the Lenders' Representative to exercise its rights of substitution on behalf of Senior Lenders.

30.5 Termination

30.5.1 At any time during the period of Suspension under this Article 30, the Concessionaire may by notice require the Authority to revoke the Suspension and issue a Termination Notice. Subject to the rights of the Lenders' Representative to undertake substitution in accordance with the provisions of this Agreement and within the period specified in Clause 30.4, the Authority shall, within 15 (fifteen) days of receipt of such notice, terminate this Agreement under and in accordance with Article 31 as if it is a Concessionaire Default under Clause 31.1.

30.5.2 Notwithstanding anything to the contrary contained in this Agreement, in the event that Suspension is not revoked within 180 (one hundred and eighty) days from the date of Suspension hereunder or within the extended period, if any, set forth in Clause 30.1, the Concession Agreement shall, upon expiry of the aforesaid period, be deemed to have been terminated by mutual agreement of the Parties and all the provisions of this Agreement shall apply, mutatis mutandis, to such Termination as if a Termination Notice had been issued by the Authority upon occurrence of a Concessionaire Default.

ARTICLE 31

TERMINATION

31.1 Termination for Concessionaire Default

31.1.1 Save as otherwise provided in this Agreement, in the event that any of the defaults specified below shall have occurred, and the Concessionaire fails to cure the default within the Cure Period set forth below, or where no Cure Period is specified, then within a Cure Period of 60 (sixty) days, the Concessionaire shall be deemed to be in default of this Agreement (the "**Concessionaire Default**"), unless the default has occurred as a result of any breach of this Agreement by the Authority or due to Force Majeure. The defaults referred to herein shall include the following:

(a) The Performance Security has been encashed and appropriated in accordance with Clause 9.2 and the Concessionaire fails to replenish or provide fresh Performance Security within a Cure Period of 15 (fifteen) days;

(b) subsequent to the replenishment or furnishing of fresh Performance Security in accordance with Clause 9.2, the Concessionaire fails to meet any Condition Precedent or cure the Concessionaire Default, as the case may be, for which whole or part of the Performance Security was appropriated, within a Cure Period of 120 (one hundred and twenty) days;

(c) the Concessionaire does not achieve the latest outstanding Project Milestone due in accordance with the provisions of Schedule-G and continues to be in default for 120 (one hundred and twenty) days;

(d) The Concessionaire abandons or manifests intention to abandon the construction or operation of the Project without the prior written consent of the Authority;

(e) COD does not occur within the period specified in Clause 12.3.3;

(f) the Punch List items have not been completed within the period set forth in Clause 14.4.1;

(g) the Concessionaire is in breach of the Maintenance Requirements or the Safety Requirements, as the case may be;

(h) the Concessionaire has failed to make any payment to the Authority within the period specified in this Agreement;

(i) an Escrow Default has occurred and the Concessionaire fails to cure the default within a Cure Period of 15 (fifteen) days;

(j) upon occurrence of a Financial Default, the Lenders' Representative has by notice required the Authority to undertake Suspension or Termination, as the case may be, in accordance with the Substitution Agreement and the Concessionaire fails to cure the default within the Cure Period specified hereinabove;

(k) a breach of any of the Project Agreements by the Concessionaire has caused a Material Adverse Effect;

(l) the Concessionaire creates any Encumbrance in breach of this Agreement;

(m) the Concessionaire repudiates this Agreement or otherwise takes any action or evidences or conveys an intention not to be bound by the Agreement;

(n) a Change in Ownership has occurred in breach of the provisions of Clause 5.3;

(o) there is a transfer, pursuant to law either of (i) the rights and/or obligations of the Concessionaire under any of the Project Agreements, or of (ii) all or part of the assets or undertaking of the Concessionaire, and such transfer causes a Material Adverse Effect;

(p) an execution levied on any of the assets of the Concessionaire has caused a Material Adverse Effect;

(q) the Concessionaire is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Concessionaire or for the whole or material part of its assets that has a material bearing on the Project;

(r) the Concessionaire has been, or is in the process of being liquidated, dissolved, wound-up, amalgamated or reconstituted in a manner that would cause, in the reasonable opinion of the Authority, a Material Adverse Effect;

(s) a resolution for winding up of the Concessionaire is passed, or any petition for winding up of the Concessionaire is admitted by a court of competent jurisdiction and a provisional liquidator or receiver is appointed and such order has not been set aside within 90 (ninety) days of the date thereof or the Concessionaire is ordered to be wound up by a court except for the purpose of amalgamation or reconstruction; provided that, as part of such amalgamation or reconstruction, the entire property, assets and undertaking of the Concessionaire are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Concessionaire under this Agreement and the Project Agreements; and provided that:

(I) the amalgamated or reconstructed entity has the capability and operating experience necessary for the performance of its obligations under this Agreement and the Project Agreements;

(ii) the amalgamated or reconstructed entity has the financial standing to perform its obligations under this Agreement and the Project Agreements and has a credit worthiness at least as good as that of the Concessionaire as at the Appointed Date; and

(iii) Each of the Project Agreements remains in full force and effect;

(t) any representation or warranty of the Concessionaire herein contained which is, as of the date hereof, found to be materially false, incorrect or misleading or the Concessionaire is at any time hereafter found to be in breach thereof;

(u) the Concessionaire submits to the Authority any statement, notice or other document, in written or electronic form, which has a material effect on the Authority's rights, obligations or interests and which is false in material particulars;

(v) the Concessionaire has failed to fulfill any obligation, for which failure Termination has been specified in this Agreement;

(w) the Concessionaire issues a Termination Notice in violation of this Agreement;

(x) the Concessionaire commits a default in complying with any other provision of this Agreement if such default causes a Material Adverse Effect on the Authority.

31.1.2 Without prejudice to any other rights or remedies which the Authority may have under this Agreement, upon occurrence of a Concessionaire Default, the Authority shall be entitled to terminate this Agreement by issuing a Termination Notice to the Concessionaire; provided that before issuing the Termination Notice, the Authority shall by a notice inform the Concessionaire of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Concessionaire to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice, subject to the provisions of Clause 31.1.3.

31.1.3 The Authority shall, if there be Senior Lenders, send a copy of its notice of intention to issue a Termination Notice referred to in Clause 31.1.2 to inform the Lenders' Representative and grant 15 (fifteen) days to the Lenders' Representative, for making a

representation on behalf of the Senior Lenders stating the intention to substitute the Concessionaire in accordance with the Substitution Agreement. In the event the Authority receives such representation on behalf of Senior Lenders, it shall, in its discretion, either withhold Termination for a period not exceeding 180 (one hundred and eighty) days from the date of such representation or exercise its right of Suspension, as the case may be, for enabling the Lenders' Representative to exercise the Senior Lenders' right of substitution in accordance with the Substitution Agreement:

Provided that the Lenders' Representative may, instead of exercising the Senior Lenders' right of substitution, procure that the default specified in the notice is cured within the aforesaid period of 180 (one hundred and eighty) days, and upon such curing thereof, the Authority shall withdraw its notice referred to above and restore all the rights of the Concessionaire.

Provided further that upon written request from the Lenders' Representative and the Concessionaire, the Authority shall extend the aforesaid period of 180 (one hundred and eighty) days by such further period not exceeding 90 (ninety) days, as the Authority may deem appropriate.

31.2 Termination for Authority Default

31.2.1 In the event that any of the defaults specified below shall have occurred, and the Authority fails to cure such default within a Cure Period of 90 (ninety) days or such longer period as has been expressly provided in this Agreement, the Authority shall be deemed to be in default of this Agreement (the **"Authority Default"**) unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure. The defaults referred to herein shall include the following:

(a) The Authority commits a material default in complying with any of the provisions of this Agreement and such default has a Material Adverse Effect on the Concessionaire;

(b) The Authority has failed to make any payment to the Concessionaire within the period specified in this Agreement;

(c) The Authority fails to provide, within a period of 180 (one hundred and eighty days) from the Appointed Date, statutory clearances required for construction of the Project; or

(d) The Authority repudiates this Agreement or otherwise takes any action that amounts to or manifests an irrevocable intention not to be bound by this Agreement.

31.2.2 Without prejudice to any other right or remedy which the Concessionaire may have under this Agreement, upon occurrence of an Authority Default, the Concessionaire shall, subject to the provisions of the Substitution Agreement, be entitled to terminate this Agreement by issuing a Termination Notice to the Authority; provided that before issuing the Termination Notice, the Concessionaire shall by a notice inform the Authority of its intention to issue the Termination Notice and grant 15 (fifteen) days to the Authority to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice.

31.3 Termination Payment

31.3.1 Upon Termination on account of a Concessionaire Default during the Operation Period, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to 65% (sixty five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.

31.3.2 Notwithstanding to the provisions of Clause 31.3.1 upon Termination on account of Concessionaire Default during the Construction Period, the Termination Payment shall be based on the Payment Milestone achieved which is in terms of the Physical Progress made by the Concessionaire in the Project and the Termination Payment corresponding to the achieved Payment Milestone shall be as follows:

Payment Milestone	Basis of calculation for Termination Payment
1st Payment Milestone	NIL
2nd Payment Milestone	NIL
3rd Payment Milestone	50% of Debt Due or 3.00% of Bid Project Cost , whichever is lower
4th Payment Milestone	55% of Debt Due or 5.78% of Bid Project Cost , whichever is lower
5th Payment Milestone	60% of Debt Due or 9.00% of Bid Project Cost , whichever is lower
6th Payment Milestone	65% of Debt Due or 12.68% of Bid Project Cost , whichever is lower
7th Payment Milestone	70% of Debt Due or 16.80% of Bid Project Cost , whichever is lower
8th Payment Milestone	75% of Debt Due or 21.38% of Bid Project Cost , whichever is lower
9th Payment Milestone	80% of Debt Due or 26.40% of Bid Project Cost , whichever is lower
10th Payment Milestone	85% of Debt Due or 31.88% of Bid Project Cost , whichever is lower

For the avoidance of doubt, it is clarified that in case of termination happening in between two Payment Milestones, for the purpose of calculation of Termination Payment, the milestone achieved would only be considered.

31.3.3 Upon Termination on account of an Authority Default, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to:

(i) In case the termination occurs prior to COD

(a) Debt Due payment calculated as per the table below less Insurance Cover; provided that if any insurance claims forming part of the Insurance Cover are not admitted and paid, then 80% (eighty per cent) of such unpaid claims shall be included in the computation of Debt Due. Further the Debt Due would be calculated as per the table provided below:

Payment Milestone	Basis of calculation for Debt Due payment
1st Payment Milestone	Debt Due or 0.75% of Bid Project Cost , whichever is lower
2nd Payment Milestone	Debt Due or 1.50% of Bid Project Cost , whichever is lower
3rd Payment Milestone	Debt Due or 6.00% of Bid Project Cost , whichever is lower
4th Payment Milestone	Debt Due or 10.50% of Bid Project Cost , whichever is lower
5th Payment Milestone	Debt Due or 15.00% of Bid Project Cost , whichever is lower
6th Payment Milestone	Debt Due or 19.50% of Bid Project Cost , whichever is lower
7th Payment Milestone	Debt Due or 24.00% of Bid Project Cost , whichever is lower
8th Payment Milestone	Debt Due or 28.50% of Bid Project Cost , whichever is lower
9th Payment Milestone	Debt Due or 33.00% of Bid Project Cost , whichever is lower
10th Payment Milestone	Debt Due or 37.50% of Bid Project Cost , whichever is lower

For the avoidance of doubt, it is clarified that in case of termination happening in between two Payment Milestones, for the purpose of calculation of Debt Due, the milestone achieved would only be considered; and

(b) 150% (one hundred and fifty per cent) of the Adjusted Equity;

(ii) In case the termination occurs on or after COD, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.

31.3.4 Termination Payment shall become due and payable to the Concessionaire within 15 (fifteen) days of a demand being made by the Concessionaire to the Authority with the necessary particulars, and in the event of any delay, the Authority shall pay interest at a rate equal to 3% (three per cent) above the daily average Bank Rate on the amount of Termination Payment remaining unpaid; provided that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Authority of its payment obligations in respect thereof hereunder.

31.3.5 The Concessionaire expressly agrees that Termination Payment under this Article 31 shall constitute a full and final settlement of all claims of the Concessionaire on account of Termination of this Agreement for any reason whatsoever and that the Concessionaire or any shareholder thereof shall not have any further right or claim under any law, treaty, convention, contract or otherwise.

31.4 Certain limitations on Termination Payment

31.4.1 During the Construction Period, Termination Payment due and payable under this Agreement shall be computed with reference to the Debt Due in accordance with the provisions of this Agreement. The Parties also agree that for the purposes of computing Termination Payment, the Debt Due shall at no time exceed 85% (eighty five per cent) of the Total Project Cost.

31.4.2 The amount payable in respect of any Debt Due expressed in foreign currency shall be computed at the Reference Exchange Rate for conversion into the relevant foreign currency as on the date of Termination Payment. Provided further that all borrowings in foreign currency shall be restricted to the financing of Total Project Cost and any borrowings in excess thereof shall not qualify for computation of Termination Payment. It is clarified that the rate of conversion of such foreign currency shall be calculated on the date on which the Agreement is terminated.

31.5 Other rights and obligations of the Authority

Upon Termination for any reason whatsoever, the Authority shall:

(a) Be deemed to have taken possession and control of the Project forthwith;

(b) Take possession and control of all materials, stores, implements, construction plants and equipment on or about the Site;

(c) Be entitled to restrain the Concessionaire and any person claiming through or under the Concessionaire from entering upon the Site or any part of the Project;

(d) Require the Concessionaire to comply with the Divestment Requirements set forth in Clause 32.1; and

(e) succeed upon election by the Authority, without the necessity of any further action by the Concessionaire, to the interests of the Concessionaire under such of the Project Agreements as the Authority may in its discretion deem appropriate, and shall upon such election be liable to the Contractors only for compensation accruing and becoming due and payable to them under the terms of their respective Project Agreements from and after the date the Authority elects to succeed to the interests of the Concessionaire. For the avoidance of doubt, the Concessionaire acknowledges and agrees that all sums claimed by such Contractors as being -due and owing for works and services performed or accruing on account of any act, omission or event prior to such date shall constitute debt between the Concessionaire and such Contractors, and the Authority shall not in any manner be liable for such sums. It is further agreed that in the event the Authority elects to cure any outstanding defaults under such Project Agreements, the amount expended by the Authority for this purpose shall be deducted from the Termination Payment.

31.6 Survival of rights

Notwithstanding anything to the contrary contained in this Agreement, but subject to the provisions of Clause 31.3.5, any Termination pursuant to the provisions of this Agreement shall be without prejudice to the accrued rights of either Party including its right to claim and recover money damages, insurance proceeds, security deposits, and other rights and remedies, which it may have in law or contract. All rights and obligations of either Party under this Agreement, including Termination Payments and Divestment Requirements, shall survive the Termination to the extent such survival is necessary for giving effect to such rights and obligations.

ARTICLE 32

DIVESTMENT OF RIGHTS AND INTEREST

32.1 Divestment Requirements

32.1.1 Upon Termination, the Concessionaire shall comply with and conform to the following Divestment Requirements:

(a) Notify to the Authority forthwith the location and particulars of all Project Assets;

(b) deliver forthwith the actual or constructive possession of the Project, free and clear of all Encumbrances, save and except to the extent set forth in the Substitution Agreement;

(c) cure all Project Assets, including the road, bridges, structures and equipment, of all defects and deficiencies so that the Project is compliant with the Maintenance Requirements; provided that in the event of Termination during the Construction Period, all Project Assets shall be handed over on 'as is where is' basis after bringing them to a safe condition;

(d) deliver and transfer relevant records, reports, Intellectual Property and other licenses pertaining to the Project and its design, engineering, construction, operation and maintenance, including all programmers and manuals pertaining thereto, and complete 'as built' Drawings as on the Transfer Date. For the avoidance of doubt, the Concessionaire represents and warrants that the Intellectual Property delivered hereunder shall be adequate and complete for the design, engineering, construction, operation and maintenance of the Project and shall be assigned to the Authority free of any Encumbrance;

(e) Transfer and/or deliver all Applicable Permits to the extent permissible under Applicable Laws;

(f) execute such deeds of conveyance, documents and other writings as the Authority may reasonably require for conveying, divesting and assigning all the rights, title and interest of the Concessionaire in the Project Assets, including manufacturers' warranties in respect of any plant or equipment and the right to receive outstanding insurance claims to the extent due and payable to the Authority, absolutely unto the Authority or its nominee; and

(g) Comply with all other requirements as may be prescribed or required under Applicable Laws for completing the divestment and assignment of all rights, title and interest of the Concessionaire in the Project, free from all Encumbrances, absolutely unto the Authority or to its nominee.

32.1.2 Subject to the exercise by the Authority of its rights under this Agreement or under any of the Project Agreements to perform or procure the performance by a third party of any of the obligations of the Concessionaire, the Parties shall continue to perform their obligations under this Agreement, notwithstanding the issuance of any Termination Notice, until the Termination of this Agreement becomes effective in accordance with its terms.

32.2 Inspection and cure

Not earlier than 90 (ninety) days prior to Termination but not later than 15 (fifteen) days prior to the effective date of such Termination, the Independent Engineer shall verify, after giving due notice to the Concessionaire specifying the time, date and place of such verification and/or inspection, compliance by the Concessionaire with the Maintenance Requirements, and if required, cause appropriate tests to be carried out at the Concessionaire's cost for this purpose. Defaults, if any, in the Maintenance Requirements shall be cured by the Concessionaire at its cost and the provisions of Article 33 shall apply, mutatis mutandis, in relation to curing of defects or deficiencies under this Article 32.

32.3 Cooperation and assistance on transfer of Project

32.3.1 The Parties shall cooperate on a best effort basis and take all necessary measures, in good faith, to achieve a smooth transfer of the Project in accordance with the provisions of this Agreement so as to protect the safety of and avoid undue delay or inconvenience to the Users, other members of the public or the lawful occupiers of any part of the Site.

32.3.2 The Parties shall provide to each other, 9 (nine) months prior to the Transfer Date in the event of Termination by efflux of time and immediately in the event of either Party conveying to the other Party its intent to issue a Termination Notice, as the case may be, as much information and advice as is reasonably practicable regarding the proposed arrangements for operation of the Project following the Transfer Date. The Concessionaire shall further provide such reasonable advice and assistance as the Authority, its concessionaire or agent may reasonably require for operation of the Project until the expiry of 6 (six) months after the Transfer Date.

32.3.3 The Authority shall have the option to purchase or hire from the Concessionaire at a fair market value and free from any encumbrance all or any part of the plant and machinery used in connection with the Project but which does not form part of the assets specified in Clause 32.1.1 and is reasonably required in connection with operation of the Project. For the avoidance of doubt, in the event of dispute or difference relating to fair market value, the Dispute Resolution Procedure shall apply.

32.4 Vesting Certificate

The divestment of all rights, title and interest in the Project shall be deemed to be complete on the date when all of the Divestment Requirements have been fulfilled, and the Authority shall, without unreasonable delay, thereupon issue a certificate substantially in the form set forth in Schedule-Q (the **"Vesting Certificate"**), which will have the effect of constituting evidence of divestment by the Concessionaire of all of its rights, title and interest in the Project, and their vesting in the Authority pursuant hereto. It is expressly agreed that any defect or deficiency in the Divestment Requirements shall not in any manner be construed or interpreted as restricting the exercise of any rights by the Authority or its nominee on, or in respect of, the Project on the footing that all Divestment Requirements have been complied with by the Concessionaire.

32.5 Divestment costs etc.

32.5.1 The Concessionaire shall bear and pay all costs incidental to divestment of all of the rights, title and interest of the Concessionaire in the Project Assets in favor of the Authority upon Termination, save and except that all stamp duties payable on any deeds or Documents

executed by the Concessionaire in connection with such Divestment shall be borne by the Authority.

32.5.2 In the event of any Dispute relating to matters covered by and under this Article 32, the Dispute Resolution Procedure shall apply.

ARTICLE 33

DEFECTS LIABILITY AFTER TERMINATION

33.1 Liability for defects after Termination

The Concessionaire shall be responsible for all defects and deficiencies in the Project for a period of 120 (one hundred and twenty) days after Termination, and it shall have the obligation to repair or rectify, at its own cost, all defects and deficiencies observed by the Independent Engineer in the Project during the aforesaid period. In the event that the Concessionaire fails to repair or rectify such defect or deficiency within a period of 15 (fifteen) days from the date of notice issued by the Authority in this behalf, the Authority shall be entitled to get the same repaired or rectified at the Concessionaire's risk and cost so as to make the Project conform to the Maintenance Requirements. All costs incurred by the Authority hereunder shall be reimbursed by the Concessionaire to the Authority within 15 (fifteen) days of receipt of demand thereof, and in the event of default in reimbursing such costs, the Authority shall be entitled to recover the same from the funds retained in the Escrow Account under the provisions of Clause 33.2 or from the Performance Guarantee provided thereunder. For the avoidance of doubt, the provisions of this Article 33 shall not apply if Termination occurs prior to COD.

33.2 Retention in Escrow Account

33.2.1 Notwithstanding anything to the contrary contained in this Agreement, but subject to the provisions of Clause 33.2.3, a sum equal to 15% (fifteen per cent) of the Annuity Payment due and payable immediately preceding the Transfer Date shall be retained in the Escrow Account for a period of 120 (one hundred and twenty) days after Termination for meeting the liabilities, if any, arising out of or in connection with the provisions of Clause 33.1.

33.2.2 Without prejudice to the provisions of Clause 33.2.1, the Independent Engineer shall carry out an inspection of the Project at any time between 210 (two hundred and ten) and 180 (one hundred and eighty) days prior to the Termination and if it recommends that the status of the Project is such that a sum larger than the amount stipulated in Clause 33.2.1 should be retained in the Escrow Account and for a period longer than the aforesaid 120 (one hundred and twenty) days, the amount recommended by the Independent Engineer shall be retained in the Escrow Account for the period specified by it.

33.2.3 The Concessionaire may, for the performance of its obligations under this Article 33, provide to the Authority a guarantee from a Bank for a sum equivalent to the amount determined under Clause 33.2.1 or 33.2.2, as the case may be, and for the period specified therein, substantially in the form set forth in Schedule-F (the **"Performance Guarantee"**), to be modified, mutatis mutandis, for this purpose, and the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate the required amounts from the Performance Guarantee for undertaking the repairs or rectification at the Concessionaire's risk and cost in accordance with the provisions of this Article 33. Upon furnishing of a Performance Guarantee under this Clause 33.2.3, the retention of funds in the Escrow Account in terms of Clause 33.2.1 or 33.2.2, as the case may be, shall be dispensed with.

Part VI
Other Provisions

ARTICLE 34

ASSIGNMENT AND CHARGES

34.1 Restrictions on assignment and charges

34.1.1 Subject to Clauses 34.2 and 34.3, this Agreement shall not be assigned by the Concessionaire to any person, save and except with the prior consent in writing of the Authority, which consent the Authority shall be entitled to decline without assigning any reason.

34.1.2 Subject to the provisions of Clause 34.2, the Concessionaire shall not create nor permit to subsist any Encumbrance, or otherwise transfer or dispose of all or any of its rights and benefits under this Agreement or any Project Agreement to which the Concessionaire is a party, except with prior consent in writing of the Authority, which consent the Authority shall be entitled to decline without assigning any reason.

34.2 Permitted assignment and charges

The restraints set forth in Clause 34.1 shall not apply to:

(a) liens arising by operation of law (or by an agreement evidencing the same) in the ordinary course of business of the Project;

(b) mortgages/pledges/hypothecation of goods/assets other than Project Assets and their related documents of title, arising or created in the ordinary course of business of the Project, and as security only for indebtedness to the Senior Lenders under the Financing Agreements and/or for working capital arrangements for the Project. For the avoidance of doubt, the Senior Lenders would be entitled to create a lien on the Escrow Account, subject to and without prejudice to the rights of the Authority under this Agreement;

(c) assignment of rights, interest and obligations of the Concessionaire to or in favor of the Lenders' Representative as nominee and for the benefit of the Senior Lenders, to the extent covered by and in accordance with the Substitution Agreement as security for financing provided by Senior Lenders under the Financing Agreements; and

(d) Liens or encumbrances required by any Applicable Law.

34.3 Substitution Agreement

34.3.1 The Lenders' Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the **"Substitution Agreement"**) to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, substantially in the form set forth in Schedule-R.

34.3.2 Upon substitution of the Concessionaire under and in accordance with the Substitution Agreement, the Nominated Company substituting the Concessionaire shall be deemed to be the Concessionaire under this Agreement and shall enjoy all rights and be responsible for all obligations of the Concessionaire under this Agreement as if it were the Concessionaire; provided that where the Concessionaire is in breach of this Agreement on the date of such substitution, the Authority shall by notice grant a Cure Period of 120 (one hundred and twenty) days to the Concessionaire for curing such breach.

34.4 Assignment by the Authority

Notwithstanding anything to the contrary contained in this Agreement, the Authority may, after giving 60 (sixty) days' notice to the Concessionaire, assign and/ or transfer any of its rights and benefits and/or obligations under this Agreement to an assignee who is, in the reasonable opinion of the Authority, capable of fulfilling all of the Authority's then outstanding obligations under this Agreement.

ARTICLE 35

CHANGE IN LAW

35.1 Increase in costs

If as a result of Change in Law, the Concessionaire suffers an increase in costs or reduction in net after-tax return or other financial burden, the aggregate financial effect of which exceeds the higher of **Rs. 1.29 crore (Rupees One Crore and Twenty Nine Lakh only)** or 2% (two per cent) of the total Annuity Payments in any Accounting Year, the Concessionaire may so notify the Authority and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in increased costs, reduction in return or other financial burden as aforesaid. Upon notice by the Concessionaire, the Parties shall meet, as soon as reasonably practicable as but no later than 30 (thirty) days from the date of notice and either agree on amendments to this Agreement or on any other mutually agreed arrangement:

Provided that if no agreement is reached within 90 (ninety) days of the aforesaid notice, the Concessionaire may by notice require the Authority to pay an amount that would place the Concessionaire in the same financial position that it would have enjoyed had there been no such Change in Law, and within 15 (fifteen) days of receipt of such notice, along with particulars thereof, the Authority shall pay the amount specified therein; provided that if the Authority shall dispute such claim of the Concessionaire, the same shall be settled in accordance with the Dispute Resolution Procedure. For the avoidance of doubt, it is agreed that this Clause 35.1 shall be restricted to changes in law directly affecting the Concessionaire's costs of performing its obligations under this Agreement.

35.2 Reduction in costs

If as a result of Change in Law, the Concessionaire benefits from a reduction in costs or increase in net after-tax return or other financial gains, the aggregate financial effect of which exceeds the higher of **Rs. 1.29 crore (Rupees One Crore and Twenty Nine Lakh only)** or 2% (two per cent) of the total Annuity Payments in any Accounting Year, the Authority may so notify the Concessionaire and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in decreased costs, increase in return or other financial gains as aforesaid. Upon notice by the Authority, the Parties shall meet, as soon as reasonably practicable as but no later than 30 (thirty) days from the date of notice and either agree on such amendments to this Agreement or on any other mutually agreed arrangement:

Provided that if no agreement is reached within 90 (ninety) days of the aforesaid notice, the Authority may by notice require the Concessionaire to pay an amount that would place the Concessionaire in the same financial position that it would have enjoyed had there been no such Change in Law, and within 15 (fifteen) days of receipt of such notice, along with particulars thereof, the Concessionaire shall pay the amount specified therein to the Authority; provided that if the Concessionaire shall dispute such claim of the Authority, the same shall be settled in accordance with the Dispute Resolution Procedure. For the avoidance of doubt, it is agreed that this Clause 35.2 shall be restricted to changes in law directly affecting the Concessionaire's costs of performing its obligations under this Agreement.

35.3 Protection of NPV

Pursuant to the provisions of Clauses 35.1 and 35.2 and for the purposes of placing the Concessionaire in the same financial position as it would have enjoyed had there been no Change in Law affecting the costs, returns or other financial burden or gains, the Parties shall rely on the Financial Model to establish a net present value (the **"NPV"**) of the net cash flow and make necessary adjustments in costs, revenues, compensation or other relevant parameters, as the case may be, to procure that the NPV of the net cash flow is the same as it would have been if no Change in Law had occurred. For the avoidance of doubt, the Parties expressly agree that for determination of NPV, the discount rate to be used shall be equal to the weighted average rate of interest at which the Concessionaire has raised the Debt Due under its Financing Agreements.

35.4 Restriction on cash compensation

The Parties acknowledge and agree that the demand for cash compensation under this Article 35 shall be restricted to the effect of Change in Law during the respective Accounting Year and shall be made at any time after commencement of such year, but no later than one year from the close of such Accounting Year. Any demand for cash compensation payable for and in respect of any subsequent Accounting Year shall be made after the commencement of the Accounting Year to which the demand pertains, but no later than 2 (two) years from the close of such Accounting Year.

35.5 Deleted

ARTICLE 36

LIABILITY AND INDEMNITY

36.1 General indemnity

36.1.1 The Concessionaire shall indemnify, defend, save and hold harmless the Authority and its officers, servants, agents, Government Instrumentalities and Government owned and/or controlled entities/enterprises, (the **"Authority Indemnified Persons"**) against any and all suits, proceedings, actions, demands and claims from third parties for any loss, damage, cost and expense of whatever kind and nature, whether arising out of any breach by the Concessionaire of any of its obligations under this Agreement or any related agreement or on account of any defect or deficiency in the provision of services by the Concessionaire to the Authority or to any User, or from any negligence of the Concessionaire under contract or tort or on any other ground whatsoever, except to the extent that any such suits, proceedings, actions, demands and claims have arisen due to any negligent act or omission, or breach or default of this Agreement on the part of the Authority Indemnified Persons.

36.1.2 The Authority shall indemnify, defend, save and hold harmless the Concessionaire against any and all suits, proceedings, actions, demands and claims from third parties for any loss, damage', cost and expense of whatever kind and nature arising out of (a) defect in title and/or the rights of the Authority in the land comprised in the Site, and/or (b) breach by the Authority of any of its obligations under this Agreement or any related agreement, which materially and adversely affect the performance by the Concessionaire of its obligations under this Agreement, save and except that where any such claim, suit, proceeding, action, and/or demand has arisen due to a negligent act or omission, or breach of any of its obligations under any provision of this Agreement or any related agreement, and/or breach of its statutory duty on the part of the Concessionaire, its subsidiaries, affiliates, contractors, servants or agents, the same shall be the liability of the Concessionaire.

36.2 Indemnity by the Concessionaire

36.2.1 Without limiting the generality of Clause 36.1, the Concessionaire shall fully indemnify, hold harmless and defend the Authority and the Authority Indemnified Persons from and against any and all loss and/or damages arising out of or with respect to:

(a) Failure of the Concessionaire to comply with Applicable Laws and Applicable Permits;

(b) Payment of taxes required to be made by the Concessionaire in respect of the income or other taxes of the Concessionaire's contractors, suppliers and representatives; or

(c) Non-payment of amounts due as a result of materials or services furnished to the Concessionaire or any of its contractors which are payable by the Concessionaire or any of its contractors.

36.2.2 Without limiting the generality of the provisions of this Article 36, the Concessionaire shall fully indemnify, hold harmless and defend the Authority Indemnified Persons from and against any and all suits, proceedings, actions, claims, demands, liabilities and damages which the Authority Indemnified Persons may hereafter suffer, or pay by reason of any demands, claims, suits or proceedings arising out of claims of infringement of any domestic or foreign patent rights, copyrights or other intellectual property, proprietary or

confidentiality rights with respect to any materials, information, design or process used by the Concessionaire or by the Concessionaire's Contractors in performing the Concessionaire's obligations or in any way incorporated in or related to the Project. If in any such suit, action, claim or proceedings, a temporary restraint order or preliminary injunction is granted, the Concessionaire shall make every reasonable effort, by giving a satisfactory bond or otherwise, to secure the revocation or suspension of the injunction or restraint order. If, in any such suit, action, claim or proceedings, the Project, or any part thereof or comprised therein, is held to constitute an infringement and its use is permanently enjoined, the Concessionaire shall promptly make every reasonable effort to secure for the Authority a license, at no cost to the Authority, authorizing continued use of the infringing work. If the Concessionaire is unable to secure such license within a reasonable time, the Concessionaire shall, at its own expense, and without impairing the Specifications and Standards, either replace the affected work, or part, or process thereof with non-infringing work or part or process, or modify the same so that it becomes non-infringing.

36.3 Notice and contest of claims

In the event that either Party receives a claim or demand from a third party in respect of which it is entitled to the benefit of an indemnity under this Article 36 (the **"Indemnified Party"**) it shall notify the other Party (the **"Indemnifying Party"**) within 15 (fifteen) days of receipt of the claim or demand and shall not settle or pay the claim without the prior approval of the Indemnifying Party, which approval shall not be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim or demand, it may conduct the proceedings in the name of the Indemnified Party, subject to the Indemnified Party being secured against any costs involved, to its reasonable satisfaction.

36.4 Defense of claims

36.4.1 The Indemnified Party shall have the right, but not the obligation, to contest, defend and litigate any claim, action, suit or proceeding by any third party alleged or asserted against such Party in respect of, resulting from, related to or arising out of any matter for which it is entitled to be indemnified hereunder, and reasonable costs and expenses thereof shall be indemnified by the Indemnifying Party. If the Indemnifying Party acknowledges in writing its obligation to indemnify the Indemnified Party in respect of loss to the full extent provided by this Article 36, the Indemnifying Party shall be entitled, at its option, to assume and control the defense of such claim, action, suit or proceeding, liabilities, payments and obligations at its expense and through the counsel of its choice; provided it gives prompt notice of its intention to do so to the Indemnified Party and reimburses the Indemnified Party for the reasonable cost and expenses incurred by the Indemnified Party prior to the assumption by the Indemnifying Party of such defense. The Indemnifying Party shall not be entitled to settle or compromise any claim, demand, action, suit or proceeding without the prior written consent of the Indemnified Party, unless the Indemnifying Party provides such security to the Indemnified Party as shall be reasonably required by the Indemnified Party to secure the loss to be indemnified hereunder to the extent so compromised or settled.

36.4.2 If the Indemnifying Party has exercised its rights under Clause 36.3, the Indemnified Party shall not be entitled to settle or compromise any claim, action, suit or proceeding without the prior written consent of the Indemnifying Party (which consent shall not be unreasonably withheld or delayed).

36.4.3 If the Indemnifying Party exercises its rights under Clause 36.3, the Indemnified Party shall nevertheless have the right to employ its own counsel, and such counsel may participate in such action, but the fees and expenses of such counsel shall be at the expense of the Indemnified Party, when and as incurred, unless:

(a) The employment of counsel by such party has been authorized in writing by the Indemnifying Party;

(b) The Indemnified Party shall have reasonably concluded that there may be a conflict of interest between the Indemnifying Party and the Indemnified Party in the conduct of the defense of such action;

(c) the Indemnifying Party shall not, in fact, have employed independent counsel reasonably satisfactory to the Indemnified Party, to assume the defense of such action and shall have been so notified by the Indemnified Party; or

(d) The Indemnified Party shall have reasonably concluded and specifically notified the Indemnifying Party either:

(I) that there may be specific defenses available to it which are different from or additional to those available to the Indemnifying Party; or

(ii) That such claim, action, suit or proceeding involves or could have a material adverse effect upon it beyond the scope of this Agreement:

Provided that if Sub-clauses (b), (c) or (d) of this Clause 36.4.3 shall be applicable, the counsel for the Indemnified Party shall have the right to direct the defense of such claim, demand, action, suit or proceeding on behalf of the Indemnified Party, and the reasonable fees and disbursements of such counsel shall constitute legal or other expenses hereunder.

36.5 No consequential claims

Notwithstanding anything to the contrary contained in this Article 36, the indemnities herein provided shall not include any claim or recovery in respect of any cost, expense, loss or damage of an indirect, incidental or consequential nature, including loss of profit, except as expressly provided in this Agreement.

36.6 Survival on Termination

The provisions of this Article 36 shall survive Termination.

ARTICLE 37

RIGHTS AND TITLE OVER THE SITE

37.1 Licensee rights

For the purpose of this Agreement, the Concessionaire shall have rights to the use of the Site as a licensee subject to and in accordance with this Agreement, and to this end; it may regulate the entry and use of the Project by third parties in accordance with and subject to the provisions of this Agreement.

37.2 Access rights of the Authority and others

37.2.1 The Concessionaire shall allow free access to the Site at all times for the authorized representatives and vehicles of the Authority and/or its contractors, Senior Lenders, and the Independent Engineer, and for the persons and vehicles duly authorized by any Government Instrumentality to inspect the Project and to investigate any matter within their authority, and upon reasonable notice, the Concessionaire shall provide to such persons reasonable assistance necessary to carry out their respective duties and functions.

37.2.2 The Concessionaire shall, for the purpose of operation and maintenance of any utility or road specified in Article 11, allow free access to the Site at all times for the authorized persons and vehicles of the controlling body of such utility or road.

37.3 Property taxes

All property taxes on the Site shall be payable by the Authority as owner of the Site; provided, however, that any such taxes payable by the Concessionaire under Applicable Laws for use of the Site shall not be reimbursed or payable by the Authority. For the avoidance of doubt, the Parties agree that stamp duties, if any, due and payable on the grant of license comprising this Agreement shall be paid by the Authority. Provided, however, that the Authority may require the Concessionaire to pay such stamp duties, which shall be reimbursed by the Authority to the Concessionaire within 15 (fifteen) days of receiving the demand thereof.

37.4 Restriction on sub-letting

The Concessionaire shall not sub-license or sub-let the whole or any part of the Site, save and except as may be expressly set forth in this Agreement; provided that nothing contained herein shall be construed or interpreted as restricting the right of the Concessionaire to appoint Contractors for the performance of its obligations hereunder including for operation and maintenance of all or any part of the Project.

ARTICLE 38

DISPUTE RESOLUTION

38.1 Dispute Resolution

38.1.1 In the event of any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the **"Dispute"**) either Party may call upon the Independent Engineer, to mediate and assist the Parties in arriving at an amicable settlement thereof.

38.1.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

38.1.3 Dispute Resolution Board (DRB):

Failing mediation by the Independent Engineer or without the intervention of the Independent Engineer, either Party may require such Dispute to be referred to the Dispute Resolution Board ("DRB") in accordance with the procedure setforth in Schedule-S to the Concession Agreement. The decision(s) of the Dispute Resolution Board shall be binding on both parties who shall promptly give effect to unless and until the same is revised/ modified, as hereinafter provided, in a Conciliation/ Arbitral Tribunal.

38.2 Conciliation

If either the Authority or the Concessionaire is dissatisfied with any decision of the DRB, and/or if the DRB is unable to resolve the dispute, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 38.3 but before resorting to such arbitration, the parties agree to explore conciliation by the Conciliation Committees of Independent Experts set up by the Authority in accordance with the procedure decided by the panel of such experts and notified by the Authority on its website including its subsequent amendments. In the event of the conciliation proceedings being successful, the parties to the dispute would sign the written settlement agreement and the conciliators would authenticate the same. Such settlement agreement would then be binding on the parties in terms of Section 73 of the Arbitration Act. In case of failure of the conciliation process even at the level of the Conciliation Committee, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 38.3.

38.3 Arbitration

38.3.1 Any Dispute which is not resolved amicably by conciliation, as provided in Clause 38.2, shall be finally settled by arbitration as set forth below:

i) The Dispute shall be finally referred to Society for Affordable Resolution of Disputes (hereinafter called as SAROD), a society registered under Society's Act, 1860 vide Registration no. S/RS/SW1049/2013 duly represented by Authority and National Highways Builders Federation (NHBF). The dispute shall be dealt with in terms of Rules of SAROD. The detailed procedure for conducting Arbitration shall be governed by the Rules of SAROD and provisions of Arbitration & Conciliation

Act, 1996, as amended from time to time. The Dispute shall be governed by Substantive Law of India.

ii) The appointment of Tribunal, Code of conduct for Arbitrators and fees and expenses of SAROD and Arbitral Tribunal shall also be governed by the Rules of SAROD as amended from time to time.

iii) Subject to the provisions of THE LIMITATION ACT, 1963, as amended from time to time, Arbitration may be commenced during or after the Concession Period that the obligations of Authority and the Concessionaire shall not be altered by reason of the Arbitration being conducted during the Concession Period.

iv) The venue of Arbitration shall be New Delhi or a place selected by governing body of SAROD and the language for all documents and communications between the parties shall be English.

v) The expenses incurred by each party in connection with the preparation, presentation, etc., of arbitral proceedings shall be shared by each party itself.

38.3.2 The arbitrators shall make a reasoned award (the **"Award"**). Any Award made in any arbitration held pursuant to this Article 38 shall be final and binding on the Parties as from the date it is made, and the Concessionaire and the Authority agree and undertake to carry out such Award without delay.

38.3.3 The Concessionaire and the Authority agree that an Award may be enforced against the Concessionaire and/or the Authority, as the case may be, and their respective assets wherever situated.

38.3.4 This Agreement and the rights and obligations of the Parties shall remain in full force and effect, pending the Award in any arbitration proceedings hereunder. Further, the parties unconditionally acknowledge and agree that notwithstanding any dispute between them, each party shall proceed with the performance of its respective obligations, pending resolution of Dispute in accordance with this Article.

38.4 Adjudication by Regulatory Authority, Tribunal or Commission

In the event of constitution of a statutory regulatory authority, tribunal or commission, as the case may be, with powers to adjudicate upon disputes between the Concessionaire and the Authority, all Disputes arising after such constitution shall, instead of reference to arbitration under Clause 38.3, be adjudicated upon by such regulatory authority, tribunal or commission in accordance with the Applicable Law and references to Dispute Resolution Procedure shall be construed accordingly. For the avoidance of doubt, the parties hereto agree that the adjudication hereunder shall not be final and binding until an appeal against such adjudication has been decided by an appellate tribunal or court of competent jurisdiction, as the case may be, or no such appeal has been preferred within the time specified in the Applicable Law.

ARTICLE 39

DISCLOSURE

39.1 Disclosure of Specified Documents

The Concessionaire shall make available for inspection by any person, copies of this Concession Agreement, the Maintenance Manual, the Maintenance Program, the Maintenance Requirements and the Safety Requirements (hereinafter collectively referred to as the **"Specified Documents"**), free of charge, during normal business hours on all working days at the Site and the Concessionaire's Registered Office. The Concessionaire shall prominently display at the Site, public notices stating the availability of the Specified Documents for such inspection, and shall provide copies of the same to any person upon payment of copying charges on a 'no profit no loss' basis.

39.2 Disclosure of Documents relating to safety

The Concessionaire shall make available for inspection by any person copies of all Documents and data relating to safety of the Project, free of charge, during normal business hours on all working days, at the Concessionaire's Registered Office. The Concessionaire shall make copies of the same available to any person upon payment of copying charges on a 'no profit no loss' basis.

39.3 Notwithstanding the provisions of Clauses 39.1 and 39.2, the Authority shall be entitled to direct the Concessionaire, from time to time, to withhold the disclosure of Protected Documents (as defined herein below) to any person in pursuance of the aforesaid Clauses.

Explanation:

The expression Protected Documents shall mean such of the Specified Documents or documents referred to in Clauses 39.1 and 39.2, or portions thereof, the disclosure of which the Authority is entitled to withhold under the provisions of the Right to Information Act, 2005.

ARTICLE 40

REDRESSAL OF PUBLIC GRIEVANCES

40.1 Complaints Register

40.1.1 The Concessionaire shall maintain a public relations office at the Site where it shall keep a register (the **"Complaint Register"**) open to public access at all times for recording of complaints by any person (the **"Complainant"**). Information relating to the availability of and access to the Complaint Register shall be prominently displayed by the Concessionaire at each the Site so as to bring it to the attention of all Users.

40.1.2 The Complaint Register shall be securely bound and each page thereof shall be duly numbered. It shall have appropriate columns including the complaint number, date, name and address of the Complainant, substance of the complaint and the action taken by the Concessionaire. Immediately after a complaint is registered, the Concessionaire shall give a receipt to the Complainant stating the date and complaint number.

40.1.3 Without prejudice to the provisions of Clauses 40.1.1 and 40.1.2, the Authority may, in consultation with the Concessionaire, specify the procedure for making complaints in electronic form and for responses thereto.

40.2 Redressal of complaints

40.2.1 The Concessionaire shall inspect the Complaint Register every day and take prompt and reasonable action for redressed of each complaint. The action taken shall be briefly noted in the Complaint Register and a reply stating the particulars thereof shall be sent by the Concessionaire to the Complainant under a certificate of posting.

40.2.2 Within 7 (seven) days of the close of each month, the Concessionaire shall send to the Authority and to the Independent Engineer a true photocopy each of all the pages of the Complaint Register on which any entry has been recorded during the course of such month, and upon perusal thereof, the Authority may, in its discretion, advise the Concessionaire to take such further action as the Authority may deem appropriate for a fair and just redressal of any grievance. The Concessionaire shall consider such advice and inform the Authority of its decision thereon, and if the Authority is of the opinion that the Complainant is entitled to further relief, the Authority may advise the Complainant to seek appropriate remedy under the Consumer Protection Act, 1986, at his own risk and cost.

ARTICLE 41

MISCELLANEOUS

41.1 Governing law and jurisdiction

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

41.2 Waiver of immunity

Each Party unconditionally and irrevocably:

(a) Agrees that the execution, delivery and performance by it of this Agreement constitute commercial acts done and performed for commercial purpose;

(b) agrees that, should any proceedings be brought against it or its assets, property or revenues in any jurisdiction in relation to this Agreement or any transaction contemplated by this Agreement, no immunity (whether by reason of sovereignty or otherwise) from such proceedings shall be claimed by or on behalf of the Party with respect to its assets;

(c) waives any right of immunity which it or its assets, property or revenues now has, may acquire in the future or which may be attributed to it in any jurisdiction; and

(d) consents generally in respect of the enforcement of any judgment or award against it in any such proceedings to the giving of any relief or the issue of any process in any jurisdiction in connection with such proceedings (including the making, enforcement or execution against it or in respect of any assets, property or revenues whatsoever irrespective of their use or intended use of any order or judgment that may be made or given in connection therewith).

41.3 Depreciation

For the purposes of depreciation under Applicable Laws, the property representing the capital investment made by the Concessionaire in the Project shall be deemed to be acquired and owned by the Concessionaire. For the avoidance of doubt, the Authority shall not in any manner be liable in respect of any claims for depreciation to be made by the Concessionaire under Applicable Laws.

41.4 Delayed payments

41.4.1 The Parties hereto agree that payments due from one Party to the other Party under the provisions of this Agreement shall be made within the period set forth therein, and if no such period is specified, within 30 (thirty) days of receiving a demand along with the necessary particulars. Unless otherwise specified in this Agreement, in the event of delay beyond such period, the defaulting Party shall pay interest for the period of delay calculated at a rate equal to 4% (four per cent) above the daily average Bank Rate, and recovery thereof shall be without prejudice to the rights of the Parties under this Agreement including Termination thereof.

41.4.2 Unless otherwise specified, any interest payable under this Agreement shall accrue on a daily outstanding basis and shall be compounded on the basis of quarterly rests.

41.5 Waiver

41.5.1 Waiver, including partial or conditional waiver, by either Party of any default by the other Party in the observance and performance of any provision of or obligations under this Agreement:

(a) Shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions of or obligations under this Agreement;

(b) Shall not be effective unless it is in writing and executed by a duly authorized representative of the Party; and

(c) Shall not affect the validity or enforceability of this Agreement in any manner.

41.5.2 Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement or any obligation thereunder nor time or other indulgence granted by a Party to the other Party shall be treated or deemed as waiver of such breach or acceptance of any variation or the relinquishment of any such right hereunder.

41.6 Liability for review of Documents and Drawings

Except to the extent expressly provided in this Agreement

(a) no review, comment or approval by the Authority or the Independent Engineer of any Project Agreement, Document or Drawing submitted by the Concessionaire nor any observation or inspection of the construction, operation or maintenance of the Project nor the failure to review, approve, comment, observe or inspect hereunder shall relieve or absolve the Concessionaire from its obligations, duties and liabilities under this Agreement, Applicable Laws and Applicable Permits; and

(b) The Authority shall not be liable to the Concessionaire by reason of any review, comment, approval, observation or inspection referred to in Sub-clause (a) above.

41.7 Exclusion of implied warranties etc.

This Agreement expressly excludes any warranty, condition or other undertaking implied at law or by custom or otherwise arising out of any other agreement between the Parties or any representation by either Party not contained in a binding legal agreement executed by both Parties.

41.8 Survival

41.8.1 Termination shall:

(a) Not relieve the Concessionaire or the Authority, as the case may be, of any obligations hereunder which expressly or by implication survive Termination hereof; and

(b) except as otherwise provided in any provision of this Agreement expressly limiting the liability of either Party, not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of, or caused by, acts or omissions of such Party prior to the effectiveness of such Termination or arising out of such Termination.

41.8.2 All obligations surviving Termination shall only survive for a period of 3 (three) years following the date of such Termination.

41.9 Entire Agreement

This Agreement and the Schedules together constitute a complete and exclusive statement of the terms of the agreement between the Parties on the subject hereof, and no amendment or modification hereto shall be valid and effective unless such modification or amendment is agreed to in writing by the Parties and duly executed by persons especially empowered in this behalf by the respective Parties. All prior written or oral understandings, offers or other communications of every kind pertaining to this Agreement are abrogated and withdrawn. For the avoidance of doubt, the Parties hereto agree that any obligations of the Concessionaire arising from the Request for Proposals, as the case may be, shall be deemed to form part of this Agreement and treated as such.

41.10 Severability

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

41.11 No partnership

This Agreement shall not be interpreted or construed to create an association, joint venture or partnership between the Parties, or to impose any partnership obligation or liability upon either Party, and neither Party shall have any right, power or authority to enter into any agreement or undertaking for, or act on behalf of, or to act as or be an agent or representative of, or to otherwise bind, the other Party.

41.12 Third parties

This Agreement is intended solely for the benefit of the Parties and their respective successors and permitted assigns, and nothing in this Agreement shall be construed to create any duty to, standard of care with reference to, or any liability to, any person not a Party to this Agreement including any Concessionaire's Contractor.

41.13 Successors and assigns

This Agreement shall be binding upon, and inure to the benefit of the Parties and their respective successors and permitted assigns.

41.14 Notices

Unless the law requires to follow the specified mode of communication only as prescribed therein, any notice or other communication to be given by one contracting party to the other Party under or in connection with the matters contemplated by this Agreement shall be routed through NHAI Data Lake under the hand of the authorized representative and shall:

(a) In the case of the Concessionaire, be given through NHAI Data Lake and marked for attention of the person set out below or to such other person as the Concessionaire may from time to time designate by notice to the Authority;

Attention: V. K. Joshi
Designation: General Manager
Address: G-5&6, Sector-10, Dwarka, New Delhi-110075
Fax No.
Email: vkjoshi@nhai.org

(b) In the case of the Authority, be given through NHAI Data Lake and be addressed to the person named below with a copy delivered to the Authority representative or such other person as the Authority may from time to time designate by notice to the Concessionaire;

Attention: Mr. Ishwar Singh
Designation: Authorised Signatory
Address: SCO No. 327-328, Sector-20 Market, HUDA, Kaithal, Kaithal, Haryana, India, 136027
Fax No.
Email: diplambalakalaamb@gmail.com

and

(c) Any notice or communication by one contracting Party to the other Party, given in accordance herewith, shall be deemed to have been delivered when given through or made on the NHAI Data Lake.

41.15 Language

All notices required to be given by one Party to the other Party and all other communications, Documentation and proceedings which are in any way relevant to this Agreement shall be in writing and in English language.

41.16 Counterparts

This Agreement may be executed in two counterparts, each of which, when executed and delivered, shall constitute an original of this Agreement.

41.17 **State Support Agreement**

The Concessionaire acknowledges that it has received from the Authority a certified true copy of the agreement executed between MORTH and the State Government for providing the support and services specified therein (the "**State Support Agreement**"), and the Parties hereto agree to make their best endeavors to procure the support of the State Government.

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

ARTICLE 42

DEFINITIONS

42.1 Definitions

In this Agreement, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them:

"**Accounting Year**" means the financial year commencing from the first day of April of any calendar year and ending on the thirty-first day of March of the next calendar year;

"**Adjusted Equity**" means the Equity funded in Indian Rupees and adjusted on the first day of the current month (the **"Reference Date"**), in the manner set forth below, to reflect the change in its value on account of depreciation and variations in WPI, and for any Reference Date occurring:

(a) on or before COD, the Adjusted Equity shall be a sum equal to the Equity funded in Indian Rupees and expended on the Project, revised to the extent of one half of the variation in WPI occurring between the first day of the month of Appointed Date and the Reference Date;

"Affected Party" shall have the meaning as set forth in Clause 28.1;

"Agreement" or "Concession Agreement" means this Agreement, its Recitals, and the Schedules hereto and any amendments thereto made in accordance with the provisions contained in this Agreement;

"Annuity Payments" shall have the meaning as set forth in Clause 23.6.2;

"Annuity Payment Date" shall have the meaning as set forth in Clause 23.6.2;

"Appendix" shall have the meaning as set forth in Clause 10.3.1;

"Applicable Laws" means all laws, brought into force and effect by GOI or the State Government including rules, regulations and notifications made thereunder, and judgments, decrees, injunctions, writs and orders of any court of record, applicable to this Agreement and the exercise, performance and discharge of the respective rights and obligations of the Parties hereunder, as may be in force and effect during the subsistence of this Agreement;

"Applicable Permits" means all clearances, licenses, permits, authorizations, no objection certificates, consents, approvals and exemptions required to be obtained or maintained under Applicable Laws in connection with the construction, operation and maintenance of the Project during the subsistence of this Agreement;

"Appointed Date" means the date on which Financial Close is achieved and every Condition Precedent is satisfied, in accordance with the provisions of this Agreement, and such date shall be the date of commencement of the Concession Period;

"Associate" or "Affiliate" means, in relation to either Party {and/or Consortium Members}, a person who controls, is controlled by, or is under the common control with such Party {or Consortium Member} (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, whether by operation of law or by contract or otherwise);

"Authority" shall have the meaning attributed thereto in the array of Parties as set forth in the Recitals;

"Authority Default" shall have the meaning as set forth in Clause 31.2.1;

"Authority Indemnified Persons" shall have the meaning set forth in Clause 36.1.1;

"Authority Representative" means such person or persons as may be authorized in writing by the Authority to act on its behalf under this Agreement and shall include any person or persons having authority to exercise any rights or perform and fulfill any obligations of the Authority under this Agreement;

"Bank" means a bank incorporated in India and having a minimum net worth of Rs. 1,000 crore (Rupees one thousand crore) or any other bank acceptable to Senior Lenders, but does not include a bank in which any Senior Lender has an interest;

"Bank Rate" means the rate of interest specified by the Reserve Bank of India from time to time in pursuance of section 49 of the Reserve Bank of India Act, 1934 or any replacement of such Bank Rate for the time being in effect;

"Bid" means the documents in their entirety comprised in the bid submitted by the selected bidder in response to the Request for Proposals in accordance with the provisions thereof and **"Bids"** shall mean the bids submitted by any and all pre-qualified bidders;

"Bid Date" means the last date on which the Bid may have been submitted in accordance with the provisions of the Request for Proposals;

"Bid Project Cost" shall have the meaning as set forth in Clause 23.1;

"Bid Security" means the security provided by the Concessionaire to the Authority along with the Bid, in accordance with the Request for Proposals, and which is to remain in force until substituted by the Performance Security;

"COD" or "Commercial Operation Date" shall have the meaning as set forth in Clause 15.1.1;

"CPI (IW)" means the Consumer Price Index for Industrial Workers as published by the Labour Bureau, Government of India and shall include any index which substitutes the CPI (IW), and any reference to CPI (IW) shall, unless the context otherwise requires, be construed as a reference to the CPI (IW) published for the period ending with the preceding quarter;

"Change in Law" means the occurrence of any of the following after the Bid Date:

(a) The enactment of any new Indian law;

(b) The repeal, modification or re-enactment of any existing Indian law;

(c) The commencement of any Indian law which has not entered into effect until the Bid Date;

(d) a change in the interpretation or application of any Indian law by a judgment of a court of record which has become final, conclusive and binding, as compared to such interpretation or application by a court of record prior to the Bid Date; or

(e) Any change in the rates of any of the Taxes that have a direct effect on the Project;

"Change in Ownership" means a transfer of the direct and/or indirect legal or beneficial ownership of any shares, or securities convertible into shares, that causes the aggregate holding of the selected bidder, together with its Associates, in the total Equity to decline below 51% (fifty one per cent) thereof during Construction Period and six months thereafter; provided that any material variation (as compared to the representations made by the Concessionaire during the bidding process for the purposes of meeting the minimum conditions of eligibility or for evaluation of its application or bid, as the case may be,) in the proportion of the equity holding of the selected bidder to the total Equity, if it occurs prior to completion of a period six months after COD, shall constitute Change in Ownership;

"Change of Scope" shall have the meaning as set forth in Clause 16.1.1;

"Company" means the company acting as the Concessionaire under this Agreement;

"Completion Certificate" shall have the meaning as set forth in Clause 14.2;

"Completion Cost" shall have the meaning as set forth in Clause 23.6.1

"Concession" shall have the meaning as set forth in Clause 3.1.1;

"Concessionaire" shall have the meaning attributed thereto in the array of Parties as set forth in the Recitals;

"Concession Period" means the period starting on and from Appointed Date and ending on the Transfer Date. For avoidance of doubt it is clarified that the Concession Period shall include the Construction Period plus a fixed period of 15 years of Operation & Maintenance Period from the COD;

"Concessionaire Default" shall have the meaning as set forth in Clause 31.1.1;

"Conditions Precedent" shall have the meaning as set forth in Clause 4.1.1;

"Consortium" Deleted

"Consortium Member" Deleted

"Construction Period" means the period beginning from the Appointed Date and ending on COD;

"Construction Works" means all works and things necessary to complete the Project in accordance with this Agreement;

"Contractor" means the person or persons, as the case may be, with whom the Concessionaire has entered into any of the EPC Contract, the O&M Contract or any other material agreement or contract for construction, operation and/or maintenance of the Project or matters incidental thereto, but does not include a person who has entered into an agreement for providing financial assistance to the Concessionaire;

"Cure Period" means the period specified in this Agreement for curing any breach or default of any provision of this Agreement by the Party responsible for such breach or default and shall:

(a) Commence from the date on which a notice is delivered by one Party to the other Party asking the latter to cure the breach or default specified in such notice;

(b) Not relieve any Party from liability to pay Damages or compensation under the provisions of this Agreement; and

(c) Not in any way be extended by any period of Suspension under this Agreement;

provided that if the cure of any breach by the Concessionaire requires any reasonable action by the Concessionaire that must be approved by the Authority or the Independent Engineer hereunder, the applicable Cure Period shall be extended by the period taken by the Authority or the Independent Engineer to accord their approval;

"DBOT" or "Design, Build, Operate and Transfer" shall have the meaning as set forth in Recital (A);

"Damages" shall have the meaning as set forth in Sub-clause (w) of Clause 1.2.1;

"Debt Due" means the aggregate of the following sums expressed in Indian Rupees outstanding on the Transfer Date:

(a) the principal amount of the debt provided by the Senior Lenders under the Financing Agreements for financing the Total Project Cost (the "principal") but excluding any part of the principal that had fallen due for repayment two years prior to the Transfer Date;

(b) all accrued interest, financing fees and charges payable under the Financing Agreements on, or in respect of, the debt referred to in Sub-clause (a) above until the Transfer Date but excluding (i) any interest, fees or charges that had fallen due one year prior to the Transfer Date, (ii) any penal interest or charges payable under the Financing Agreements to any Senior Lender, and (iii) any pre-payment charges in relation to accelerated repayment of debt except where such charges have arisen due to Authority Default; and

(c) any Subordinated Debt which is included in the Financial Package and disbursed by lenders for financing the Total Project Cost;

provided that if all or any part of the Debt Due is convertible into Equity at the option of Senior Lenders and/or the Concessionaire, it shall for the purposes of this Agreement be deemed to be Debt Due even after such conversion and the principal thereof shall be dealt with as if such conversion had not been undertaken;

"Debt Service" means the sum of all payments on account of principal, interest, financing fees and charges due and payable in an Accounting Year to the Senior Lenders for and in respect of Debt Due under the Financing Agreements;

"Development Period" means the period from the date of this Agreement until the Appointed Date;

"Dispute" shall have the meaning as set forth in Clause 38.1.1;

"Dispute Resolution Procedure" means the procedure for resolution of Disputes as set forth in Article 38;

"Divestment Requirements" means the obligations of the Concessionaire for and in respect of Termination as set forth in Clause 32.1;

"Document" or "Documentation" means documentation in printed or written form, or in tapes, discs, drawings, computer programmers, writings, reports, photographs, films, cassettes, or expressed in any other written, electronic, audio or visual form;

"Drawings" means all of the drawings, calculations and documents pertaining to the Project as set forth in Schedule-H, and shall include 'as built' drawings of the Project;

"EPC Contract" means the engineering, procurement and construction contract or contracts entered into by the Concessionaire with one or more Contractors for, inter alia, engineering and construction of the Project in accordance with the provisions of this Agreement;

"EPC Contractor" means the person with whom the Concessionaire has entered into an EPC Contract;

"Emergency" means a condition or situation that is likely to endanger the security of the individuals on or about the Project, including Users thereof, or which poses an immediate threat of material damage to any of the Project Assets;

"Encumbrances" means, in relation to the Project, any encumbrances such as mortgage, charge, pledge, lien, hypothecation, security interest, assignment, privilege or priority of any kind having the effect of security or other such obligations, and shall include any designation of loss payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Project, where applicable herein but excluding utilities referred to in Clause 11.1;

"Equity" means the sum expressed in Indian Rupees representing the paid up equity share capital of the Concessionaire for meeting the equity component of the Total Project Cost, and for the purposes of this Agreement shall include convertible instruments or other similar forms of capital, which shall compulsorily convert into equity share capital of the Company, and any interest-free funds advanced by any shareholder of the Company for meeting such equity component;

"Escrow Account" means an Account which the Concessionaire shall open and maintain with a Bank in which all inflows and outflows of cash on account of capital and revenue receipts and expenditures shall be credited and debited, as the case may be, in accordance with the provisions of this Agreement, and includes the Sub-Accounts of such Escrow Account;

"Escrow Agreement" shall have the meaning as set forth in Clause 25.1.2;

"Escrow Bank" shall have the meaning as set forth in Clause 25.1.1;

"Escrow Default" shall have the meaning as set forth in Schedule-O;

"Estimated Project Cost" shall be the cost estimated by the Authority for development of the Project and provided in the Request for Proposal Volume –I – Instructions to Bidders.

"**Financial Close**" means the fulfillment of all conditions precedent to the initial availability of funds under the Financing Agreements which shall be communicated by the Lender's Representative to the Authority in writing. Such communication from Lender's Representative shall be treated as date on which the Financial Close is achieved;

"Financial Default" shall have the meaning as set forth in Schedule-R;

"Financial Model" means the financial model adopted by Senior Lenders, setting forth the capital and operating costs of the Project and revenues therefrom on the basis of which financial viability of the Project has been determined by the Senior Lenders, and includes a description of the assumptions and parameters used for making calculations and projections therein;

"Financial Package" means the financing package indicating the total capital cost of the Project and the means of financing thereof, as set forth in the Financial Model and approved by the Senior Lenders, and includes Equity, all financial assistance specified in the Financing Agreements and Subordinated Debt, if any;

"Financing Agreements" means the agreements executed by the Concessionaire in respect of financial assistance to be provided by the Senior Lenders by way of loans, guarantees, subscription to non-convertible debentures and other debt instruments including loan agreements, guarantees, notes, debentures, bonds and other debt instruments, security agreements, and other documents relating to the financing (including refinancing) of the Total Project Cost, and includes amendments or modifications made in accordance with Clause 5.2.3;

"Force Majeure" or "Force Majeure Event" shall have the meaning ascribed to it in Clause 28.1;

"GOI" means the Government of India;

"Good Industry Practice" means the practices, methods, techniques, designs, standards, skills, diligence, efficiency, reliability and prudence which are generally and reasonably expected from a reasonably skilled and experienced operator engaged in the same type of undertaking as envisaged under this Agreement and which would be expected to result in the performance of its obligations by the Concessionaire in accordance with this Agreement, Applicable Laws and Applicable Permits in reliable, safe, economical and efficient manner and for providing safe, economical, reliable and efficient use of the Project;

"Government" means the Government of the India;

"Government Instrumentality" means any department, division or sub-division of the Government or the State Government and includes any commission, board, authority, agency or municipal and other local authority or statutory body, including Panchayat, under the control of the Government or the State Government, as the case may be, and having jurisdiction over all or any part of the Project or the performance of all or any of the services or obligations of the Concessionaire under or pursuant to this Agreement;

"Indemnified Party" means the Party entitled to the benefit of an indemnity pursuant to Article 36;

"Indemnifying Party" means the Party obligated to indemnify the other Party pursuant to Article 36;

"Independent Engineer" shall have the meaning as set forth in Clause 21.1;

"Indirect Political Event" shall have the meaning as set forth in Clause 28.3;

"Insurance Cover" means the aggregate of the maximum sums insured under the insurances taken out by the Concessionaire pursuant to Article 26, and includes all insurances required to be taken out by the Concessionaire under Clause 26.2 but not actually taken, and when used in the context of any act or event, it shall mean the aggregate of the maximum sums insured and payable or deemed to be insured and payable in relation to such act or event;

"Intellectual Property" means all patents, trademarks, service marks, logos, get-up, trade names, internet domain names, rights in designs, blue prints, programs and manuals, drawings, copyright (including rights in computer software), database rights, semi-conductor, topography rights, utility models, rights in know-how and other intellectual property rights, in each case whether registered or unregistered and including applications for registration, and all rights or forms of protection having equivalent or similar effect anywhere in the world;

"LOA" or "Letter of Award" means the letter of award referred to in Recital(D);

"Lead Member" Deleted

"Lenders' Representative" means the person duly authorized by the Senior Lenders to act for and on behalf of the Senior Lenders with regard to matters arising out of or in relation to this Agreement, and includes his successors, assigns and substitutes;

"Licensed Premises" shall have the meaning as set forth in Clause 10.2.2;

"MoRTH" means the Ministry of Road Transport and Highways or any substitute thereof dealing with highways;

"Maintenance Manual" shall have the meaning as set forth in Clause 17.3.1;

"Maintenance Program" shall have the meaning as set forth in Clause 17.4.1;

"Maintenance Requirements" shall have the meaning as set forth in Clause 17.2;

"Material Adverse Effect" means a material adverse effect of any act or event on the ability of either Party to perform any of its obligations under and in accordance with the provisions of this Agreement and which act or event causes a material financial burden or loss to either Party;

"Nominated Company" means a company selected by the Lenders' Representative and proposed to the Authority for substituting the Concessionaire in accordance with the provisions of the Substitution Agreement;

"Non-Political Event" shall have the meaning as set forth in Clause 28.2;

"O&M" means the operation and maintenance of the Project and includes all matters connected with or incidental to such operation and maintenance, and provision of services and facilities, in accordance with the provisions of this Agreement;

"O&M Contract" means the operation and maintenance contract that may be entered into between the Concessionaire and the O&M Contractor for performance of all or any of the O&M obligations;

"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M Contract for discharging O&M obligations for and on behalf of the Concessionaire;

"O&M Expenses" means expenses incurred by or on behalf of the Concessionaire or by the Authority, as the case may be, for all O&M including (a) cost of salaries and other compensation to employees, (b) cost of materials, supplies, utilities and other services, (c) premier for insurance, (d) all taxes, duties, cess and fees due and payable for O&M, (e) all repair, replacement, reconstruction, reinstatement, improvement and maintenance costs, (f) payments required to be made under the O&M Contract or any other contract in connection with or incidental to O&M, and (g) all other expenditure required to be incurred under Applicable Laws, Applicable Permits or this Agreement;

"O&M Inspection Report" shall have the meaning as set forth in Clause 19.2;

"O&M Payments" shall have the meaning as set forth in Clause 23.7.1;

"Operation Period" means the operation and maintenance period of 15 (fifteen) years commencing from COD and ending on the Transfer Date;

"**Parties"** means the parties to this Agreement collectively and "Party" shall mean any of the parties to this Agreement individually;

"**Payment Milestone"** shall have the meaning as set forth in Clause 23.4;

"Performance Guarantee" shall have the meaning as set forth in Clause 33.2.3;

"Performance Security" shall have the meaning as set forth in Clause 9.1.1;

"Additional Performance Security" shall have the meaning as set forth in Clause 9.7;

"Physical Progress" shall mean the physical construction of the Project completed by the Concessionaire and shall be measured as per the assessment done by the Independent Engineer in accordance with Clause 23.4 of this Agreement.

"Political Event" shall have the meaning as set forth in Clause 28.4;

"Price Index" shall comprise:

(a) 70% (seventy per cent) of WPI; and

(b) 30% (thirty per cent) of CPI (IW),

Which constituents may be substituted by such alternative index or indices as the Parties may by mutual consent determine;

"Price Index Multiple" shall have the meaning set forth in 23.2.3;

"Project" means the construction, operation and maintenance of the Project in accordance with the provisions of this Agreement, and includes all works, services and equipment relating to or in respect of the Scope of the Project in Site comprising the 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) and all Project Assets, and its subsequent development and augmentation in accordance with this Agreement;

"Project Agreements" means this Agreement, the Financing Agreements, EPC Contract, O&M Contract, and any other material agreements or contracts that may be entered into by the Concessionaire with any person in connection with matters relating to, arising out of or incidental to the Project, but does not include the Escrow Agreement, Substitution Agreement, or any agreement for procurement of goods and services involving a consideration of up to Rs.25 crore (twenty five crore);

"Project Assets" means all physical and other assets relating to and forming part of the Site including (a) rights over the Site in the form of license, Right of Way or otherwise; (b) tangible assets such as civil works and equipment including foundations, [embankments, pavements, road surface, interchanges, bridges, culverts, road over bridges, drainage works, traffic signals, sign boards, kilometer-stones, toll plaza(s), electrical systems, communication systems, rest areas, relief centers, maintenance depots and administrative offices]; (c) Project Facilities situated on the Site; (d) all rights of the Concessionaire under the Project Agreements; (e) financial assets, such as receivables, security deposits etc.; (f) insurance proceeds; and (g) Applicable Permits and authorizations relating to or in respect of the Project;

"Project Completion Schedule" means the progressive Project Milestones set forth in Schedule-G for completion of the Project on or before the Scheduled Completion Date;

"Project Facilities" means all the amenities and facilities situated on the Site, as described in Schedule-C;

"Project Highway" means the Site comprising 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) and all Project Assets, and its subsequent development and augmentation in accordance with this Agreement;

"Project Milestones" means the project milestones as set forth in Schedule-G;

"Provisional Certificate" shall have the meaning as set forth in Clause 14.3;

"Punch List" shall have the meaning ascribed to it in Clause 14.3.1 and, if applicable, shall only include any or all of the below:

(i) plantation of avenue trees along the edge of the RoW and other landscaping works within RoW
(ii) completion of work on Provision of Unlined Roadside Drains
(iii) lining of roadside drains in identified stretches
(iv) construction of rest areas, as approved
(v) completion of Fencing Works of RoW
(vi) turfing on embankment slopes in identified sections
(vii) pointing to Stone Masonry works in identified Cross Drainage Structures
(viii) stone Pitching at identified locations

"RBI" means the Reserve Bank of India, as constituted and existing under the Reserve Bank of India Act, 1934, including any statutory modification or replacement thereof, and its successors;

"Re.", "Rs." or "Rupees" or "Indian Rupees" means the lawful currency of the Republic of India;

"Reference Exchange Rate" means, in respect of any one currency that is to be converted into another currency in accordance with the provisions of this Agreement, the exchange rate as of 12.00 (twelve) noon on the relevant date quoted in Delhi by the State Bank of India, and in the absence of such rate, the average of similar rates quoted in Delhi by the Bank of India and the Bank of Baroda;

"Reference Index Date" means, in respect of the specified date or month, as the case may be, that last day of the preceding month with reference to which the Price Index or any constituent thereof is revised and in the event such revision has not been notified, the last such Price Index or any constituent thereof shall be adopted provisionally and used until the Price Index or such constituent thereof is revised and notified;

"Request for Proposals" or "RFP" shall have the meaning as set forth in Recital (B);

"Right of Way" means the constructive possession of the Site, together with all way leaves, easements, unrestricted access and other rights of way, howsoever described, necessary for construction, operation and maintenance of the Project in accordance with this Agreement;

"Safety Consultant" shall have the meaning as set forth in Clause 18.1.2;

"Safety Requirements" shall have the meaning as set forth in Clause 18.1.1;

"Scheduled Completion Date" shall have the meaning as set forth in Clause 12.3.1;

"Scope of the Project" shall have the meaning as set forth in Clause 2.1;

"Senior Lenders" means the financial institutions, banks, multilateral lending agencies, trusts, funds and agents or trustees of debenture holders, including their successors and assignees, who have agreed to guarantee or provide finance to the Concessionaire under any of the Financing Agreements for meeting all or any part of the Total Project Cost and who hold pari passu charge on the assets, rights, title and interests of the Concessionaire;

"Site" shall have the meaning as set forth in Clause 10.1;

"**Specifications and Standards"** means the specifications and standards relating to the quality, quantity, capacity and other requirements for the Project, as set forth in Schedule-D, and any modifications thereof, or additions thereto, as included in the design and engineering for the Project submitted by the Concessionaire to, and expressly approved by, the Authority;

"State" means the State of Punjab, as the case may be, and "**State Government**" means the government of that State;

"Statutory Auditors" means a reputable firm of chartered accountants acting as the statutory auditors of the Concessionaire under the provisions of the Companies Act, 2013, including any re-enactment or amendment thereof, for the time being in force, and appointed in accordance with Clause 27.2.1;

"Subordinated Debt" means the aggregate of the following sums expressed in Indian Rupees or in the currency of debt, as the case may be, outstanding as on the Transfer Date;

(a) the principal amount of debt provided by lenders or the Concessionaire's shareholders for meeting the Total Project Cost and subordinated to the financial assistance provided by the Senior Lenders; and

(b) all accrued interest on the debt referred to in Sub-clause (a) above but restricted to the lesser of actual interest rate and a rate equal to 5% (five per cent) above the Bank Rate in case of loans expressed in Indian Rupees and lesser of the actual interest rate and 6 (six) month LIBOR (London Inter-Bank Offer Rate) plus 2% (two per cent) in case of loans expressed in foreign currency, but does not include any interest that had fallen due 1 (one) year prior to the Transfer Date;

provided that if all or any part of the Subordinated Debt is convertible into Equity at the option of the lenders and/or the Concessionaire's shareholders, it shall for the purposes of this Agreement be deemed to be Subordinated Debt even after such conversion and the principal thereof shall be dealt with as if such conversion had not been undertaken;

"Substitution Agreement" shall have the meaning as set forth in Clause 34.3.1;

"Suspension" shall have the meaning as set forth in Clause 30.1;

"Taxes" means any Indian taxes including GST, excise duties, customs duties, value added tax, sales tax, local taxes, cess and any impost or surcharge of like nature (whether Central, State or local) on the goods, materials, equipment and services incorporated in and forming part of the Project charged, levied or imposed by any Government Instrumentality, but excluding any interest, penalties and other sums in relation thereto imposed on any account whatsoever. For the avoidance of doubt, Taxes shall not include taxes on corporate income;

"Termination" means the expiry or termination of this Agreement and the Concession hereunder;

"Termination Notice" means the communication issued in accordance with this Agreement by one Party to the other Party terminating this Agreement;

"Termination Payment" means the amount payable by the Authority to the Concessionaire, under and in accordance with the provisions of this Agreement, upon Termination;

"Tests" means the tests set forth in Schedule-I to determine the completion of the Project in accordance with the provisions of this Agreement;

"Total Project Cost" means 60 % (sixty percent) of the Bid Project Cost specified in Clause 23.1;

provided that in the event WPI increases, on an average, by more than 3% (three per cent) per annum for the period between the Bid Date and COD, the amount hereinbefore specified shall be increased such that the effect of increase in WPI, in excess of such 3% (three per cent), is reflected in the Total Project Cost;

provided further that in the event of Termination, the Total Project Cost shall be deemed to be modified to the extent of variation in WPI or Reference Exchange Rate occurring in respect of Debt Due, as the case may be, in accordance with the provisions of this Agreement;

Provided also that the Total Project Cost shall not exceed 60% of the actual capital expenditure on the Project and capitalized in the books of accounts of the Concessionaire as certified by the Statutory Auditor;

"Transfer Date" means the date on which this Agreement and the Concession hereunder expires pursuant to the provisions of this Agreement or is terminated by a Termination Notice;

"User" means a person who uses or intends to use the Project or any part thereof in accordance with the provisions of this Agreement and Applicable Laws;

"Vesting Certificate" shall have the meaning as set forth in Clause 32.4; and

"WPI" means the Wholesale Price Index for all commodities as published by the Ministry of Industry, GOI and shall include any index which substitutes the WPI, and any reference to WPI shall, unless the context otherwise requires, be construed as a reference to the latest monthly WPI published no later than 30 (thirty) days prior to the date of consideration hereunder.

IN WITNESS WHEREOF THE PARTIES HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DAY, MONTH AND YEAR FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED For and on behalf of THE AUTHORITY by:

वी. के. जोशी / V. K. Joshi
महाप्रबंधक(तक.) / GM(Tech)
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
National Highways Authority of India
(सड़क परिवहन और राजमार्ग मंत्रालय)
(Ministry of Road Transport & Highways)
जी-5 एवं 6,सैक्टर-10,द्वारका,नई दिल्ली-75
G-5 & 6, Sector - 10,Dwarka, New Delhi - 75

(V. K. Joshi)
General Manager (T)
National Highways Authority of India
G-5 & 6, Sector 10, Dwarka, New Delhi-110075
Email: vkjoshi@nhai.org

SIGNED, SEALED AND DELIVERED For and on behalf of Ambala Kala Amb Highway Private Limited by:

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

(Ishwar Singh)
Authorized Signatory
Ambala Kala Amb Highway Private Limited
SCO No. 327-328, Sector-20 Market, HUDA, Kaithal, Kaithal, Haryana, India, 136027
Email: diplambalakalaamb@gmail.com

In the presence of:

1. Manoj Kumar
Member Project,NHAI

2.

1. CHANDER MOHAN

2. KULDEEP

इसके साक्ष्यस्वरूप दोनों पक्षों ने इस करार को पहले ऊपर लिखी तिथि, माह और वर्ष को निष्पादित किया और सौंप दिया।

हस्ताक्षर किए मुहरबंद किया और सौंप दिया।
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण के लिए और उसकी ओर से द्वारा :

वी. के. जोशी / V. K. Joshi
महाप्रबंधक(तक.) / GM(Tech)
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
National Highways Authority of India
(सड़क परिवहन और राजमार्ग मंत्रालय)
(Ministry of Road Transport & Highways)
जी-5 एवं 6,सैक्टर-10,द्वारका,नई दिल्ली-75
G - 5 & 6, Sector - 10,Dwarka, New Delhi - 75

(वी के जोशी)
महाप्रबंधक (तक)
भाराराप्रा,जी-5 एवं 6 सैक्टर-10,
द्वारका, नई दिल्ली-110075
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अंबाला कला अंब हाईवे प्राइवेट लिमिटेड के लिए और उसकी ओर से हस्ताक्षरित, मुहरबंद और वितरित:

Ambala Kala Amb Highway Pvt. Ltd.
AKHPL
Kaithal

(ईश्वर सिंह)
अधिकृत हस्ताक्षरकर्ता
मैसर्स अंबाला कला अम्ब हाईवे प्राइवेट लिमिटेड ए-898, एससीओ नंबर 327-328, सेक्टर-20 मार्केट, हुडा, कैथल, कैथल, हरियाणा-136027 भारत
Email: diplambalakalaamb@gmail.com

निम्नलिखित की उपस्थिति में:

1. Manoj Kumar
Member Project,NHAI

2.

निम्नलिखित की उपस्थिति में:

1. CHANDER MOHAN

2. KULDEEP

Schedules

SCHEDULE – A

(See Clause 2.1 and 8.1)

SITE OF THE PROJECT

1. The Site

1.1 Site of the Project Highway shall include the land, buildings, structures and road works as described in Annex-I of this Schedule-A.

1.2 An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Concessionaire, and such inventory shall form part of the memorandum referred to in Clause 10.3.1 of the Agreement.

1.3 Additional land required for Toll Plazas, Traffic Aid Posts, Medical Aid Posts and vehicle rescue posts or for construction of works specified in the Change of Scope Order issued under Clause 16.2.3 of this Agreement shall be acquired in accordance with the provisions of Clause 10.3.6 of this Agreement. Upon acquisition, such land shall form part of the Site and vest in the Authority.

Annex - I

(Schedule-A)

SITE FOR THE PROJECT

1. The Site

1.1 Project Highway

The Site of the project highway is Ambala – Kala Amb road section in the state of Punjab and Haryana. The Project Road starts from Ch (-0.800) Khelan Village (Km 13+700 of Ambala Ring Road) and ends at Haryana/H.P. border (At T Junction of Panchkula-Naraingarh-Dehradun Road (NH-07) and Kala- Amb Sadhaura road (SH-04) at Ch 33.015. Total length of project road is 33.815 km.

The distribution of alignment among the states is as given below:

Start	End	District/UT/State
-0.800	3.200	Mohali/Punjab(Greenfield)
3.200	25.800	Ambala/Haryana(Greenfield)
25.800 (*38+680)	33.015 (*45+860)	Ambala/ Haryana (Brown field)

* Existing chainage on Ambala Kala Amb road on NH-72

1.2 Alignment

The project highway is majorly Greenfield alignment and the Project Road starts from Ch (-0.800) Khelan Village (Km 13+700 of Ring Road) and ends at Haryana/H.P. border (At T Junction of Panchkula-Naraingarh-Dehradun Road (NH-07) and Kala-Amb Sadhaura road (SH-04) at Ch 33.015. Latitude and longitude of the project corridor lies between Latitude- 683881.633 m E, Longitude- 3362227.934 m and Latitude- 712174.012 m E, Longitude- 3376014.002 m N. The Proposed centre line coordinates are given in Appendix-II and the alignment plan and profile is given in Annexure- III of this schedule.
Key map of the Project Highway is given at Appendix-I.

2. Land

The Site of the Project Highway comprises the land described below:

From (km) Design Chainage	To (km) Design Chainage	Length (km)	Existing ROW (m)	District
-0.800	3.200	4.000	-	Mohali
3.200	25.800	22.600	-	Ambala
25+800	26+000	0.200	32.19	Ambala
26+000	26+500	0.500	28.50	Ambala
26+500	27+000	0.500	30.47	Ambala
27+000	27+500	0.500	26.47	Ambala
27+500	28+000	0.500	32.23	Ambala
28+000	28+500	0.500	29.86	Ambala

From (km) Design Chainage	To (km) Design Chainage	Length (km)	Existing ROW (m)	District
28+500	29+000	0.500	31.57	Ambala
29+000	29+500	0.500	31.60	Ambala
29+500	30+000	0.500	27.03	Ambala
30+000	30+500	0.500	30.87	Ambala
30+500	31+000	0.500	30.24	Ambala
31+000	31+500	0.500	28.05	Ambala
31+500	32+000	0.500	30.70	Ambala
32+000	32+500	0.500	34.12	Ambala
32+500	33+015	0.515	30.35	Ambala

3. Carriageway

The details of existing carriageway is as below:

Start	End	Length (km)	Existing Road Details					Remarks
Design. Ch. (km)	Design. Ch. (km)		Type	Config uration	Median Width (m)	CW width (m)	Earthen Shoulder (m)	
25+800	33+015	7.215	Flexible Pavement	2-Lane + PS	-	9.00	2.0	-

4. Service Road

The detail of Service Road is as below:

S. No.	Design Chainage		Width (m)	Length (Km)	Sides	Remarks
	From	To				
Nil						

5. Major Bridges

The Site includes the following Major Bridges:

S. No.	Existing Chainage (Km)	Design Chainage (Km)	Type of Structure			No. of Spans with span length (m)	Width (m)
			Foundation	Substructure	Super structure		
On NH 72							
1	39+920	27.050	Brick Masonry	Brick Masonry	RCC	8X15=120	8.5

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6. Road over-bridges (ROB)/ Road under-bridges (RUB)

The Site includes the following ROB (road over railway line)/RUB (road under railway line):

S. No.	Chainage (km)	Type of Structure		No. of Spans with span length (m)	Width (m)	ROB/ RUB
		Foundation	Superstructure			
NIL						

7. Grade separators

The Site includes the following grade separators:

S. No.	Chainage (km)	Type of Structure		No. of Spans with span length (m)	Width (m)
		Foundation	Superstructure		
Nil					

8. Minor bridges

The Site includes the following minor bridges:

S. No.	Existing chainage (Km)	Design Chainage (Km)	Type of structure			No. of Spans x length (m)	Overall Width (m)
			Type of Foundation	Sub Structure	Super Structure		
On NH 72							
1	43+950	31.100	Brick Masonry	Brick Masonry	RCC	2x3.2	14
2	44+750	31.900	Brick Masonry	Brick Masonry	RCC	2x3.2	12.5
3	45+040	32.190	Brick Masonry	Brick Masonry	RCC	1x14.4	12.5

9. Railway Level Crossings

The site includes the following railway level crossing:

S.No.	Location (Km.)	Remark
NIL		

10. Underpasses (vehicular, non-vehicular)

The Site includes the following underpasses:

S. No.	Chainage (km)	Type of Structure	No. of Spans with span length (m)	Width (m)
NIL				

11. Culverts

The Site includes the following Culverts:

Sr. No.	Existing Chainage (Km)	Design Chainage (km)	Existing		
			Existing Structure	Total width (m)	Span Arrangement Size (m)
1	40+420	27.575	HPC	10.00	1x0.9m
2	41+810	28.985	Slab Culvert	12.00	1x1.5m
3	41+910	29.055	Slab Culvert	12.00	1x1.5m
4	42+070	29.220	HPC	10.00	1x0.9m
5	42+350	29.500	Slab Culvert	10.00	1x0.6m
6	45+190	32.340	Slab Culvert	12.00	1x1.5m

12. Bus Bays/ Shelters

The stretch has the following Bus bays/ Bus Shelters:

S. No.	Design Chainage (km)	Bus Stop Name	Side	Remarks
NIL				

13. Truck Lay byes

The stretch has the following Truck lay byes:

S. No.	Design Chainage (km)	Length (m)	Left Hand Side	Right Hand Side
NIL				

14. Road Side Drains

The Road Side Drains along the Project Highway is as follows:

S.No.	Design Chainage (km)		Type			
	From	To	Masonry/CC (Pucca)		Earthen (Kutcha)	
			LHS	RHS	LHS	RHS
NIL						

15. Major Junctions

The details of major junctions are as follows:

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Type T / Y / X	Direction	At Grade/ Grade Separated	Category of Side road
1	45+860	33.015	T	Project road ends at chainage Km 33.015 (At T Junction of Ambala Kala Amb-Nahan-Dehradun Road (NH-07) and Kala- Amb Bilaspur road (SH-04)	At Grade	SH

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Note: (NH: National Highway, SH: State Highway, MDR: Major District Road)

16. Minor Junctions

The details of the minor junctions are as follows:

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Type	Direction		Width of Road(m)
			T / Y / X	Towards left	Towards right	
1	40+270	27.420	Y	Village Road	-	5.50
2	41+020	28.170	T	-	Galouri	5.00
3	41+900	29.050	T	Mianpur	-	6.00
4	41.965	29.120	T	-	Hamidpur	5.00
5	42+180	29.330	T	-	Hamidpur	6.00
6	43+580	30.730	X	Village Road	Village Road	5.50
7	44+335	31.485	X	Dera	Connect to SH-04	LHS-5.50 & RHS-5.50
8	45+000	32.150	T	Kala Amb	-	5.00
9	45+460	32.620	X	Kala Amb	Kala Amb	LHS- 5.0 & RHS- 5.50

17. Toll Plaza

Nil

18. Existing Median Width

The details of existing median width is given below:

S. No.	Design Chainage		Width (m)	Remarks
	From	To		
NIL				

19. Bypasses

The details of existing bypasses are given below:

S.No	Name of Bypass (town)	Chainage		Length
		From	To	
NIL				

20. Other Structures

Following are the details of existing median drainage structure:

Sr. No.	Chainage (Km)	Structure Type	Openings/ Spans X Length (m)	Width (m)
NIL				

21. Total number of structures

The total number of structures at Site is noted below:

(a)	No. of Major Bridges	01
(b)	No. of Railway Over Bridges	NIL
(c)	No. of Grade Separators	NIL
(d)	No. of Minor Bridges	03
(e)	No. of Vehicular and Non-Vehicular Underpasses	NIL
(f)	No. of Box Culverts	NIL
(g)	No. of Pipe Culverts	02
(h)	No. of Arch Culverts	NIL
(i)	No. of Slab Culverts	04

22. Wayside Amenities: Nil

23. Referencing System

The details of referencing system are given below:

Sr. No.	Existing Chainage (km)	Design Chainage (km)
1	38+680	25.800
2	38+880	26.000
3	39+080	26.200
4	39+280	26.400
5	39+480	26.600
6	39+675	26.800
7	39+860	27.000
8	40+060	27.200
9	40+250	27.400
10	40+450	27.600
11	40+650	27.800
12	40+850	28.000
13	41+050	28.200
14	41+250	28.400
15	41+450	28.600
16	41+650	28.800
17	41+850	29.000
18	42+050	29.200
19	42+250	29.400
20	42+450	29.600
21	42+650	29.800
22	42+850	30.000
23	43+050	30.200

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Sr. No.	Existing Chainage (km)	Design Chainage (km)
24	43+250	30.400
25	43+450	30.600
26	43+650	30.800
27	43+850	31.000
28	44+050	31.200
29	44+250	31.400
30	44+450	31.600
31	44+650	31.800
32	44+840	32.000
33	45+045	32.200
34	45+245	32.400
35	45+445	32.600
36	45+645	32.800
37	45+860	33.015

24. Existing Utilities

The site includes the existing utilities as described below:-

Details of Existing Utility

(i) Electrical Utilities

(a) High Tension/Low Tension Lines (HT/LT Lines)

S. No.	Chainage		length (In Kms.)			Crossing					Transformer
	From	To	33 kV	11 kV	LT	33 kV	11 kV (Km)	11 kV (No)	LT (Km)	LT No	Number-Capacity
1	-0.815	3+500		0.4	0.3	-	1.2	12	0.8	8	9-10 kVA, 5-25 kVA, 4-63 kVA, 2-100 kVA
2	3+500	8+600		0.4	0.2		2.1	20	0.1	1	6-25KVA, 1-63KVA, 1-100KVA
3	8+600	11+400		0.2	0.15		1.25	9	0.1	1	2-25kVA
4	11+400	12+400		0.2			1.4	14	0.2	1	1-100kVA
5	12+400	16+900		1.98	1.32		1.35	11	1.1	11	1-100kVA, 4-63kVA, 2-25kVA
6	16+900	21+600		0.56	0.48		0.8	8	0.4	4	1-100kVA, 1-63kVA, 1-25kVA
7	21+600	23+000		0.98	0.6		1.6	16	0.75	7	1-100kVA, 2-63kVA, 2-25kVA
8	23+000	33+000		12.15	1.08		7.5	75	2.5	24	13-100kVA, 11-25kVA, 14-25kVA

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(b) Extra High Tension Lines

S.No	Crossing Chainage	Length				Crossing				
						(Km)				No.
		400 KV	220 KV	110 KV	66 KV	400 KV	220 KV	110 KV	66 KV	
1	04+690								0.750	1
2	04+780								0.750	1
3	05+207								0.850	1
4	05+550						0.869		---	1
5	08+390								0.781	1
6	19+000								1.303	1
7	21+400 & 22+200								1.262	2
8	21+650								1.379	1
9	22+850								1.096	1
10	23+060								0.699	1
11	23+570								1.015	1
	Length In Km.						0.869 km		9.885 km	12

(ii) Public Health utilities (Water / Sewage Pipe Lines)

The site includes the following Public Health utilities:-

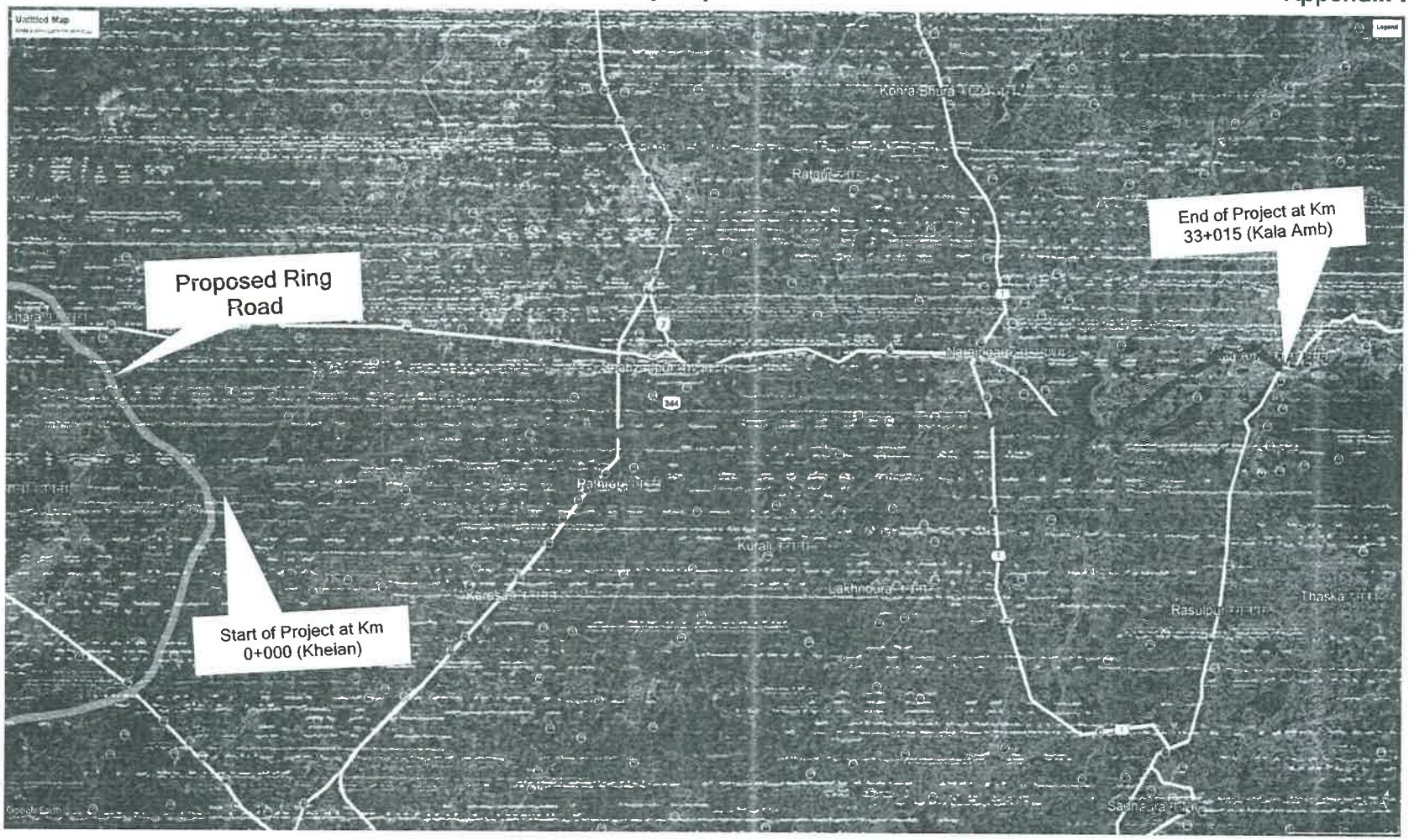
S. No.	Design Chainage (km)		Length (in Km)				Crossings				Remarks
	From	To	Water Supply Line		Sewage line		Water Supply Line		Sewage line		
			With pumping	With Gravity Flow	With pumping	With Gravity Flow	With pumping	With Gravity Flow	With pumping	With Gravity Flow	
1	25.8	33.015	4.635 Km	Nil	Nil	Nil	40 nos	Nil	Nil	Nil	Dia- 100 mm Type- D.I pipe

(iii) Chainage wise affected Well / Tube well /Village Masonry tank

Sr No.	Chainage		Nos of Well / Tube well/Water tank affected	
	From	To	LHS	RHS
01	-0.800	33.015	Village Masonry tank = 23	Village Masonry tank = 18
02	-0.800	33.015	37 nos Tube well on both side are affected	

Key Map

Appendix-I



Appendix-II

COORDINATE SYSTEM- UNIVERSAL TRANSVERSE MERCATOR (UTM)-WGS84
(Zone 43) (As per Design Centre Line)

S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
1	0	683881.633	3362227.934	40	1950	685344.145	3363404.378
2	50	683915.420	3362264.790	41	2000	685392.615	3363416.652
3	100	683949.193	3362301.661	42	2050	685440.986	3363429.307
4	150	683982.965	3362338.531	43	2100	685489.033	3363443.142
5	200	684016.737	3362375.402	44	2150	685536.718	3363458.173
6	250	684050.510	3362412.272	45	2200	685584.014	3363474.392
7	300	684084.282	3362449.142	46	2250	685630.889	3363491.787
8	350	684118.055	3362486.013	47	2300	685677.316	3363510.344
9	400	684151.827	3362522.883	48	2350	685723.554	3363529.372
10	450	684185.599	3362559.754	49	2400	685769.791	3363548.401
11	500	684219.372	3362596.624	50	2450	685816.029	3363567.429
12	550	684253.134	3362633.504	51	2500	685862.267	3363586.458
13	600	684286.304	3362670.915	52	2550	685908.504	3363605.486
14	650	684318.529	3362709.144	53	2600	685954.742	3363624.515
15	700	684349.788	3362748.166	54	2650	686000.979	3363643.544
16	750	684380.109	3362787.923	55	2700	686047.217	3363662.572
17	800	684410.190	3362827.861	56	2750	686093.455	3363681.601
18	850	684440.272	3362867.800	57	2800	686139.692	3363700.629
19	900	684470.353	3362907.739	58	2850	686185.930	3363719.658
20	950	684500.435	3362947.677	59	2900	686232.167	3363738.686
21	1000	684530.516	3362987.616	60	2950	686278.405	3363757.715
22	1050	684560.680	3363027.493	61	3000	686324.643	3363776.743
23	1100	684591.574	3363066.805	62	3050	686370.880	3363795.772
24	1150	684622.641	3363105.982	63	3100	686417.118	3363814.800
25	1200	684654.258	3363144.714	64	3150	686463.355	3363833.829
26	1250	684688.347	3363181.266	65	3200	686509.486	3363853.113
27	1300	684726.342	3363213.723	66	3250	686555.148	3363873.481
28	1350	684768.002	3363241.317	67	3300	686600.287	3363894.984
29	1400	684812.710	3363263.638	68	3350	686644.874	3363917.608
30	1450	684859.729	3363280.579	69	3400	686688.882	3363941.340
31	1500	684907.918	3363293.897	70	3450	686732.282	3363966.164
32	1550	684956.384	3363306.185	71	3500	686775.049	3363992.066
33	1600	685004.854	3363318.460	72	3550	686817.201	3364018.957
34	1650	685053.325	3363330.734	73	3600	686859.220	3364046.057
35	1700	685101.795	3363343.008	74	3650	686901.239	3364073.157
36	1750	685150.265	3363355.282	75	3700	686943.258	3364100.257
37	1800	685198.735	3363367.556	76	3750	686985.277	3364127.357
38	1850	685247.205	3363379.830	77	3800	687027.217	3364154.578
39	1900	685295.675	3363392.104	78	3850	687068.559	3364182.698

S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
79	3900	687109.185	3364211.843	122	6050	688820.417	3365506.953
80	3950	687149.069	3364241.994	123	6100	688861.335	3365535.688
81	4000	687188.308	3364272.982	124	6150	688902.218	3365564.471
82	4050	687227.471	3364304.067	125	6200	688942.693	3365593.828
83	4100	687266.944	3364334.756	126	6250	688983.161	3365623.193
84	4150	687307.167	3364364.454	127	6300	689023.670	3365652.502
85	4200	687348.067	3364393.213	128	6350	689064.741	3365681.016
86	4250	687389.106	3364421.776	129	6400	689106.475	3365708.551
87	4300	687430.144	3364450.339	130	6450	689148.363	3365735.852
88	4350	687471.182	3364478.903	131	6500	689190.252	3365763.154
89	4400	687512.296	3364507.357	132	6550	689232.194	3365790.372
90	4450	687553.630	3364535.490	133	6600	689274.191	3365817.506
91	4500	687594.985	3364563.593	134	6650	689316.188	3365844.639
92	4550	687636.341	3364591.695	135	6700	689358.186	3365871.773
93	4600	687677.696	3364619.798	136	6750	689400.183	3365898.907
94	4650	687719.051	3364647.900	137	6800	689442.180	3365926.040
95	4700	687760.406	3364676.002	138	6850	689484.177	3365953.174
96	4750	687801.762	3364704.105	139	6900	689526.174	3365980.308
97	4800	687843.117	3364732.207	140	6950	689568.171	3366007.442
98	4850	687884.472	3364760.309	141	7000	689610.169	3366034.575
99	4900	687925.827	3364788.412	142	7050	689652.166	3366061.709
100	4950	687967.182	3364816.514	143	7100	689694.163	3366088.843
101	5000	688008.571	3364844.567	144	7150	689736.054	3366116.139
102	5050	688050.064	3364872.465	145	7200	689777.509	3366144.094
103	5100	688091.558	3364900.363	146	7250	689818.491	3366172.736
104	5150	688133.051	3364928.261	147	7300	689858.991	3366202.057
105	5200	688174.543	3364956.162	148	7350	689899.010	3366232.031
106	5250	688215.627	3364984.657	149	7400	689938.881	3366262.202
107	5300	688255.987	3365014.169	150	7450	689978.751	3366292.374
108	5350	688295.596	3365044.681	151	7500	690018.622	3366322.546
109	5400	688334.430	3365076.174	152	7550	690058.493	3366352.718
110	5450	688372.465	3365108.627	153	7600	690098.363	3366382.889
111	5500	688409.676	3365142.022	154	7650	690138.234	3366413.061
112	5550	688446.065	3365176.312	155	7700	690178.105	3366443.233
113	5600	688482.199	3365210.870	156	7750	690217.975	3366473.404
114	5650	688518.334	3365245.429	157	7800	690257.846	3366503.576
115	5700	688554.468	3365279.987	158	7850	690297.717	3366533.748
116	5750	688590.603	3365314.546	159	7900	690337.896	3366563.504
117	5800	688626.909	3365348.923	160	7950	690378.804	3366592.252
118	5850	688664.006	3365382.445	161	8000	690420.418	3366619.968
119	5900	688701.929	3365415.029	162	8050	690462.712	3366646.635
120	5950	688740.654	3365446.655	163	8100	690505.659	3366672.236
121	6000	688780.159	3365477.303	164	8150	690549.232	3366696.756

S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
165	8200	690593.405	3366720.179	208	10350	692595.082	3367386.529
166	8250	690637.819	3366743.143	209	10400	692645.039	3367388.594
167	8300	690682.019	3366766.518	210	10450	692694.997	3367390.659
168	8350	690725.982	3366790.334	211	10500	692744.924	3367393.332
169	8400	690769.803	3366814.411	212	10550	692794.769	3367397.251
170	8450	690813.623	3366838.490	213	10600	692844.500	3367402.415
171	8500	690857.443	3366862.570	214	10650	692894.087	3367408.821
172	8550	690901.279	3366886.620	215	10700	692943.498	3367416.464
173	8600	690945.305	3366910.320	216	10750	692992.741	3367425.128
174	8650	690989.566	3366933.579	217	10800	693041.966	3367433.899
175	8700	691034.057	3366956.394	218	10850	693091.234	3367442.421
176	8750	691078.756	3366978.798	219	10900	693140.585	3367450.451
177	8800	691123.496	3367001.122	220	10950	693190.014	3367457.987
178	8850	691168.236	3367023.445	221	11000	693239.515	3367465.029
179	8900	691212.976	3367045.769	222	11050	693289.080	3367471.612
180	8950	691257.716	3367068.092	223	11100	693338.657	3367478.102
181	9000	691302.456	3367090.416	224	11150	693388.234	3367484.592
182	9050	691347.196	3367112.739	225	11200	693437.811	3367491.083
183	9100	691391.936	3367135.063	226	11250	693487.388	3367497.573
184	9150	691436.676	3367157.386	227	11300	693536.965	3367504.063
185	9200	691481.416	3367179.709	228	11350	693586.512	3367510.774
186	9250	691526.156	3367202.033	229	11400	693635.891	3367518.622
187	9300	691570.871	3367224.406	230	11450	693685.058	3367527.701
188	9350	691615.401	3367247.145	231	11500	693733.983	3367538.006
189	9400	691659.899	3367269.947	232	11550	693782.636	3367549.532
190	9450	691704.988	3367291.544	233	11600	693830.985	3367562.269
191	9500	691751.319	3367310.321	234	11650	693879.039	3367576.081
192	9550	691798.784	3367326.011	235	11700	693927.044	3367590.062
193	9600	691847.178	3367338.547	236	11750	693975.050	3367604.043
194	9650	691896.292	3367347.874	237	11800	694023.055	3367618.025
195	9700	691945.912	3367353.952	238	11850	694071.061	3367632.006
196	9750	691995.800	3367357.261	239	11900	694119.066	3367645.987
197	9800	692045.736	3367359.784	240	11950	694167.072	3367659.968
198	9850	692095.672	3367362.302	241	12000	694215.077	3367673.950
199	9900	692145.609	3367364.820	242	12050	694263.027	3367688.119
200	9950	692195.546	3367367.338	243	12100	694310.644	3367703.366
201	10000	692245.482	3367369.856	244	12150	694357.865	3367719.799
202	10050	692295.419	3367372.374	245	12200	694404.661	3367737.407
203	10100	692345.355	3367374.891	246	12250	694451.002	3367756.179
204	10150	692395.292	3367377.409	247	12300	694496.866	3367776.087
205	10200	692445.228	3367379.927	248	12350	694542.559	3367796.388
206	10250	692495.169	3367382.368	249	12400	694588.253	3367816.689
207	10300	692545.125	3367384.464	250	12450	694633.946	3367836.990

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S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
251	12500	694679.639	3367857.291	294	14650	696588.761	3368835.888
252	12550	694725.332	3367877.592	295	14700	696630.435	3368863.515
253	12600	694771.025	3367897.893	296	14750	696672.109	3368891.143
254	12650	694816.719	3367918.194	297	14800	696713.783	3368918.770
255	12700	694862.412	3367938.495	298	14850	696755.457	3368946.398
256	12750	694908.105	3367958.796	299	14900	696797.131	3368974.025
257	12800	694953.798	3367979.098	300	14950	696838.805	3369001.653
258	12850	694999.491	3367999.399	301	15000	696880.479	3369029.280
259	12900	695045.185	3368019.700	302	15050	696922.153	3369056.907
260	12950	695090.878	3368040.001	303	15100	696963.827	3369084.535
261	13000	695136.571	3368060.302	304	15150	697005.501	3369112.162
262	13050	695182.233	3368080.672	305	15200	697047.175	3369139.790
263	13100	695227.758	3368101.348	306	15250	697088.851	3369167.415
264	13150	695273.151	3368122.311	307	15300	697130.647	3369194.857
265	13200	695318.525	3368143.315	308	15350	697172.567	3369222.109
266	13250	695363.899	3368164.320	309	15400	697214.490	3369249.358
267	13300	695409.273	3368185.325	310	15450	697256.412	3369276.607
268	13350	695454.647	3368206.330	311	15500	697298.335	3369303.856
269	13400	695500.021	3368227.335	312	15550	697340.258	3369331.105
270	13450	695545.395	3368248.340	313	15600	697382.180	3369358.354
271	13500	695590.769	3368269.345	314	15650	697424.103	3369385.603
272	13550	695636.143	3368290.350	315	15700	697466.025	3369412.851
273	13600	695681.517	3368311.355	316	15750	697507.948	3369440.100
274	13650	695726.891	3368332.359	317	15800	697549.870	3369467.349
275	13700	695772.265	3368353.364	318	15850	697591.793	3369494.598
276	13750	695817.639	3368374.369	319	15900	697633.715	3369521.847
277	13800	695863.011	3368395.377	320	15950	697675.638	3369549.096
278	13850	695908.176	3368416.827	321	16000	697717.560	3369576.345
279	13900	695952.977	3368439.026	322	16050	697759.483	3369603.594
280	13950	695997.402	3368461.969	323	16100	697801.405	3369630.843
281	14000	696041.439	3368485.649	324	16150	697843.328	3369658.092
282	14050	696085.074	3368510.059	325	16200	697885.301	3369685.262
283	14100	696128.297	3368535.193	326	16250	697927.461	3369712.142
284	14150	696171.095	3368561.045	327	16300	697969.811	3369738.721
285	14200	696213.456	3368587.606	328	16350	698012.351	3369764.996
286	14250	696255.368	3368614.869	329	16400	698055.008	3369791.080
287	14300	696297.043	3368642.496	330	16450	698097.667	3369817.160
288	14350	696338.717	3368670.124	331	16500	698140.327	3369843.240
289	14400	696380.391	3368697.751	332	16550	698182.986	3369869.321
290	14450	696422.065	3368725.378	333	16600	698225.645	3369895.401
291	14500	696463.739	3368753.006	334	16650	698268.304	3369921.482
292	14550	696505.413	3368780.633	335	16700	698310.964	3369947.562
293	14600	696547.087	3368808.261	336	16750	698353.623	3369973.642

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S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
337	16800	698396.282	3369999.723	380	18950	700312.426	3370954.555
338	16850	698438.941	3370025.803	381	19000	700360.461	3370968.434
339	16900	698481.601	3370051.884	382	19050	700408.638	3370981.813
340	16950	698524.260	3370077.964	383	19100	700456.951	3370994.688
341	17000	698566.919	3370104.044	384	19150	700505.396	3371007.060
342	17050	698609.579	3370130.125	385	19200	700553.967	3371018.927
343	17100	698652.238	3370156.205	386	19250	700602.660	3371030.286
344	17150	698694.897	3370182.285	387	19300	700651.468	3371041.138
345	17200	698737.556	3370208.366	388	19350	700700.386	3371051.482
346	17250	698780.216	3370234.446	389	19400	700749.409	3371061.314
347	17300	698822.875	3370260.527	390	19450	700798.532	3371070.636
348	17350	698865.534	3370286.607	391	19500	700847.750	3371079.446
349	17400	698908.193	3370312.687	392	19550	700897.057	3371087.742
350	17450	698950.853	3370338.768	393	19600	700946.447	3371095.525
351	17500	698993.512	3370364.848	394	19650	700995.916	3371102.792
352	17550	699036.171	3370390.928	395	19700	701045.458	3371109.544
353	17600	699078.831	3370417.009	396	19750	701095.067	3371115.779
354	17650	699121.490	3370443.089	397	19800	701144.739	3371121.497
355	17700	699164.196	3370469.092	398	19850	701194.467	3371126.698
356	17750	699207.191	3370494.615	399	19900	701244.248	3371131.380
357	17800	699250.501	3370519.600	400	19950	701294.074	3371135.544
358	17850	699294.120	3370544.041	401	20000	701343.940	3371139.188
359	17900	699338.041	3370567.934	402	20050	701393.843	3371142.313
360	17950	699382.257	3370591.277	403	20100	701443.774	3371144.917
361	18000	699426.761	3370614.066	404	20150	701493.731	3371147.002
362	18050	699471.547	3370636.296	405	20200	701543.706	3371148.566
363	18100	699516.608	3370657.965	406	20250	701593.695	3371149.609
364	18150	699561.935	3370679.069	407	20300	701643.692	3371150.131
365	18200	699607.523	3370699.605	408	20350	701693.692	3371150.133
366	18250	699653.364	3370719.569	409	20400	701743.689	3371149.614
367	18300	699699.451	3370738.958	410	20450	701793.678	3371148.574
368	18350	699745.777	3370757.770	411	20500	701843.653	3371147.013
369	18400	699792.334	3370776.002	412	20550	701893.610	3371144.932
370	18450	699839.116	3370793.650	413	20600	701943.542	3371142.331
371	18500	699886.114	3370810.712	414	20650	701993.444	3371139.210
372	18550	699933.225	3370827.464	415	20700	702043.311	3371135.569
373	18600	699980.335	3370844.215	416	20750	702093.142	3371131.465
374	18650	700027.446	3370860.966	417	20800	702142.968	3371127.288
375	18700	700074.564	3370877.696	418	20850	702192.793	3371123.110
376	18750	700121.811	3370894.057	419	20900	702242.618	3371118.933
377	18800	700169.226	3370909.926	420	20950	702292.443	3371114.756
378	18850	700216.803	3370925.299	421	21000	702342.268	3371110.578
379	18900	700264.539	3370940.176	422	21050	702392.093	3371106.401

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S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
423	21100	702441.904	3371102.059	466	23250	704461.261	3371562.466
424	21150	702491.606	3371096.620	467	23300	704501.488	3371592.161
425	21200	702541.160	3371089.965	468	23350	704541.715	3371621.855
426	21250	702590.660	3371082.910	469	23400	704581.942	3371651.550
427	21300	702640.160	3371075.856	470	23450	704622.169	3371681.245
428	21350	702689.660	3371068.802	471	23500	704662.397	3371710.939
429	21400	702739.160	3371061.748	472	23550	704702.624	3371740.634
430	21450	702788.663	3371054.721	473	23600	704742.851	3371770.329
431	21500	702838.277	3371048.527	474	23650	704783.078	3371800.023
432	21550	702888.027	3371043.546	475	23700	704823.305	3371829.718
433	21600	702937.884	3371039.780	476	23750	704863.533	3371859.413
434	21650	702987.818	3371037.230	477	23800	704903.760	3371889.107
435	21700	703037.799	3371035.899	478	23850	704943.987	3371918.802
436	21750	703087.798	3371035.788	479	23900	704984.214	3371948.497
437	21800	703137.784	3371036.896	480	23950	705024.598	3371977.977
438	21850	703187.729	3371039.222	481	24000	705065.663	3372006.499
439	21900	703237.602	3371042.766	482	24050	705107.428	3372033.987
440	21950	703287.374	3371047.525	483	24100	705149.867	3372060.422
441	22000	703337.015	3371053.497	484	24150	705192.954	3372085.787
442	22050	703386.495	3371060.677	485	24200	705236.661	3372110.068
443	22100	703435.786	3371069.062	486	24250	705280.961	3372133.249
444	22150	703484.857	3371078.646	487	24300	705325.828	3372155.314
445	22200	703533.680	3371089.425	488	24350	705371.231	3372176.252
446	22250	703582.226	3371101.391	489	24400	705416.992	3372196.401
447	22300	703630.466	3371114.537	490	24450	705462.764	3372216.522
448	22350	703678.370	3371128.856	491	24500	705508.537	3372236.644
449	22400	703725.912	3371144.339	492	24550	705554.389	3372256.582
450	22450	703773.061	3371160.977	493	24600	705600.959	3372274.763
451	22500	703819.791	3371178.759	494	24650	705648.579	3372289.976
452	22550	703866.073	3371197.676	495	24700	705697.077	3372302.108
453	22600	703911.880	3371217.716	496	24750	705746.252	3372311.107
454	22650	703957.184	3371238.868	497	24800	705795.870	3372317.239
455	22700	704001.959	3371261.118	498	24850	705845.613	3372322.310
456	22750	704046.179	3371284.453	499	24900	705895.357	3372327.356
457	22800	704089.816	3371308.859	500	24950	705945.118	3372332.237
458	22850	704132.845	3371334.323	501	25000	705994.912	3372336.777
459	22900	704175.240	3371360.829	502	25050	706044.707	3372341.303
460	22950	704216.976	3371388.360	503	25100	706094.501	3372345.829
461	23000	704258.060	3371416.856	504	25150	706144.296	3372350.355
462	23050	704298.973	3371445.598	505	25200	706194.091	3372354.881
463	23100	704339.887	3371474.339	506	25250	706243.885	3372359.407
464	23150	704380.723	3371503.191	507	25300	706293.680	3372363.933
465	23200	704421.033	3371532.771	508	25350	706343.475	3372368.459

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S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
509	25400	706393.270	3372372.985	552	27550	708237.800	3372927.994
510	25450	706443.063	3372377.530	553	27600	708268.540	3372967.428
511	25500	706492.772	3372382.898	554	27650	708299.280	3373006.863
512	25550	706542.333	3372389.506	555	27700	708330.020	3373046.297
513	25600	706591.712	3372397.352	556	27750	708360.760	3373085.731
514	25650	706640.880	3372406.429	557	27800	708391.500	3373125.165
515	25700	706689.811	3372416.704	558	27850	708422.240	3373164.599
516	25750	706738.663	3372427.358	559	27900	708452.980	3373204.033
517	25800	706787.515	3372438.012	560	27950	708483.720	3373243.468
518	25850	706836.367	3372448.666	561	28000	708514.460	3373282.902
519	25900	706885.219	3372459.320	562	28050	708545.200	3373322.336
520	25950	706934.070	3372469.974	563	28100	708575.940	3373361.770
521	26000	706982.922	3372480.628	564	28150	708606.516	3373401.331
522	26050	707031.774	3372491.282	565	28200	708637.057	3373440.920
523	26100	707080.626	3372501.936	566	28250	708667.598	3373480.508
524	26150	707129.477	3372512.590	567	28300	708698.139	3373520.097
525	26200	707178.329	3372523.243	568	28350	708728.680	3373559.685
526	26250	707227.181	3372533.897	569	28400	708759.221	3373599.274
527	26300	707276.640	3372540.382	570	28450	708789.762	3373638.862
528	26350	707326.046	3372533.724	571	28500	708820.303	3373678.451
529	26400	707372.874	3372516.272	572	28550	708850.844	3373718.039
530	26450	707419.323	3372497.766	573	28600	708881.385	3373757.628
531	26500	707465.772	3372479.260	574	28650	708911.926	3373797.216
532	26550	707512.453	3372461.365	575	28700	708942.467	3373836.805
533	26600	707560.514	3372447.649	576	28750	708973.061	3373876.352
534	26650	707609.704	3372438.799	577	28800	709003.909	3373915.702
535	26700	707659.532	3372434.904	578	28850	709034.756	3373955.052
536	26750	707709.500	3372436.003	579	28900	709065.604	3373994.402
537	26800	707759.108	3372442.085	580	28950	709096.452	3374033.752
538	26850	707807.862	3372453.090	581	29000	709127.299	3374073.102
539	26900	707855.273	3372468.906	582	29050	709158.147	3374112.452
540	26950	707900.891	3372489.331	583	29100	709188.995	3374151.802
541	27000	707945.746	3372511.424	584	29150	709219.843	3374191.152
542	27050	707990.600	3372533.517	585	29200	709250.690	3374230.502
543	27100	708035.454	3372555.610	586	29250	709281.538	3374269.852
544	27150	708079.880	3372578.500	587	29300	709312.386	3374309.202
545	27200	708116.278	3372612.408	588	29350	709343.233	3374348.552
546	27250	708138.521	3372656.902	589	29400	709374.081	3374387.902
547	27300	708144.263	3372706.371	590	29450	709404.929	3374427.251
548	27350	708144.708	3372756.369	591	29500	709435.776	3374466.601
549	27400	708152.311	3372805.548	592	29550	709466.624	3374505.951
550	27450	708176.320	3372849.126	593	29600	709497.472	3374545.301
551	27500	708207.060	3372888.560	594	29650	709528.320	3374584.651

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S. No.	Chainage	X/Easting	Y/Northing	S. No.	Chainage	X/Easting	Y/Northing
595	29700	709559.167	3374624.001	638	31850	711035.657	3376132.810
596	29750	709590.015	3374663.351	639	31900	711084.890	3376141.494
597	29800	709620.863	3374702.701	640	31950	711134.529	3376147.447
598	29850	709651.710	3374742.051	641	32000	711184.420	3376150.649
599	29900	709682.558	3374781.401	642	32050	711234.412	3376151.091
600	29950	709713.406	3374820.751	643	32100	711284.352	3376148.772
601	30000	709744.254	3374860.101	644	32150	711334.102	3376143.823
602	30050	709775.101	3374899.451	645	32200	711383.730	3376137.733
603	30100	709805.949	3374938.801	646	32250	711433.353	3376131.610
604	30150	709836.797	3374978.151	647	32300	711482.977	3376125.487
605	30200	709867.644	3375017.501	648	32350	711532.525	3376118.790
606	30250	709898.492	3375056.851	649	32400	711581.920	3376111.035
607	30300	709929.340	3375096.201	650	32450	711631.294	3376103.146
608	30350	709960.187	3375135.551	651	32500	711680.667	3376095.257
609	30400	709991.035	3375174.901	652	32550	711730.041	3376087.368
610	30450	710021.883	3375214.251	653	32600	711779.415	3376079.479
611	30500	710052.731	3375253.601	654	32650	711828.789	3376071.591
612	30550	710083.578	3375292.951	655	32700	711878.162	3376063.702
613	30600	710114.426	3375332.300	656	32750	711927.536	3376055.813
614	30650	710145.274	3375371.650	657	32800	711976.910	3376047.924
615	30700	710176.121	3375411.000	658	32850	712026.204	3376039.557
616	30750	710206.969	3375450.350	659	32900	712075.473	3376031.039
617	30800	710237.817	3375489.700	660	32950	712124.742	3376022.521
618	30850	710268.677	3375529.040	661	33000	712174.012	3376014.002
619	30900	710300.169	3375567.875				
620	30950	710332.577	3375605.949				
621	31000	710365.213	3375643.829				
622	31050	710397.849	3375681.709				
623	31100	710430.485	3375719.589				
624	31150	710463.121	3375757.469				
625	31200	710495.757	3375795.349				
626	31250	710528.421	3375833.205				
627	31300	710561.967	3375870.275				
628	31350	710597.426	3375905.518				
629	31400	710634.778	3375938.748				
630	31450	710673.907	3375969.866				
631	31500	710714.695	3375998.775				
632	31550	710757.017	3376025.387				
633	31600	710800.744	3376049.622				
634	31650	710845.742	3376071.406				
635	31700	710891.875	3376090.671				
636	31750	710939.001	3376107.359				
637	31800	710986.977	3376121.420				

Annexure– II

(Schedule-A)

Details of Right of Way of Construction Zone

Detail of Proposed right of way is as below:-

S. No.	Design Chainage (km)		Design Length (km)	Proposed ROW (m)	Remarks
	From	To			
1	-0.800	25.800	26.600	60	Green Field
2	25.800	26.200	0.400	45	Open Area
3	26.200	26.900	0.700	30	Forest Area
4	26.900	30.750	3.850	30 to 45	-
5	30.750	33.015	2.265	30	Built Up Area

Annexure– III

(Schedule-A)

Alignment Plans

The existing alignment of the Project Highway shall be modified as per the alignment plan indicated below:

(i) The alignment of the Project Highway is enclosed in alignment plan. Finished road level indicated in the alignment plan shall be followed by the concessionaire as minimum FRL. In any case, the finished road level of the project highway shall not be less than those indicated in the alignment plan. The concessionaire, however may improve/ upgrade the Road profile as indicated in Alignment plan based on site/design requirement.

(ii) The existing alignment of the Project Highway shall be modified as per the Plan & Profile for the Project attached as per **Annexure II** of **Schedule B**.

Annex – IV

(Schedule-A)

Environment Clearances

The following environment clearances have been obtained: **Not Applicable**

SCHEDULE - B

(See Clause 2.1)

DEVELOPMENT OF THE PROJECT HIGHWAY

1. Development of the Project

Development of the Project Highway shall include construction of the project as described in this Schedule B and in Schedule C.

2. Project Highway (4 lane + PS)

- Construction of four lane Ambala-Kala Amb section(design Chainage Km -0.800 to 33.015) starting from Khelan Village (Design Ch -0.800) (Km 13+700 of Ring Road Ambala) and ending at Haryana/H.P. border(Ch. 33.015) (At T Junction of Panchkula-Naraingarh-Dehradun Road (NH-07) and Kala- Amb Sadhaura road (SH-04)) in state of Haryana and Punjab on Hybrid Annuity mode under NHO works as described in Annex-I of **Schedule-B** and in **Schedule-C**.

- The Project Highway shall be designed and constructed in conformity with the Specifications and Standards specified in **Schedule-D**.

Annex – I
(Schedule – B)

DESCRIPTION OF DEVELOPMENT

1. Development of Greenfield and Reconstruction/Upgradation of Existing Highway

Major Part of the Project Highway is Greenfield and Reconstruction/Upgradation of Brownfield part shall follow existing alignment unless otherwise specified by the Authority and shown in the alignment plans specified in Annex-III of Schedule-A. Geometric deficiencies, if any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for [plain/rolling] terrain to the extent land is available.

1.1. Width of Carriageway

a) Main Carriageway: The Paved Carriageway for main carriageway shall be as per the TCS and TCS Schedule as indicated in **Annexure I** of this Schedule B.

b) Loops/Ramps: The Paved Carriageway for loops and ramps at interchanges shall be as indicated in Appendix- II of this Schedule B.

c) Cross road (VUP/LVUP/SVUP): These shall be as indicated in **Annexure I** of this Schedule B.

d) The entire cross-sectional elements shall be accommodated in the available/ proposed ROW. If required, suitable retaining structures shall be provided to accommodate the highway cross section within the available/proposed ROW and the same shall not constitute a Change of Scope.

e) Except as otherwise provided in this Agreement, the width of the paved carriageway and cross-sectional features shall conform to above clauses.
Note:

i. In addition to width of paved carriageway mentioned in clauses above, additional lane/lanes shall be given as acceleration/deceleration lane as per site requirements and taper length required at interchange locations shall be as per Specifications.

ii. In addition to width of paved carriageway mentioned in clause above, at RE wall and Retaining wall locations the width of paved carriageway, edge strip shall be as given in the corresponding TCS.

2. Project Facilities
Project facilities shall be constructed in conformity with Annex-I of Schedule- C.

3. Specifications and Standards
The Project shall be constructed in conformity with the Specifications and Standards specified in Schedule-D.

4. Geometric Design and General Features

i) General

Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the IRC: SP:84-2019.

ii) Design Speed

The design speed of the Project Highway shall be 100 km per hour.

iii) Improvement of the Existing Road Geometrics

The existing geometry of the crossroads at VUP/LVUP/SVUP location shall be improved as specified in this schedule and schedule D.

iv) Right of Way

Details of the Right of Way are given below.

DETAILS OF PROPOSED ROW

S. No.	Design Chainage (km)		Design Length (km)	Proposed ROW (m)
	From	To		
1	-0.800	25.800	26.600	60
2	25.800	26.200	0.400	45
3	26.200	26.900	0.700	30
4	26.900	30.750	3.850	30 to 45
5	30.750	33.015	2.265	30

Note: The Concessionaire shall design the horizontal and vertical geometrics within the PROW as detailed above and in consultation with NHAI and Independent Engineer of the project.

v) Type of Shoulders

Type of Shoulders shall be as per corresponding TCS. The shoulder composition shall be as follows:

a) The compositions and specification of the paved shoulder, edge strip and extra widening shall be as that of the main carriageway.

b) The earthen shoulder shall be provided with 150 mm thick layer of granular material (G S B - I V) for protection against erosion as per para 5.11 of section 5 of IRC: SP: 84-2019.

vi) Lateral and Vertical Clearances at Flyovers/Underpasses/Interchanges

Details of Lateral and Vertical Clearances at Flyovers/Underpasses/Interchanges structures shall be as follows:-

Details of Interchange (Trumpet)

S.No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle (φ)	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
01	0+000 (0.000 to -0.060)	PSC Girder	2X30	0	5.5	2X11.100	2.90	-

Details of Flyover

S.No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle (φ)	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
01	25.740	PSC Girder	2X30	0	5.5	2X11.100	2.90	-

Details of Overpass

S.No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle (φ)	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
NIL								

Details of VUP:

S.No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
1	1.909	RCC GIRDER	1X20	15	5.50	2x11.100	2.90	RCC Box 1x7.0x4.5 is provided for U-Turn on both sides of the approaches at Km 1.809& 2.000
2	5.291	RCC GIRDER	1X20	10	5.50	2x11.100	2.90	RCC Box 1x7.0x4.5 is provided for U-Turn on both sides of the approaches at Km 5.200&5.390
3	12.393	PSC GIRDER	2x30	0	5.50	2x11.100	2.90	RCC Box 1x7.0x4.5 is provided for U-Turn on both sides of the approaches at Km 12.260&12.440

S.No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
4	13.131	PSC GIRDER	1x30	50	5.50	2x11.100	2.90	-
5	15.213	PSC GIRDER	1X30	37	5.50	2x11.100	2.90	-
6	21.730	PSC GIRDER	1X30	20	5.50	2x11.100	2.90	RCC Box 1x7.0x4.5 is provided for U-Turn on both sides of the approches at Km 21.670&21.830
7	23.620	PSC GIRDER	2X30	0	5.50	2x11.100	2.90	Single RCC Box 1x7.0x4.5 is provided on one side of approach road for U-Turn at Km 23.700

 # Clear Span measured in square distance

Details of LVUP:

S.No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
1	3.875	RCC Box	1x12	10	4.50	2x11.100	2.90	-
2	7.000	RCC Box	1x12	62	4.50	2x11.100	2.90	-
3	8.625	RCC Box	1x12	10	4.50	2x11.100	2.90	-
4	10.240	RCC Box	1x12	32	4.50	2x11.100	2.90	-
5	14.500	RCC Box	1x12	17	4.50	2x11.100	2.90	-
6	15.470	RCC Box	1x12	33	4.50	2x11.100	2.90	-
7	16.395	RCC Box	1x12	12	4.50	2x11.100	2.90	-
8	19.950	RCC Box	1x12	32	4.50	2x11.100	2.90	-
9	21.240	RCC Box	1x12	40	4.50	2x11.100	2.90	-
10	22.300	RCC Box	1x12	16	4.50	2x11.100	2.90	-
11	24.720	RCC Box	1x12	32	4.50	2x11.100	2.90	-

 # Clear Span measured in square distance

N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

Details of SVUP:

S. No.	Design chainage (KM)	Type of Structure	Span Arrangement (Nos.xm)	Skew Angle	Vertical Clearance(m)	Deck Configuration (Nos.xm)	Width of Open Median(m)	Remark
1	1.809	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
2	2.000	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
3	5.200	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
4	5.390	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
5	8.815	RCC Box	1x7.0	30	4.5	2x11.100	2.90	-
6	12.260	RCC Box	1x7.0	24	4.5	2x11.100	2.90	-
7	12.440	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
8	21.670	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
9	21.830	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
10	23.700	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-
11	25.810	RCC Box	1x7.0	0	4.5	2x11.100	2.90	-

 # Clear Span measured in square distance

Note:

- *Detailed design of all interchange, Grade separators shall be done in accordance with this Schedule, Manual and MoRT&H type design.*
- *Any other junction not mentioned above but observed during the construction of the project shall be improved as per IRC: SP:84-2019 requirements. The same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.*
- *Approaches to Grade-separated structures shall be of full height RE Wall.*
- *The improvement of cross roads under all grade separated structures shall be design properly to avoid any water logging.*
- *The minimum turning radius at cross road below VUP/LVUP/SVUP shall be ensured as per manual.*
- *Entry & Exit arrangement shall be provided as per Manual.*
- *Provide skew angle as per site requirement and any change in skew angle due to site requirement shall not constitute a change of scope,*
- *The Concessionaire shall take up 'Detailed Engineering study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in Section-3 of IRC: SP: 84-2019. The same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.*
- *Junction improvement under grade separators/ interchanges shall be carried out as per IRC: SP:84-2019 and MoRT&H type design. with proper entry/exit and pavement composition as per IRC: SP:84-2019 and indicated in this Schedule B for not less than 50m on either side on cross road after proposed ROW of Highway*
- *Any other structures falling within acceleration / deceleration lane /taper shall be constructed to the required width. These changes shall not be treated as change of scope.*
- *Wherever liquefaction is observed in Open foundation and Raft Structures, Ground improvement shall be done to compact the soil to increase its penetration resistance and satisfy clause 8.4.4 (v) of IRC114.*
- *Special vehicle loading is to be considered in Design of structures. Since the subject project is 4 lane Highway configuration, therefore, Congestion factor is not to be considered in calculation of live load.*

vii) Service Roads/ Slip Roads

Service/Slip Roads shall be constructed as given below:

Sl. No.	Design Chainage (km)		(RHS)/ (LHS) or (BHS)	Length of Service/Slip Road (Km)	Length of Service/Slip Road (Km)	Carriageway Width* (m)	Remarks
	From	To					
1	Slip Road (TCS 8F & 8G)		Both Sides	2X0.1835	0.367	7.0#	Ramp
2	0.000	0.450	Both Sides	2x0.450	0.900	7.5	Slip Road
3	1.570	1.809	Both Sides	2x0.239	0.478	7.5	Slip Road
4	1.816	1.900	Both Sides	2x0.084	0.168	7.5	Slip Road
5	1.920	2.000	Both Sides	2x0.080	0.160	7.5	Slip Road
6	2.007	2.330	Both Sides	2x0.323	0.646	7.5	Slip Road
7	3.300	3.869	Both Sides	2x0.569	1.138	7.5	Slip Road
8	3.881	4.190	Both Sides	2x0.309	0.618	7.5	Slip Road
9	4.950	5.200	Both Sides	2x0.250	0.500	7.5	Slip Road
10	5.207	5.280	Both Sides	2x0.073	0.146	7.5	Slip Road
11	5.300	5.390	Both Sides	2x0.090	0.180	7.5	Slip Road
12	5.397	5.900	Both Sides	2x0.503	1.006	7.5	Slip Road
13	6.410	6.994	Both Sides	2x0.584	1.168	7.5	Slip Road
14	7.006	7.680	Both Sides	2x0.674	1.348	7.5	Slip Road
15	8.260	8.619	Both Sides	2x0.359	0.718	7.5	Slip Road
16	8.631	8.811	Both Sides	2x0.180	0.360	7.5	Slip Road
17	8.818	8.950	Both Sides	2x0.132	0.264	7.5	Slip Road
18	9.655	10.234	Both Sides	2x0.579	1.158	7.5	Slip Road
19	10.246	10.690	Both Sides	2x0.444	0.888	7.5	Slip Road
20	11.800	12.260	Both Sides	2x0.460	0.920	7.5	Slip Road
21	12.267	12.363	Both Sides	2x0.096	0.192	7.5	Slip Road
22	12.423 to 12.440 & 12.447 to 12.700		Both Sides	2x0.270	0.540	7.5	Slip Road
23	12.700	13.116	Both Sides	2x0.416	0.832	7.5	Slip Road

Sl. No.	Design Chainage (km)		(RHS)/ (LHS) or (BHS)	Length of Service/Slip Road (Km)	Length of Service/Slip Road (Km)	Carriageway Width* (m)	Remarks
	From	To					
24	13.146	13.520	Both Sides	2x0.374	0.748	7.5	Slip Road
25	14.370	14.494	Both Sides	2x0.124	0.248	7.5	Slip Road
26	14.506	15.198	Both Sides	2x0.692	1.384	7.5	Slip Road
27	15.228	15.464	Both Sides	2x0.236	0.472	7.5	Slip Road
28	15.476	15.740	Both Sides	2x0.264	0.528	7.5	Slip Road
29	16.080	16.390	Both Sides	2x0.31	0.620	7.5	Slip Road
30	16.402	16.765	Both Sides	2x0.363	0.726	7.5	Slip Road
31	19.500	19.944	Both Sides	2x0.444	0.888	7.5	Slip Road
32	19.956	20.290	Both Sides	2x0.334	0.668	7.5	Slip Road
33	20.900	21.234	Both Sides	2x0.334	0.668	7.5	Slip Road
34	21.246	21.670	Both Sides	2x0.424	0.848	7.5	Slip Road
35	21.677 to 21.715 & 21+745 to 21.830		Both Sides	2x0.123	0.246	7.5	Slip Road
36	21.837	22.294	Both Sides	2x0.457	0.914	7.5	Slip Road
37	22.306	22.490	Both Sides	2x0.184	0.368	7.5	Slip Road
38	23.160	23.590	Both Sides	2x0.430	0.860	7.5	Slip Road
39	23.650	23.700	Both Sides	2x0.050	0.100	7.5	Slip Road
40	23.707	23.960	Both Sides	2x0.253	0.506	7.5	Slip Road
41	24.400	24.714	Both Sides	2x0.314	0.628	7.5	Slip Road
42	24.726	25.050	Both Sides	2x0.324	0.648	7.5	Slip Road
43	25.400	25.710	Both Sides	2x0.310	0.620	7.5	Slip Road
44	25.770 to 25.810 &25.817 to 26.200		Both Sides	2x0.423	0.846	7.5	Slip Road
45	29.100	29.500	Both Sides	2x0.400	0.800	7.5	Service Road
Total Length			**(2x14.331)+(0.367)**		**29.029**		

* *Carriageway width for service road is including 0.250 m kerb shyness on both side towards Separator along main carriageway and 0.250m kerb shyness towards footpath cum drain*

* *Carriageway width of 7.5 m for slip road is including 0.500 m kerb shyness on side of RE wall along main carriageway. Further, 1 m earthen shoulder has to be provided along with paved*

carriage way of 7.5 m.

 # Carriageway width is 7m as per IRC:84:2019 clause 2.12.2 with 1m earthen shoulder on either side.

Note:

a) *The above lengths are indicative and minimum specified. The actual length of the Service/Slip roads shall be determined by the Concessionaire in accordance with IRC: SP: 84-2019 and actual site requirements with approval from the Independent Engineer. Any change of location of service road/Slip Road specified in this Clause of Schedule-B shall not constitute a Change of Scope. However any increasing in length of service road/Slip Road shall be dealt as per article-16.*

b) *Length of roads given in above table excludes length across the Project Highway for proper connectivity of cross roads on either side of Project Highway as given in the alignment plan enclosed in this Schedule which shall be deemed to be included in the scope of work.*

c) *Entry & exit arrangement with service road/slip road shall be as per IRC-SP-84-2019 and not included in above length and. the same shall not constitute a Change of Scope. The structures falling within this stretch shall also be constructed and the same shall not constitute a Change of Scope. Width of connecting road shall not be less than the width of the existing road subject to minimum width specified in paragraph 2.12.3 of IRC: SP: 84-2019.*

d) *The above lengths are tentative and minimum specified without acceleration / deceleration lane and taper length. Any increase in length due to acceleration / deceleration lane and taper length shall not constitute a Change of Scope. The acceleration / deceleration lane and taper shall be constructed as per Schedule D.*

viii) Grade Separated Structures

I) Grade separated structures shall be provided as per provision of the relevant Manual. The requisite particulars are given below:

S. No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle (φ)	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remark
1	0+000 (0.000 to -0.060)	PSC Girder	2X30	0	5.5	2X11.10	2.90	Trumpet
2	1.809	RCC Slab	1X7	0	4.5	2X11.10	2.90	SVUP
3	1.909	RCC GIRDER	1X20	15	5.5	2X11.10	2.90	VUP
4	2.000	RCC Box	1x7	0	4.5	2X11.10	2.90	SVUP
5	3.875	RCC Slab	1x12	10	4.5	2X11.10	2.90	LVUP
6	5.200	RCC Box	1x7	0	4.5	2X11.10	2.90	SVUP
7	5.291	RCC GIRDER	1X20	10	5.5	2X11.10	2.90	VUP
8	5.390	RCC Box	1x7	0	4.5	2X11.10	2.90	SVUP
9	7.000	RCC Slab	1x12	62	4.5	2X11.10	2.90	LVUP
10	8.625	RCC Slab	1x12	10	4.5	2X11.10	2.90	LVUP
11	8.815	RCC Slab	1x7	30	4.5	2X11.10	2.90	SVUP
12	10.240	RCC Slab	1x12	32	4.5	2X11.10	2.90	LVUP
13	12.260	RCC Box	1x7.0	24	4.5	2X11.10	2.90	SVUP
14	12.393	PSC GIRDER	2X30	0	5.5	2X11.10	2.90	VUP
15	12.440	RCC Box	1x7.0	0	4.5	2X11.10	2.90	SVUP
16	13.131	PSC GIRDER	1X30	50	5.5	2X11.10	2.90	VUP
17	14.500	RCC Slab	1x12	17	4.5	2X11.10	2.90	LVUP
18	15.213	PSC GIRDER	1X30	37	5.5	2X11.10	2.90	VUP
19	15.470	RCC Slab	1x12	33	4.5	2X11.10	2.90	LVUP

S. No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Skew Angle (φ)	Vertical Clearance (m)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remark
20	16.395	RCC Slab	1x12	12	4.5	2X11.10	2.90	LVUP
21	19.950	RCC Slab	1x12	32	4.5	2X11.10	2.90	LVUP
22	21.240	RCC Slab	1x12	40	4.5	2X11.10	2.90	LVUP
23	21.670	RCC Box	1x7.0	0	4.5	2X11.10	2.90	SVUP
24	21.730	PSC GIRDER	1X30	20	5.5	2X11.10	2.90	VUP
25	21.830	RCC Box	1x7.0	0	4.5	2X11.10	2.90	SVUP
26	22.300	RCC Slab	1x12	16	4.5	2X11.10	2.90	LVUP
27	23.620	PSC GIRDER	2X30	0	5.5	2X11.10	2.90	VUP
28	23.700	RCC Box	1x7.0	0	4.5	2X11.10	2.90	SVUP
29	24.720	RCC Slab	1x12	32	4.5	2X11.10	2.90	LVUP
30	25.740	PSC Girder Bridge	2X30	0	5.5	2X11.10	2.90	Fly over
31	25.810	RCC Slab	1x7.0	0	4.5	2X11.10	2.90	SVUP

ii) In the case of grade separated structures, the type of structure and the level of the Project Highway and the crossroads shall be as given above and **Annexure II** of this schedule.

ix) Cattle and Pedestrian Underpass/Overpass

S. No.	Location	Type of Crossing
NIL		

x) Typical Cross Sections

i) The Project Highway shall be constructed to 4 lane configurations + Paved Shoulders with or without Service/Slip Roads with four lane structures. Typical cross sections for different segments of the project highway shall be as per **Annexure-I** of this Schedule.

ii) At toll plaza location, the lane width and no. of lanes shall be as per NHAI policy Circular no. 17.5.82 dated 24.05.2021 for which detail mentioned in Schedule C.

5. Intersections and Grade Separators

All intersections shall be as per Section 3 of the Manual. Existing intersections which are deficient shall be improved to the prescribed standards

Properly designed intersections shall be provided at the locations and of the types and features given in the tables below:

A. At-grade intersections/ Cross road below grade Separator Structure

i) Major Junctions

Major junctions to be improved as per standard designs for intersections.

Sl. No.	Existing Chainage (km)	Design Chainage (km)	Type (T/X/Y)	Surface type	Location	Remarks
1	-	1.909	X	Flexible Pavement	LHS to Utalan and RHS to Pilakhani	VUP
2	-	5.291	X	Flexible Pavement	LHS to Bahloli and RHS to Korwa khurd	VUP
3	-	12.393	X	Flexible Pavement	NH-344	VUP
4	-	13.131	X	Flexible Pavement	Old NH-344	VUP
5	-	15.213	X	Flexible Pavement	LHS to Shazadpur and RHS to Shadaqpur	VUP
6	-	21.730	X	Flexible Pavement	LHS to Panjlasa and RHS to Kurali	VUP
7	-	23.620	X	Flexible Pavement	SH-1	VUP
8	-	25.740	Y	Flexible Pavement	LHS to NH-72	Fly Over
9	-	33.015	T	Flexible Pavement	Project roads ends at Chainage 33.015 and road further leads to Dehradun and RHS side to SH-04	-

ii) Minor Junctions

Minor junctions to be improved as per standard designs for intersections: -

Sl. No.	Design Chainage (Km)	Type(T/X/Y)	Surface Type	Direction		Carriageway Width (m)	Remark
				Towards left	Towards right		
1	3.875	X	Flexible Pavement	Nasdoli	Nagla Nanku	10	LVUP
2	7.000	X	Flexible Pavement	Berpura	Gharoli Narayangarh	10	LVUP
3	8.625	X	Flexible Pavement	Patvi	Gharoli Narayangarh	10	LVUP
4	8.815	X	Flexible Pavement	Berpura	Khurd	10	SVUP
5	10.240	X	Flexible Pavement	Sounti	Khurd	10	LVUP
6	14.480	X	Flexible Pavement	Shazadpur	Kural	10	LVUP
7	15.470	X	Flexible Pavement	Tandwal	Sadaqpur	10	LVUP
8	16.395	X	Flexible Pavement	Banaudi	Sadaqpur	10	LVUP
9	19.950	X	Flexible Pavement	Chajjal Majara	Ramgarh	10	LVUP
10	21.240	X	Flexible Pavement	Panjlasa	Baragaun	10	LVUP
11	22.300	X	Flexible Pavement	Panjlasa	Barhaman Majra	10	LVUP
12	24.720	X	Flexible Pavement	Lautan	Manakpur	10	LVUP
13	25.810	Y	Flexible Pavement	-	Naraingarh	5.5	SVUP
14	27.420	Y	Flexible Pavement	Village Road	-	5.5	-
15	28.170	T	Flexible Pavement	-	Galouri	5.0	-
16	29.050	T	Flexible Pavement	Mianpur	-	5.0	-
17	29.120	T	Flexible Pavement	-	Hamidpur	5.0	-
18	29.330	T	Flexible Pavement	-	Hamidpur	6.0	
19	30.730	X	Flexible Pavement	Village Road	Village Road	5.5	-
20	31.485	X	Flexible Pavement	Dera	Connect to SH-04	LHS-5.50 & RHS-5.50	-
21	32.150	T	Flexible Pavement	Kala Amb	-	5.0	-
22	32.620	X	Flexible Pavement	Kala Amb	Kala Amb	LHS- 5.0 & RHS- 5.50	-

Note:

a) *Detailed design of all intersections/ cross roads below grade separator structure shall be done in accordance with this Schedule, Manual and MoRT&H type design in a length not less than 50m on either side after proposed ROW of Highway.*

b) *Any other junction not mentioned above but observed during the construction of the project shall be improved as per IRC: SP:84-2019 requirements. The same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.*

c) *The Concessionaire shall take up 'Detailed Engineering study' to ascertain further details of all intersections and treatment of the intersections shall be designed in accordance with the latest guidelines mentioned out in section-3 of IRC: SP: 84-2019. The same shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.*

d) *Junction improvement under grade separators/ interchanges shall be carried out as per IRC: SP:84-2019 and MoRTH type design for intersection with proper entry/exit and pavement composition as indicated in this Schedule B. Junction of greenfield alignment with existing road at Km 25+760 below flyover shall be properly designed by providing four lane for existing road and service road and median island to avoid any conflict of traffic.*

e) *Any other structures falling within Service/Slip road and within acceleration / deceleration lane /taper shall be constructed to the required width. These changes shall not be treated as change of scope.*

f) *The cross roads underneath the Flyovers, Underpasses shall be developed with proper geometrics as per manual requirement, layouts given in **Annexure-II** of this Schedule-B and typical layout drawings as per MoRT&H type Design. This shall not be treated as change of Scope.*

6. Road Embankment and Cut Section

(i) Reconstruction/Upgradation of the existing road embankment/ cuttings and construction of new road embankment/ cuttings shall conform to the Specifications and Standards given in Section 4 of the Manual and the specified cross-sectional details. Deficiencies in the plan and profile of the existing road shall be corrected.

(ii) Notwithstanding anything to the contrary contained in this Agreement or IRC: SP: 84-2019, the proposed plan and profile of the project highway as indicated in the Annex-III of Schedule A shall be deemed to be part of this Schedule B and shall be treated as an approximate assessment. Based on site/design requirement specified in Schedule-D, the Concessionaire shall design the alignment plans and profiles of the project highway within the available Right of Way.

(iii) Concessionaire shall Provide Road drainage for embankment protection as per IRC: SP:42-2014.

(iv) Filling of any local depression, dug well, bore well etc. with suitable material and dismantling of village masonry RCC tank will not be considered as change of scope.

(v) Provide Stone pitching/Brick lining/ grass turfing and chute drain as per manual.

(vi) Fly ash Use: - Fly ash if available in the state shall be utilized in Construction as per IRC & Policy guideline of MoRTH/NHAI. The procurement of all the resources requirements for the Construction of the Project shall be the responsibility of the Concessionaire.

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7. Pavement Design

i. Pavement design shall be carried out in accordance with Section 5 of IRC: SP: 84-2019, IRC 37-2018 & IRC 58.

ii. **Type of Pavement**

a) The pavement shall be flexible pavement for the main carriageway and service/slip roads for the entire length of project highway and Rigid pavement at toll plaza.

b) Following minimum thickness shall be provided at Toll Plaza/Toll Booth locations including the tapered section.

Pavement Layer	Pavement Layer Thickness* (mm)
PQC	300
DLC	150
GSB	150
Subgrade	500

**125micron PVC sheet over DLC will be provided as a debonding layer.*

iii. **Design Requirements**

a) Design Period and Strategy

Flexible pavement shall be designed for a minimum design period of 20 years and Rigid pavement shall be designed for a minimum design period of 30 years. Stage construction shall not be permitted.

Pavement design shall be carried out in accordance with Section-5 of the IRC: SP: 84-2019, IRC 37- 2018 for flexible pavement and IRC 58-2015 for Rigid Pavement.

b) Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the IRC: SP: 84-2019, the Concessionaire shall design the pavement of main carriageway including paved shoulders, loop/ramp at interchange locations as flexible pavement designed for minimum design traffic of 112 MSA and for maximum effective subgrade CBR of 9 % while the pavement for connecting/service/slip road shall be designed for minimum design traffic of 20 MSA and maximum effective subgrade CBR of 9 %.

The pavement at Toll Plaza locations shall be designed by the Concessionaire as Rigid Pavement.

c) Flexible pavement shall also be provided for merging/ diverging with service/ slip roads and for improvements to the cross roads up-to a minimum length of 50m on either side from Right of way of highway.

iv. **Strengthening and Reconstruction of Stretches**

Strengthening / Reconstruction sections are given below:

Strengthening/Overlay Sections					
Existing. Chainage (m)		Design Chainage. (m)		Length (m)	Remarks
From	To	From	To		
NIL					

Reconstruction Sections					
Existing. Chainage (m)		Design Chainage (m)		Length (m)	Remarks
From	To	From	To		
-	-	25800	33015	7215	-
		Total (m)		7215	

Note: The above stretches shall be reconstructed/raised with the requirements specified in Clause 5(ii) and 5(iii) of Schedule B & Schedule D.

8. Roadside Drainage

In addition to the provisions given in TCS, adequate Drainage system including surface and subsurface drains and median drainage system in super elevation section for the Project Highway shall be provided as per Schedule D.

Unlined / lined drains shall be provided in the entire project length as per the Drainage Plan enclosed and also as per NHAI Policy Circular no 18.48 dated 8th July 2020.

(i) RCC covered drain with footpath shall be provided in both sides at following locations.

Sl No.	Design Chainage (km)		Length (km)	Side (LHS/RHS/BHS)	Total Length (km)	Remarks
	From	To				
1	29.100	29.500	0.400	BHS	2x0.400=0.800	-
2	30.750	31.096	0.346	BHS	2x0.346=0.692	-
3	31.103	31.896	0.793	BHS	2x0.793=1.586	-
4	31.903	32.180	0.277	BHS	2x0.277=0.554	-
5	32.200	33.015	0.815	BHS	2x0.815=1.630	-
6	-0.800	33.015	2.178	BHS	2X1.089 = 2.178	RCC Drain crossing on cross road and service/slip road shall be designed to take required vehicular load at location below VUP/LVUP/SVUP.
Total					2 x 3.720 = 7.440	

Note: - At all cross roads below grade separator structure on either side and on cross road on at grade junction, RCC covered drain crossing shall be designed to take required vehicle load.

(ii) Unlined open drain shall be provided in both sides at following locations

Sl No.	Design Chainage (km)		Length (km)	Side (LHS/RHS/BHS)	Total Length (km)	Remarks
	From	To				
1	At Trumpet		0.175	BHS	0.350	-
2			0.192	BHS	0.384	-
3	-0.06	-0.175	0.115	BHS	0.230	-
4	-0.175	-0.53	0.355	BHS	0.710	-
5	-0.53	-0.8	0.270	RHS	0.270	-
6	-0.53	-0.77	0.240	LHS	0.240	-
7	0.000	0.450	0.450	BHS	0.900	-
8	0.450	1.130	0.680	BHS	1.360	-
9	1.570	1.809	0.239	BHS	0.478	-
10	1.816	1.900	0.084	BHS	0.168	-
11	1.920	2.000	0.080	BHS	0.160	-
12	2.007	2.330	0.323	BHS	0.646	-
13	2.330	3.300	0.970	BHS	1.940	-
14	3.300	3.869	0.569	BHS	1.138	-
15	3.881	4.190	0.309	BHS	0.618	-
16	4.190	4.950	0.760	BHS	1.520	-
17	4.950	5.200	0.250	BHS	0.500	-
18	5.207	5.280	0.073	BHS	0.146	-
19	5.300	5.390	0.090	BHS	0.180	-
20	5.397	5.900	0.503	BHS	1.006	-
21	5.900	6.410	0.510	BHS	1.020	-
22	6.410	6.994	0.584	BHS	1.168	-
23	7.006	7.680	0.674	BHS	1.348	-
24	7.680	8.260	0.580	BHS	1.160	-
25	8.260	8.619	0.359	BHS	0.718	-
26	8.631	8.811	0.180	BHS	0.360	-
27	8.818	8.950	0.132	BHS	0.264	-
28	8.950	9.655	0.705	BHS	1.410	-
29	9.655	10.234	0.579	BHS	1.158	-
30	10.246	10.690	0.444	BHS	0.888	-
31	10.690	10.745	0.055	BHS	0.110	-
32	11.730	11.800	0.070	BHS	0.140	-
33	11.800	12.260	0.460	BHS	0.920	-
34	12.267	12.363	0.096	BHS	0.192	-
35	12.423 to 12.440 & 12.447 to 12.700		0.270	BHS	0.540	-
36	12.700	12.870	0.170	BHS	0.340	-
37	12.870	13.116	0.246	BHS	0.492	-
38	13.146	13.520	0.374	BHS	0.748	-
39	13.520	14.370	0.850	BHS	1.700	-
40	14.370	14.494	0.124	BHS	0.248	-
41	14.506	15.198	0.692	BHS	1.384	-

Sl No.	Design Chainage (km)		Length (km)	Side (LHS/RHS/BHS)	Total Length (km)	Remarks
	From	To				
42	15.228	15.464	0.236	BHS	0.472	-
43	15.476	15.740	0.264	BHS	0.528	-
44	15.740	16.080	0.340	BHS	0.680	-
45	16.080	16.390	0.310	BHS	0.620	-
46	16.402	16.765	0.363	BHS	0.726	-
47	17.840	19.500	1.660	BHS	3.320	-
48	19.500	19.944	0.444	BHS	0.888	-
49	19.956	20.290	0.334	BHS	0.668	-
50	20.290	20.900	0.610	BHS	1.220	-
51	20.900	21.234	0.334	BHS	0.668	-
52	21.246	21.670	0.424	BHS	0.848	-
53	21.677 to 21.715 & 21+745 to 21.830		0.123	BHS	0.246	-
54	21.837	22.294	0.457	BHS	0.914	-
55	22.306	22.490	0.184	BHS	0.368	-
56	22.490	23.160	0.670	BHS	1.340	-
57	23.160	23.590	0.430	BHS	0.860	-
58	23.650	23.700	0.050	BHS	0.100	-
59	23.707	23.960	0.253	BHS	0.506	-
60	23.960	24.400	0.440	BHS	0.880	-
61	24.400	24.714	0.314	BHS	0.628	-
62	24.726	25.050	0.324	BHS	0.648	-
63	25.050	25.400	0.350	BHS	0.700	-
64	25.400	25.710	0.310	BHS	0.620	-
65	25.770 to 25.810 &25.817 to 26.200		0.423	BHS	0.846	-
66	26.200	26.900	0.700	BHS	1.400	-
67	26.900	26.990	0.090	BHS	0.180	-
68	27.110	27.220	0.110	BHS	0.220	-
69	27.220	29.100	1.880	BHS	3.760	-
70	29.500	30.750	1.250	BHS	2.500	-

Note: - Concessionaire shall provide depth of road drainage as per drainage plan (enclosed) and IRC codal provisions.

9. Design of Structures

General

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i) All bridges, culverts and structures shall be designed and constructed in accordance with Section 7 of the Manual and shall conform to the cross-sectional features and details specified in Sections below.
ii) Width of the carriageway of bridges and structures shall be for four lane and as specified below.
iii) All bridges shall be high-level bridges.
iv) Cross-section of the new culverts and bridges at deck level for the Project Highway shall confirm to the typical cross-sections and provision of relevant Manual.

ii. Culverts

a) The overall width of all culverts shall be equal to the roadway width of the approaches.
b) Reconstruction of Existing Culverts and Proposed New Culverts:
All culverts shall be designed and constructed in accordance with Section 7 of the Manual and shall conform to the cross-sectional features and details specified below.

LIST OF CULVERTS FOR CROSS DRAINAGE

(A) Reconstruction

S.No.	Design Chainage (km)	Structure Type	Proposed Span (BxH)	Remarks
1	27+575	RCC Box	2.0x1.5m	-
2	28+985	RCC Box	2.0x1.5m	-
3	29+055	RCC Box	2.0x1.5m	-
4	29+220	RCC Box	2.0x1.5m	-
5	29+500	RCC Box	2.0x1.5m	-
6	32+340	RCC Box	2.0x1.5m	-

(B) New Construction

(i) Size 2x1.5m

S. No.	Culvert Location	Type of Culvert	Span / Opening	Remark
1	-0.100	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
2	-0.325	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
3	-0.675	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
4	At Trumpet Service Road LHS	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
5	At Trumpet Service Road RHS	Box Culvert	2X1.5m	New Construction (for Main Carriageway)

S. No.	Culvert Location	Type of Culvert	Span / Opening	Remark
6	1.215	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
7	2.200	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
8	2.445	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
9	2.750	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
10	2.950	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
11	3.200	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
12	4.228	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
13	4.770	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
14	5.040	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
15	5.640	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
16	6.150	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
17	6.610	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
18	7.700	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
19	7.860	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
20	8.080	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
21	8.975	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
22	9.250	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
23	10.080	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
24	10.365	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
25	11.390	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
26	13.900	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
27	14.150	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
28	14.320	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
29	14.785	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
30	16.190	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)

S. No.	Culvert Location	Type of Culvert	Span / Opening	Remark
31	17.140	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
32	17.470	Box Culvert	2X1.5m	New Construction (for Main Carriageway + toll plaza)
33	18.050	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
34	18.550	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
35	18.900	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
36	19.110	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
37	19.360	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
38	19.800	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
39	20.485	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
40	20.875	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
41	21.010	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
42	21.900	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
43	22.810	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
44	23.900	Box Culvert	2X1.5m	New Construction (for Main Carriageway + Service road/Slip Road)
45	24.400	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
46	25.250	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
47	25.420	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
48	26.460	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
49	27.250	Box Culvert	2X1.5m	New Construction (for Main Carriageway)
50	28.280	Box Culvert	2X1.5m	New Construction (for Main Carriageway)

(B) New Construction

(ii)Size 6x3m

S. No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Vertical Clearance (m)	Remark
1	0.950	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
2	2.585	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
3	3.470	RCC Box	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
4	4.100	RCC Slab	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
5	4.640	RCC Slab	1x6.0	3	New Construction (for Main Carriageway)
6	5.850	RCC Slab	1x6.0	3	New Construction (for Main Carriageway)
7	6.350	RCC Slab	1x6.0	3	New Construction (for Main Carriageway)
8	7.525	RCC Slab	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
9	8.400	RCC Slab	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
10	9.595	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
11	10.805	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
12	11.625	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
13	11.860	RCC Box	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
14	12.768	RCC Slab	1x6.0	3	New Construction (for Main Carriageway)
15	13.390	RCC Slab	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
16	15.800	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
17	16.570	RCC Box	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
18	17.370	RCC Slab	1x6.0	3	New Construction (for Main Carriageway+ toll plaza)
19	17.710	RCC Box	1x6.0	3	New Construction (for Main Carriageway + toll plaza)
20	18.237	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
21	19.520	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
22	20.217	RCC Box	1x6.0	3	New Construction (for Main Carriageway+ Service Road/Slip road)
23	20.610	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
24	22.470	RCC Box	1x6.0	3	New Construction (for Main

S. No.	Design Chainage (km)	Type of Structure	Span (clear#) Arrangement (Nos. x m)	Vertical Clearance (m)	Remark
					Carriageway)
25	23.100	RCC Box	1x6.0	3	New Construction (for Main Carriageway)
26	24.210	RCC Box	1x6.0	3	New Construction (for Main Carriageway)

(C) Widening

S.No.	Existing Chainage (km)	Design Chainage (km)	Structure Type	Proposed Span (clear#) (Nos. x clear width x clear height)	Skew Angle (φ)	Remarks
Nil						

Note:

1. Locations of the above culverts are indicative. Exact location of these culverts shall be decided in consultation with Independent Engineer. Number and type of culvert may increase as per site condition and this shall not constitute a Change of Scope.

2. Ventway/Span arrangement are minimum specified. The actual vent way/span arrangements of culverts shall be determined on the basis of detailed investigations by the Concessionaire in accordance with the specifications and Standards. Any variations in vent way/span arrangements specified above shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

3. Concessionaire shall Provide skew angle as per site requirement and any change in skew angle due to site requirement shall not constitute as a change of scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

4. The overall width of the above culverts shall be equal to Roadway width including the gap between main carriageway & service road in case there is any service road. Width of culverts at toll plaza location shall be as per 8 lane toll plaza width. Any additional Barrel length required as per site conditions shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

5. Wherever liquefaction is observed in Open foundation and Raft Structures, Ground improvement shall be done to compact the soil to increase its penetration resistance and satisfy clause 8.4.4 (v) of IRC: SP:114-2018.

6. Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

7. Diversion arrangement at the time of reconstruction of culvert shall be part of the construction and agreement and shall not constitute change of scope.

Repairs/replacements of railing/parapets, flooring and protection works of the existing culverts shall be undertaken as follows: **NIL**

iii. Bridges

Reconstruction/New Construction of Major Bridges: 4-Lane Carriageway with Footpath
The width of the structure shall be provided as per of manual with deviation as provided in Schedule D.

S No.	Existing Chainage (km)	Design Chainage (km)	Proposed Structure Type	Span Arrangement (Nos. x m)*	Skew Angle (φ)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
On Main Carriageway								
1	-	11.120	RCC GIRDER	4X25	0	2X13.50	3	New construction
2	-	16.840	PSC GIRDER	5X30	0	2X13.50	3	New construction on Begna River
3	-	27.050	PSC GIRDER	4X30	0	2X13.50	3	Reconstruction on Roon River

* c/c Expansion joint in Square direction (m)

Note:

1. The Deck level of the Bridges should be governed by HFL of Stream/Navigational HFL and Clearance as per guidelines of Inland Waterways Authority of India and IRC:5-2015.
2. The above length & span arrangement of the bridge is minimum specified. Any increase in length/width as per site requirement shall not constitute change of scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
3. Provide skew angle as per site requirement and any change in skew angle due to site requirement shall not constitute a change of scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
4. Wherever liquefaction is observed in Open foundation and Raft Structures, pile Ground improvement shall be done to compact the soil to increase its penetration resistance and satisfy clause 8.4.4 (v) of IRC: SP:114-2018
5. Diversion arrangement at the time of reconstruction of bridge shall be part of the construction and agreement and shall not constitute change of scope.
6. For structures having overall length greater than 100.0m, number of expansion joints shall be reduced by providing deck continuity.
7. Any other structures falling within acceleration / deceleration lane /taper shall be constructed to the required width. These changes shall not be treated as change of scope.
8. The span arrangements and vertical clearance are tentative and the same shall be followed as per approved GAD by the concern Irrigation Department and any change shall not be treated as change in scope of work.
9. Slope protection of embankment by stone pitching adjacent to bridge on either side upto ground level of HFL+1m shall be provided.
10. Stone pitching and other river training works designed and provided at major bridges sites on rivers to cater for meandering of the river.
11. Special vehicle loading is to be considered in Design of structures. Since the subject project is 4 lane Highway configuration, therefore, Congestion factor is not to be considered in calculation of live load.

New Construction/ Reconstruction of Minor Bridge

The width of the structure shall be provided as per manual with deviation as provided in Schedule D.

S No.	Existing Chainage (km)	Design Chainage (km)	Proposed Structure Type	Span Arrangement (Nos. x m)	Skew Angle (φ)	Deck Configuration (Nos. x m)	Width of Open Median (m)	Remarks
1	-	1.550	RCC Girder	2X20	0	2X13.50	3	New Construction
2	-	31.100	RCC Box	1X07	0	2X13.50	3	Reconstruction
3	-	31.900	RCC Box	1X07	0	2X13.50	3	Reconstruction
4	-	32.190	RCC Box	2X10	32	2X13.50	3	Reconstruction

Note:

1. # Clear Span measured in square distance
2. The Deck level of the Bridges should be governed by HFL of Stream/Navigational HFL and Clearance as per guidelines of Inland Waterways Authority of India and IRC:5-2015.
3. The above length & span arrangement of the bridge is minimum specified. Any increase in length/width as per site requirement shall not constitute change of scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
4. Provide skew angle as per site requirement and any change in skew angle due to site requirement may not constitute as a change of scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.
5. Wherever liquefaction is observed in Open foundation and Raft Structures, Ground improvement shall be done to compact the soil to increase its penetration resistance and satisfy clause 8.4.4 (v) of IRC: SP:114-2018
6. Diversion arrangement at the time of reconstruction of bridge shall be part of the construction and agreement and shall not constitute of scope.
7. Any other structures falling within acceleration / deceleration lane /taper shall be constructed to the required width. These changes shall not be treated as change of scope.
8. The span arrangements and vertical clearance are tentative and the same shall be followed as per approved GAD by the concern Irrigation Department and any change shall not be treated as change in scope of work.
9. Special vehicle loading is to be considered in Design of structures. Since the subject project is 4 lane Highway configuration, therefore, Congestion factor is not to be considered in calculation of live load.

iv. ROB/RUB: Nil

v. Grade Separated Structures

The grade separated structures shall be provided at the locations and of the type and length specified in this Schedule.

vi. Repairs and Strengthening of Bridges and Structures: Nil

vii. List of Bridges and Structures

The list of Bridges, structures, Flyovers, Underpasses and Overpasses are as given above.

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10. Traffic Management Systems

(i) Traffic control devices and road safety works shall be provided in accordance with the list given below. Advance Traffic Management System shall be provided as per Schedule D.

ADVANCE TRAFFIC MANAGEMENT SYSTEM (ATMS)

Sl. No.	Type of ATMS	Location	Remarks
1	Mobile Communication System	For Entire length of Project	--
2	Variable Message Signs	For Entire length of Project	--
3	Meteorological Data System	For Entire length of Project	--
4	Automatic Traffic Counter and Vehicle Classification	For Entire length of Project	--
5	Video Surveillance System	For Entire length of Project	--
6	Video Incident Detection System	For Entire length of Project	--
7	Heating, Ventilation and Air Conditioning (HVAC) Subsystem	For Entire length of Project	--
8	Central Processing System	For Entire length of Project	--
9	Video Analytics and Management System (VAMS)	For Entire length of Project	--
10	Closed Circuit Television (CCTV) and Access Control System (ACS) for TMC and Sub-Centre Building and Security	For Entire length of Project	--
11	Traffic Monitor Camera System (TMCS)	For Entire length of Project	--
12	Video Incident Detection System (VIDS)	For Entire length of Project	--
13	Variable Message Sign (VMS)	For Entire length of Project	--
14	Vehicle Speed Detection System (VSDS)	For Entire length of Project	--
15	Adaptive Traffic Signal Control System	For Entire length of Project	--
16	Digital Transmission System	For Entire length of Project	--
17	Facility Monitoring System	For Entire length of Project	--

Note:

- *Above items shall be provided as per ATMS functional and Technical specifications of NHAI, March- 2020 ref. No. NHAI/CO/ATMS/03-2020 (attached at Schedule-D)*
- *In addition to above locations, additional locations shall be identified and provided in accordance to schedule D.*
- *VMS shall display in English, Hindi and Punjabi Language.*

11. Traffic Control Devices and Road safety Works

Traffic control devices and road safety works shall be provided in accordance with Section 9 of the Manual.

(i) Traffic Signs: Traffic signs include roadside signs, overhead signs and curb mounted signs along the entire Project Highway.

(ii) Pavement Marking: Pavement markings shall cover road marking for the entire Project Highway.

(iii) Reflective Pavement Markers (Road Studs): Road Studs Shall be provided at the locations as suggested specified in the IRC Manual SP-84 (2019) and as

recommended in Schedule D.

(iv) Safety Barrier: Thrie-beam crash barrier shall be provided in entire project on both sides in median as per IRC: SP:84- 2019 and TCS referred in this Schedule-B and provided at appendix-B-I and as recommended in Schedule D.

(v) Road side Furniture: Roadside furniture like km/Hectometer Stones, Railings, Traffic Impact Attenuators, Delineators, chevron signs shall be provided in accordance with the provisions of Section 9 and Section 12 of IRC: SP:84-2019.

Criteria for other type of crash barrier such as concrete crash barrier shall be as per IRC:119-2015.

12. Compulsory Afforestation

The concessionaire shall plant trees and shrubs of required number and type at the appropriate locations within the Right of way, in avenue plantation and in median and in the land earmarked by the Authority for afforestation keeping in view the IRC Guidelines on Landscaping and Tree Plantation as per IRC:SP:21 . The number of trees which are required to be planted by the Concessionaire as compensatory afforestation should be as per Forest Conservation Act, as per guideline, 1:10 new trees to be planted by the Concessionaire. Number of trees to be planted are 12,000 Nos in median and 20,000 nos in Avenue and 40000 nos plants in addition to above shall be planted in land earmarked by forest department/Authority. Total plantation to be done shall be 12,000 Nos. (median)+ 20,000 Nos. (Avenue)+ 40,000 Nos. (forest Land) = 72000 Nos (minimum.) Any increase in no. of trees as per forest clearance obtained from MoEF&CC, shall not be treated as change of scope.
Median plantation, compulsory afforestation shall be as given in Schedule 'C'

13. Hazardous Locations

The safety measures shall be provided as given in Schedule C. In addition to Schedule C, additional location as directed by NHAI shall be identified and provided in accordance to Manual and the same shall not constitute a Change of Scope.

14. Special Requirement for Hill Roads – NIL

15. Change of Scope

The length of structures and bridges specified hereinabove, except for structures over existing water bodies like ponds, lakes etc. shall be treated as an approximate assessment. The proposed span arrangement of structures may be changed based on innovative design of structure, latest construction techniques and aesthetics of structures. Actual lengths of structures and bridges as required on the basis of detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Existing water bodies like ponds, lakes etc., which are to be preserved from environment impact mitigation point of view, shall be bridged to the extent of full ponding level at peak rainy season. Any variations in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article16.

16. Special Structures: NIL

17. Retaining Structures

RCC Retaining Wall/Reinforced Earth Retaining structures/Toe wall shall be constructed to accommodate the cross section within Right of Way as mentioned below and in accordance with **Schedule – D.**

(A) Stretches for Provision of Reinforced Earth Wall

Reinforced Earth wall shall be constructed to accommodate the cross section within Right of Way as mentioned below and in accordance with Schedule – D.

RE Wall on Both Side of the Carriageway

S. No.	Chainage		Length (Km.)	Total Length
	Start	End		
1	At trumpet portion		2x0.980	1.960
2	0.060	0.450	2x0.450	0.780
3	1.570	1.809	2x0.239	0.478
4	1.816	1.900	2x0.084	0.168
5	1.920	2.000	2x0.080	0.160
6	2.007	2.330	2x0.323	0.646
7	3.300	3.869	2x0.569	1.138
8	3.881	4.190	2x0.309	0.618
9	4.950	5.200	2x0.250	0.500
10	5.207	5.280	2x0.073	0.146
11	5.300	5.390	2x0.090	0.180
12	5.397	5.900	2x0.503	1.006
13	6.410	6.994	2x0.584	1.168
14	7.006	7.680	2x0.674	1.348
15	8.260	8.619	2x0.359	0.718
16	8.631	8.811	2x0.180	0.360
17	8.818	8.950	2x0.132	0.264
18	9.655	10.234	2x0.579	1.158
19	10.246	10.690	2x0.444	0.888
20	11.800	12.260	2x0.460	0.920
21	12.267	12.363	2x0.096	0.192
22	12.423 to 12.440 & 12.447 to 12.700		2x0.270	0.540
23	12.700	13.116	2x0.416	0.832
24	13.146	13.520	2x0.374	0.748
25	14.370	14.494	2x0.124	0.248
26	14.506	15.198	2x0.692	1.384
27	15.228	15.464	2x0.236	0.472
28	15.476	15.740	2x0.264	0.528
29	16.080	16.390	2x0.31	0.620

S. No.	Chainage		Length (Km.)	Total Length
	Start	End		
30	16.402	16.765	2x0.363	0.726
31	19.500	19.944	2x0.444	0.888
32	19.956	20.290	2x0.334	0.668
33	20.900	21.234	2x0.334	0.668
34	21.246	21.670	2x0.424	0.848
35	21.677 to 21.715 & 21+745 to 21.830		2x0.123	0.246
36	21.837	22.294	2x0.457	0.914
37	22.306	22.490	2x0.184	0.368
38	23.160	23.590	2x0.430	0.860
39	23.650	23.700	2x0.050	0.100
40	23.707	23.960	2x0.253	0.506
41	24.400	24.714	2x0.314	0.628
42	24.726	25.050	2x0.324	0.648
43	25.400	25.710	2x0.310	0.620
44	25.770 to 25.810 &25.817 to 26.200		2x0.423	0.846
Total Length (km.)			**2x14.851**	**29.702**

(B) Stretches for Provision of Retaining Wall -

Retaining wall shall be provided Minimum at following locations: -

Sl No.	Design Chainage (m)		Side (LHS/RHS/BHS)	Length (m)
	From	To		
1	1.130	1.530	BHS	2x400
2	4.580	4.700	BHS	2x120
3	6.290	6.410	BHS	2x120
4	9.535	9.655	BHS	2x120
5	10.745	11.070	BHS	2x325
6	11.170	11.730	BHS	2x560
7	12.700	12.870	BHS	2x170
8	15.740	15.860	BHS	2x120
9	16.915	17.180	BHS	2x265
10	17.310	17.430	BHS	2x120
11	17.650	17.770	BHS	2x120
12	18.177	18.297	BHS	2x120
13	20.550	20.670	BHS	2x120
14	23.040	23.160	BHS	2x120
15	24.150	24.270	BHS	2x120
Total Length				**2x2920=5840**

(C) Stretches for Provision of Toe Wall

Toe wall shall be provided Minimum at following locations: -

S. NO.	Design Chainage (m)		Side (LHS/RHS/BHS)	Length (Metres)
	From	To		
1	26.200	26.900	BHS	2x700
2	27.220	29.100	BHS	2x1880
3	29.500	30.750	BHS	2x1250
	Total Length (m)			**3830 x 2 = 7660**

Note:

1. RE walls shall be constructed upto full height i.e., upto FRL of the project highway with RCC crash barrier & friction slabs.

2. In addition to RE wall mentioned above, cross wall shall be provided behind each abutment, toll plaza and other locations to restrict the embankment slope within right of way.

3. The length of RE wall/ Retaining wall / Toe wall specified herein above shall be treated as an approximate assessment and minimum. The actual lengths as required on the basis of detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Any increase in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

4. Location nearby built-up area, RE wall panels should be aesthetically good and shall be approved by Independent Engineer.

5. Execution of retaining wall/ reinforced earth wall shall be done under supervision of specialized agency which shall be approved by the Independent Engineer.

6. RE wall construction is proposed to be done under supervision of specialized agency to ensure the quality.

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18. Median Opening

Median Opening shall be provided at following locations: -

S. No.	Location (Km)	Remark
01	29.100	-
02	30.750	-
03	31.500	-
04	32.600	-

Note: Above locations of median opening is tentative and minimum requirement. The actual location shall be determined by the Concessionaire in accordance with the IRC: SP: 84-2019 requirements with approval from the Independent Engineer.

19. Slope Protection

The side slopes shall be protected by using suitable slope protection measures wherever required in accordance with **Schedule - D**.

20. Ground Improvement

Ground Improvement, wherever required, shall be done as per Schedule D and the same shall not constitute a Change of Scope.

21. Fencing/ Boundary Wall

Boundary wall shall be provided on both side at ROW in a minimum length of 2x28.041 = 56.082 Km (including transverse requirements at structure locations).

22. Utilities

Provision of accommodating utilities shall be made both over as well as underground wherever required.

23. Emergency Crossover

Not Applicable.

24. Overhead Signs

In addition to the list given below, signs shall be provided as per Schedule D. Traffic Signs (excluding overhead signs at Toll Plaza): Traffic sign boards as per details given below and indicated in the traffic signage plan mentioned in **Annexure II** of this Schedule and as per manual IRC: SP- 84-2019 shall be provided in the project highway:

Sl. No.	Type of Sign
1	One Way Object Hazard Marker (OHM)
2	Two Way Object Hazard Marker (OHM)
3	Speed Limit Signs (Regulatory Sign)
4	Merging Traffic Ahead (Cautionary Sign)
5	Compulsory Keep Left Sign (Regulatory Sign)
6	Compulsory Ahead Sign (Regulatory Sign)
	U-Turn Prohibited Sign (Regulatory Sign)

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Sl. No.	Type of Sign
8	Give way sign (Regulatory Sign)
9	Chevron Marker (At Curves)
10	Reassurance Sign (Direction & Place Identification Sign)
11	Left/ Right Hand Curve (Cautionary Sign)
12	NH Route Marker Sign
13	Entry/ Exit Expressway Sign (Information Sign)
14	Map type Advance Direction Sign
15	Flag type Advance Direction Sign
16	Advance Directional Sign (Overhead Cantilever/ Gantry)
17	Rest Area Information Sign

The type, numbers and location of Traffic Signages shown in Traffic Signage Plan (Annexure II) are tentative and minimum specified. The actual numbers and location of Traffic Signages shall be determined by the Concessionaire in accordance with the IRC:67-2012 requirements with approval from the Independent Engineer. Any increase in the number and type of road sign shall not constitute a Change of Scope, save and except any variations arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16. Adequate signs for toll plaza shall be provided as given in this schedule and manual.

25. Utilities Shifting

Shifting of obstructing existing utilities indicated in Schedule A to an appropriate location in accordance with the standards and specifications of concerned Utility Owning Department and as per the MoRTH Circular No RW/NH-33044/29/2015 – S&R (R) dated 11th February 2021 is part of the scope of work of the Concessionaire. The bidders may visit the site and assess the quantum of shifting of utilities for the project before submission of their bid. Copy of utility relocation plan is enclosed. The specifications of concerned Utility Owning Department shall be applicable and followed.

Note: -

A. The type/quantity/spacing/size/specifications of poles/towers/lines/cables to be used in shifting work shall be as per the guidelines of Utility Owning Department and it is to be agreed solely between the Concessionaire and the Utility Owning Department. No change of scope shall be admissible and no cost shall be paid for using different type/quantity/spacing/size/specifications in shifted work in comparison to those in the existing work or for making any overhead crossings to underground as per requirement of Utility owning Department and/or construction of project highway. The Concessionaire shall carry out joint inspection with Utility Owning Department and get the estimates from Utility Owning Department. The assistance of the Authority is limited to giving forwarding letter on the proposal of Concessionaire. The decision/approval of Utility owning Department shall be binding on the Concessionaire.

B. The supervision charges at the rates/charges applicable of the Utility owning Department shall be paid directly by the Authority to the Utility owning Department as and when Concessionaire furnished demand of Utility Owning Department along with a copy of estimated cost given by the latter.

C. The dismantled material/scrap of existing Utility to be shifted/dismantled shall belong to the Concessionaire who would be free to dispose-off the dismantled material as deemed fit by them unless the Concessionaire is required to deposit the dismantled material to Utility Owning Department as per the norms and practice and nothing extra will be paid to concessionaire in lieu of old material deposited with utility owning agency/Department.

The utilities shall be handed over after shifting work is completed to Utility Owning Department to their entire satisfaction. The maintenance liability shall rest with the Utility Owning Department after handing over process is complete as far as utility shifting works are concerned.

Note II: - Copy of Utility Shifting plans enclosed

The Project Highway shall be constructed to Four lane configuration for the Project length. Typical cross sections required to be developed in different segments of the project highway are given below: -

S. No.	Chainage		Length (Km.)	TCS	Remark
	Start	End			
1	0.000	-0.060	0.060	TCS-8A	INTERCHANGE TRUMPET
a)	-0.060	-0.175	0.115	TCS-8B	TRUMPET APPROACH
b	-0.175	-0.530	0.355	TCS-8C	TRUMPET APPROACH
c)	-0.530	-0.800	0.270	TCS-8E	DIVERGING RAMP FROM PROPOSED AMBALA RING ROAD.
d)	-0.530	-0.770	0.240	TCS-8D	CONVERGING RAMP WITH PROPOSED AMBALA RING ROAD
2	0.000	0.450	0.450	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPARATED STRUCTURE FOR APPROACH ROAD (TRUMPET PORTION)
3	0.450	1.130	0.680	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
4	1.130	1.530	0.400	TCS-7A	APPROACH ROAD FOR BRIDGE PORTION
5	1.530	1.570	0.040	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
6	1.570	1.809	0.239	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
7	1.809	1.816	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
8	1.816	1.900	0.084	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
9	1.900	1.920	0.020	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
10	1.920	2.000	0.080	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
11	2.000	2.007	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
12	2.007	2.330	0.323	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
13	2.330	3.300	0.970	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
14	3.300	3.869	0.569	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
15	3.869	3.881	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
16	3.881	4.190	0.309	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD

S. No.	Chainage		Length (Km.)	TCS	Remark
	Start	End			
17	4.190	4.950	0.760	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
18	4.950	5.200	0.250	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
19	5.200	5.207	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
20	5.207	5.280	0.073	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
21	5.280	5.300	0.020	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
22	5.300	5.390	0.090	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
23	5.390	5.397	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
24	5.397	5.900	0.503	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
25	5.900	6.410	0.510	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
26	6.410	6.994	0.584	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
27	6.994	7.006	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
28	7.006	7.680	0.674	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
29	7.680	8.260	0.580	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
30	8.260	8.619	0.359	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
31	8.619	8.631	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
32	8.631	8.811	0.180	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
33	8.811	8.818	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
34	8.818	8.950	0.132	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
35	8.950	9.655	0.705	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)

S. No.	Chainage		Length (Km.)	TCS	Remark
	Start	End			
36	9.655	10.234	0.579	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
37	10.234	10.246	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
38	10.246	10.690	0.444	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
39	10.690	10.745	0.055	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
40	10.745	11.070	0.325	TCS-7A	APPROACH ROAD FOR BRIDGE PORTION
41	11.070	11.170	0.100	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
42	11.170	11.730	0.560	TCS-7A	APPROACH ROAD FOR BRIDGE PORTION
43	11.730	11.800	0.070	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
44	11.800	12.260	0.460	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
45	12.260	12.267	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
46	12.267	12.363	0.096	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
47	12.363	12.423	0.060	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
48	12.423 to 12.440 & 12.447 to 12.700		0.270	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
49	12.440	12.447	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
50	12.700	12.870	0.170	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
51	12.700	13.116	0.246	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
52	13.116	13.146	0.030	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
53	13.146	13.520	0.374	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
54	13.520	14.370	0.850	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
55	14.370	14.494	0.124	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD

S. No.	Chainage		Length (Km.)	TCS	Remark
	Start	End			
56	14.494	14.506	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
57	14.506	15.198	0.692	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
58	15.198	15.228	0.030	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
59	15.228	15.464	0.236	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
60	15.464	15.476	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
61	15.476	15.740	0.264	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
62	15.740	16.080	0.340	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
63	16.080	16.390	0.310	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
64	16.390	16.402	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
65	16.402	16.765	0.363	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
66	16.765	16.915	0.150	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
67	16.915	17.180	0.265	TCS-7A	APPROACH ROAD FOR BRIDGE PORTION
68	17.180	17.840	0.660	Toll Plaza	8 Lane Toll Plaza
69	17.840	19.500	1.660	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
70	19.500	19.944	0.444	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
71	19.944	19.956	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
72	19.956	20.290	0.334	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
73	20.290	20.900	0.610	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
74	20.900	21.234	0.334	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
75	21.234	21.246	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE

S. No.	Chainage		Length (Km.)	TCS	Remark
	Start	End			
76	21.246	21.670	0.424	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
77	21.670	21.677	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
78	21.677 to 21.715 & 21+745 to 21.830		0.123	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
79	21.715	21.745	0.030	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
80	21.830	21.837	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
81	21.837	22.294	0.457	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
82	22.294	22.306	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
83	22.306	22.490	0.184	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
84	22.490	23.160	0.670	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
85	23.160	23.590	0.430	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
86	23.590	23.650	0.060	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
87	23.650	23.700	0.050	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
88	23.700	23.707	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
89	23.707	23.960	0.253	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
90	23.960	24.400	0.440	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)
91	24.400	24.714	0.314	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
92	24.714	24.726	0.012	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
93	24.726	25.050	0.324	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
94	25.050	25.400	0.350	TCS-1	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (60m ROW)

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S. No.	Chainage		Length (Km.)	TCS	Remark
	Start	End			
95	25.400	25.710	0.310	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
96	25.710	25.770	0.060	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
97	25.770 to 25.810 &25.817 to 26.200		0.423	TCS-6	TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPRATED STRUCTURE FOR APPROACH ROAD
98	25.810	25.817	0.007	TCS-5	TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
99	26.200	26.900	0.700	TCS-3	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)
100	26.900	26.990	0.090	TCS-2	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (45m ROW)
101	26.990	27.110	0.120	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
102	27.110	27.220	0.110	TCS-2	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (45m ROW)
103	27.220	29.100	1.880	TCS-3	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)
104	29.100	29.500	0.400	TCS-2B	4 LANE DIVIDED HIGHWAY WITH SERVICE ROAD (45m ROW)
105	29.500	30.750	1.250	TCS-3	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)
106	30.750	31.096	0.346	TCS-4	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)
107	31.096	31.103	0.007	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
108	31.103	31.896	0.793	TCS-4	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)
109	31.896	31.903	0.007	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
110	31.903	32.180	0.277	TCS-4	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)
111	32.180	32.200	0.020	TCS-7	CROSS SECTION OF BRIDGE WITH FOOTPATH
112	32.200	33.015	0.815	TCS-4	4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD (30m ROW)

N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt. Ltd. AKAPL Kaithal

Note:

- *The lane configuration and width of all structures shall be as per respective paragraph appendices of this schedule*
- *Median width tapering shall be considered as per IRC-SP-84-2019 Clause no 2.5.4.*
- *Entry & exit arrangement with service road shall be as per Fig. 2.1C & 2.1F of IRC-SP-84-2019.*
- *If the paved carriageway width of structure is more than the carriageway width of approaches/ embankment section of project highway, then proper pavement tapering (as per manual) shall be provided.*
- *TCS schedule as given above shall be treated as an approximate assessment. Actual length of the TCS schedule shall be prepared by the Concessionaire based on detailed investigations and site requirements.*
- *Any variation in length of respective TCS specified in Schedule B shall not constitute a change of scope, save and except any variations in the design length arising out of a change of scope expressly undertaken in accordance with the provisions of Article 16.*
- *Repair and Maintenance of already constructed road during the construction period to achieve defect free condition is included in the scope of concessionaire.*
- *Proper Tapering of road has to be done in the merging of one cross section with another for smooth transitions between sections. Any such tapering length shall not constitute change of scope.*

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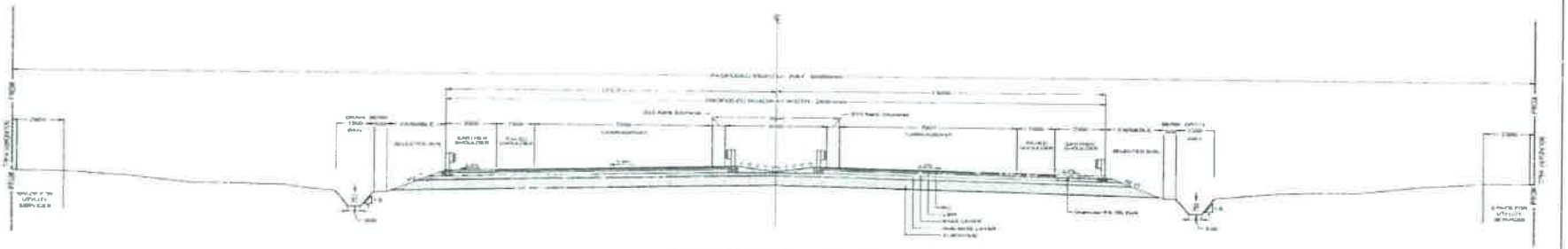
Annexure – I

(Schedule – B)

Cross Section Typical Cross Sections along the Project Corridor



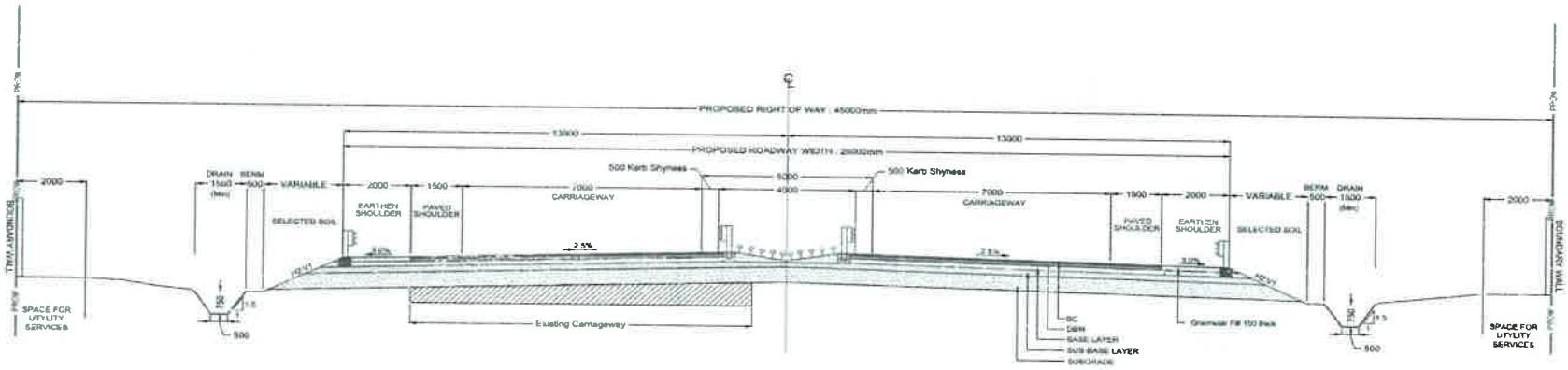
TYPICAL CROSS SECTION (Type-01)
(OPEN COUNTRY PLAIN/ROLLING TERRAIN)
NEW FOUR LANE ROAD
(4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD

Chainage		Length (Km.)
Start	End	
-0.800	1.120	1.920
1.120	3.840	2.720
3.840	6.600	2.760
6.600	9.240	2.640
9.240	11.880	2.640
11.880	14.520	2.640
14.520	17.160	2.640
17.160	19.800	2.640
19.800	22.440	2.640
22.440	25.080	2.640
25.080	27.720	2.640
27.720	30.360	2.640
30.360	33.015	2.655
Total		33.815

ALL DIMENSIONS ARE IN 'MILLIMETRE'

	CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT : MSV International Inc. In Association with Sterling Indo Tech Consultant Pvt Ltd.	PROJECT : Consultancy Services for carrying out Feasibility study and detailed project preparation for improvement, Upgradation, Redesigning, Rehabilitation and Upgradation including 4 laning of Ambala (Kalanaur) Nahargarh, Kala Amb Road (NH-72) in the State of Haryana	DRAWING: TCS-1	DRAWING NO.: AKKPL/PR DATE : 2022 DRAWN (A) Jitendra DESIGNED (B) Nitesh APPROVED (C) Anil Jain

4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).



TYPICAL CROSS SECTION (Type-02)
(OPEN COUNTRY PLAIN/ROLLING TERRAIN)
RECONSTRUCTION FOUR LANE ROAD
(4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD

Start Ch.	End Ch.	Length (Km.)
26.900	26.990	0.090
27.110	27.220	0.110
Total		0.200

ALL DIMENSIONS ARE IN 'MILLIMETRE'

SCALE –

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA

CONSULTANT: MCV International Inc. In Association with Sterling Indo Tech Consultant Pvt.Ltd

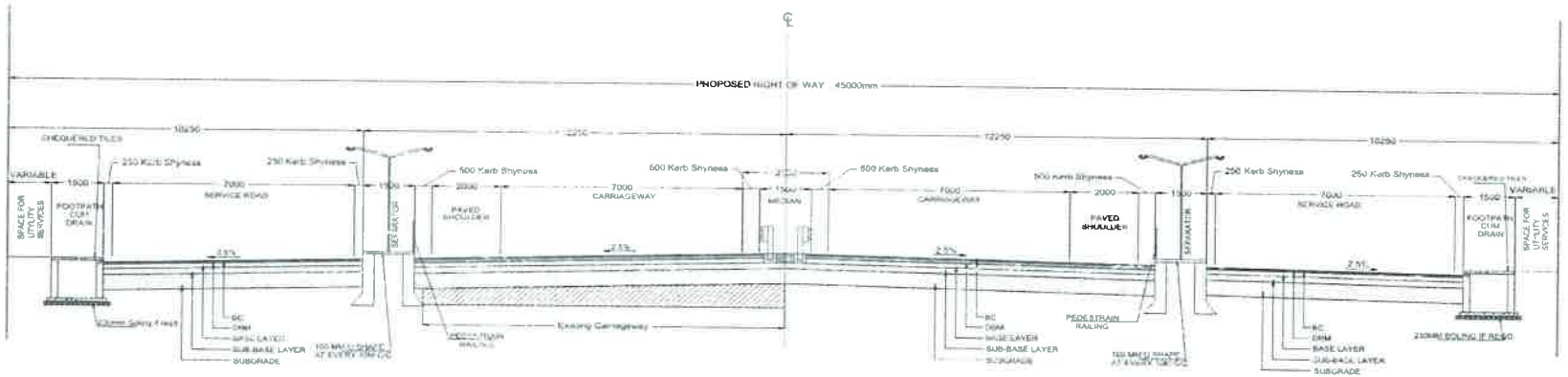
PROJECT: Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4-laning of Ambala Shahzadpur Narainpurh- Kala Amb Road (NH-72) in the State of Haryana.

DRAWING: TCS-2

DRAWING NO.: A/T/C/S /02

DATE: 2022

DRAWN (A)	DESIGNED (B)	APPROVED (C)
Jitendra	Nitesh	Atul Jain



TYPICAL CROSS SECTION (Type-02B)
(BUILT-UP SECTION PLAIN/ROLLING TERRAIN)
RECONSTRUCTION FOUR LANE WITH SERVICE ROAD
(4 LANE DIVIDED HIGHWAY WITH SERVICE ROAD)

ALL DIMENSIONS ARE IN 'MILLIMETRE'

Start Ch.	End Ch.	Length (Km.)
29.300	29.500	0.400

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA

CONSULTANT: MVV International Inc in Association with Sterling Infra Tech Consultant Pvt Ltd

PROJECT: Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Shahzadpur-Narainggarh- Kala Amb Road (NH 72) in the State of Haryana.

DRAWING: TCS-2B

DRAWING NO: A/T/CS-02

DATE: 2022

DRAWN (A)	DESIGNED (N)	APPROVED (C)
ylvindro	Nirmal	Anil Jain

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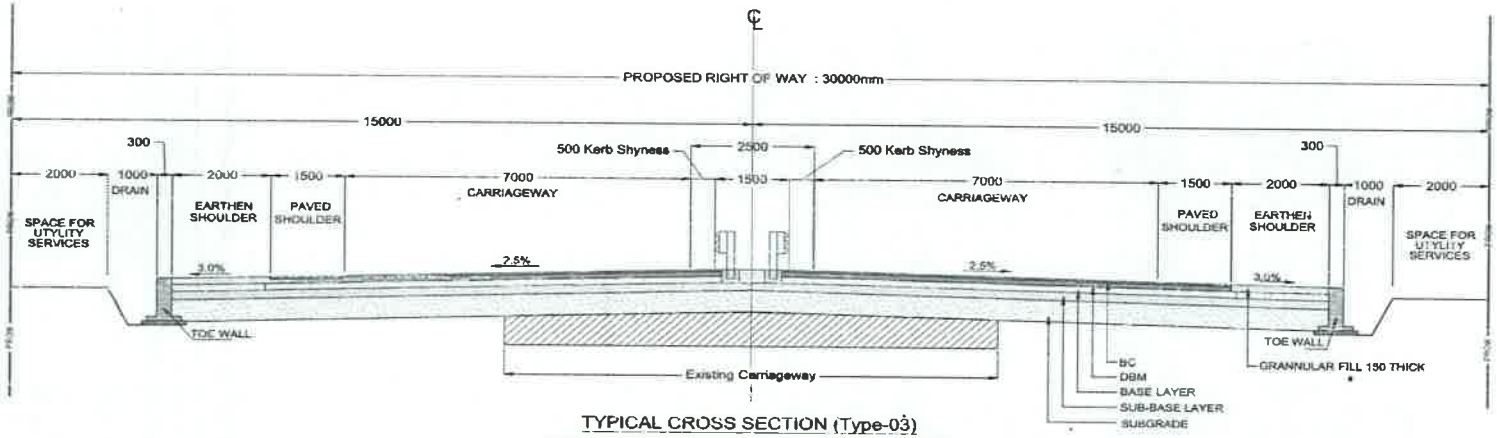


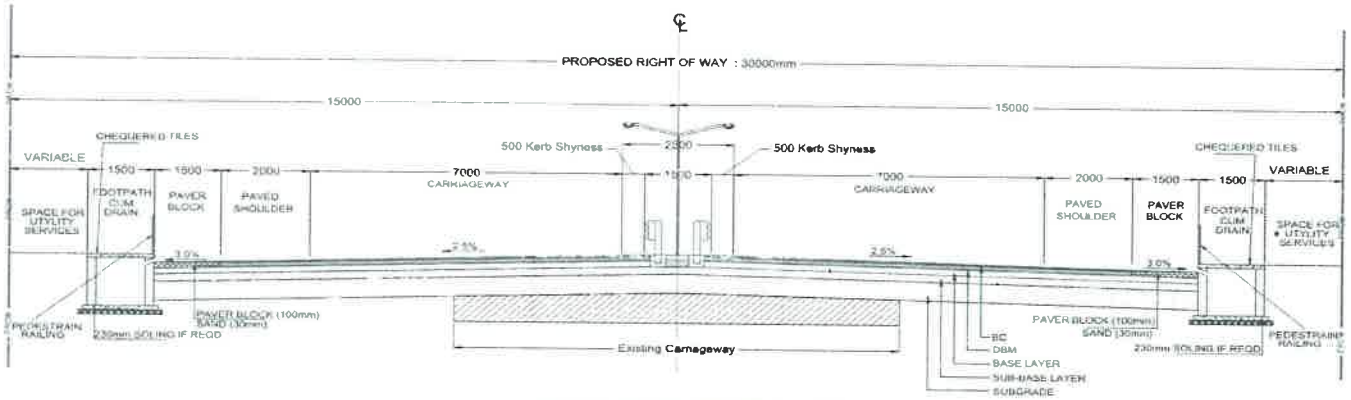
TYPICAL CROSS SECTION (Type-03)
(OPEN COUNTRY FLAIN/ROLLING TERRAIN)
RECONSTRUCTION FOUR LANE ROAD
(4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD

Start Ch.	End Ch.	Length (Km.)
26.200	26.900	0.700
27.220	31.100	3.880
39.500	30.750	3.250
Total		3.830

ALL DIMENSIONS ARE IN 'MILLIMETRE'

SCALE	CLIENT	CONSULTANT	PROJECT	DRAWING	DRAWING NO : A/TC/S.DA
	NATIONAL HIGHWAYS AUTHORITY OF INDIA	MGV International Inc. in Association with Sterling Indo Tech Consultant Pvt Ltd	Consultancy Services for carrying out Feasibility study and detailed project preparation for improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Shazadpur-Naraingarh- Kala Amb Road (NH-72) in the State of Haryana.	TCS-3	DATE : 2022

DRAWN (A)	DESIGNED (B)	APPROVED (C)
Jitendra	Nilesh	Anil Jain



TYPICAL CROSS SECTION (Type-04)
(BUILT-OP SECTION PLAIN/ROLLING TERRAIN)
RECONSTRUCTION FOUR LANE WITHOUT SERVICE ROAD
(4 LANE DIVIDED HIGHWAY WITHOUT SERVICE ROAD

Start Ch.	End Ch.	Length (Km.)
30.240	31.095	0.585
31.373	31.876	0.753
31.903	32.180	0.277
32.200	33.015	0.815
Total		2.231

ALL DIMENSIONS ARE IN 'MILLIMETRE'

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA

CONSULTANT: MSV International Inc In Association with Sterling Infra Tech Consultant Pvt Ltd

PROJECT: Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Mazadpur-Nahan with Kala Amb Road (NH-72) in the State of Haryana

DRAWING: TCS-4

DRAWN (A): plandra | DESIGNED (B): Mitesh | APPROVED (C): Anil Jain

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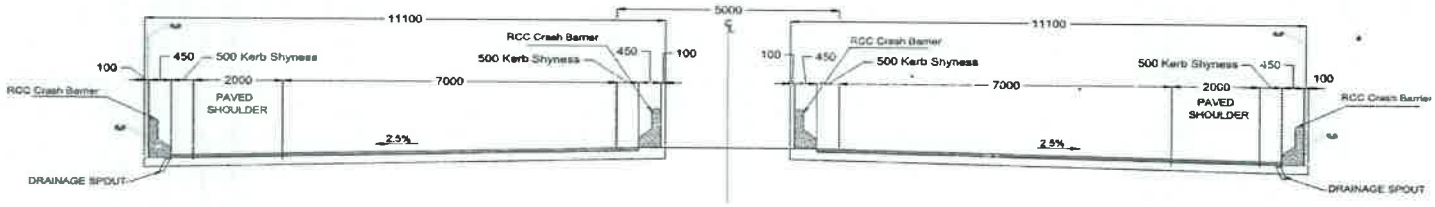
4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).



TYPICAL CROSS SECTION (Type-05)
TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
(CROSS SECTION OF GRADE SEPARATED STRUCTURE VEHICULAR UNDERPASS 4-LANE DIVIDED HIGHWAY

(Length of TCS -5,5A)

Chainage Start	Chainage End	Length (Km.)	Chainage Start	Chainage End	Length (Km.)
1.809	1.816	0.007	15.464	15.476	0.012
1.905	1.920	0.015			
2.000	2.007	0.007	18.390	18.402	0.012
2.809	2.881	0.012			
5.200	5.207	0.007	19.944	19.956	0.012
5.280	5.300	0.020			
5.580	5.587	0.007	21.234	21.246	0.012
6.994	7.006	0.012			
8.619	8.631	0.012	21.670	21.677	0.007
8.811	8.818	0.007			
10.234	10.246	0.012	21.715	21.745	0.030
12.260	12.267	0.007	21.830	21.837	0.007
12.383	12.423	0.060	22.294	22.306	0.012
12.440	12.447	0.007	23.590	23.650	0.060
13.116	13.146	0.030	23.700	23.707	0.007
14.494	14.506	0.012	24.714	24.726	0.012
15.198	15.228	0.030	25.710	25.770	0.060
			25.810	25.817	0.007
			Total		8.519

ALL DIMENSIONS ARE IN 'MILLIMETRE'

SCALE :-	CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT : MSV International Inc. in Association with Sterling Indo Tech Consultant Pvt.Ltd.	PROJECT : Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala Shahzadpur Narayangarh- Kala Amb Road (NH-72) in the State of Haryana.	DRAWING: TCS-5	DRAWING NO.: A/T/C/S /05 DATE : 2022
					DRAWN (A) jitendra / DESIGNED (B) Nilesh / APPROVED (C) Anil Jain

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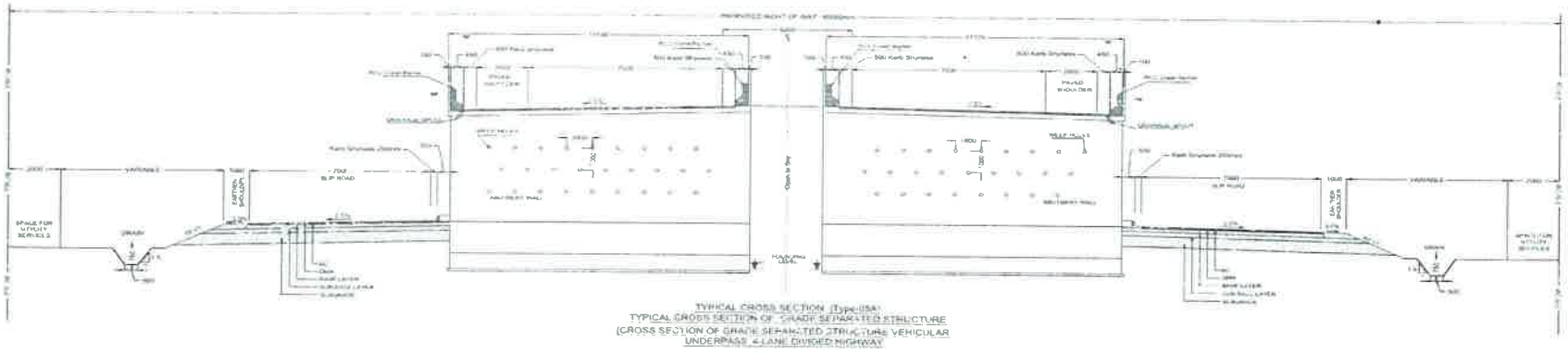

TYPICAL CROSS SECTION (Type-I/SA)
TYPICAL CROSS SECTION OF GRADE SEPARATED STRUCTURE
(CROSS SECTION OF GRADE SEPARATED STRUCTURE VEHICULAR UNDERPASS 4-LANE DIVIDED HIGHWAY

ALL DIMENSIONS ARE IN 'MILLIMETRE'

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA

CONSULTANT: MSV International Inc In Association with Sterling Indo Tech Consultant Pvt Ltd

PROJECT: Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Widening & Rehabilitation etc. to 4 lane of Ambala-Shahzadpur-Narwana-Fatehabad-Hisar road (NH-71) in the State of Haryana

DRAWING: TCS-5A

DRAWN (A) | DESIGNED (B) | APPROVED (C)

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

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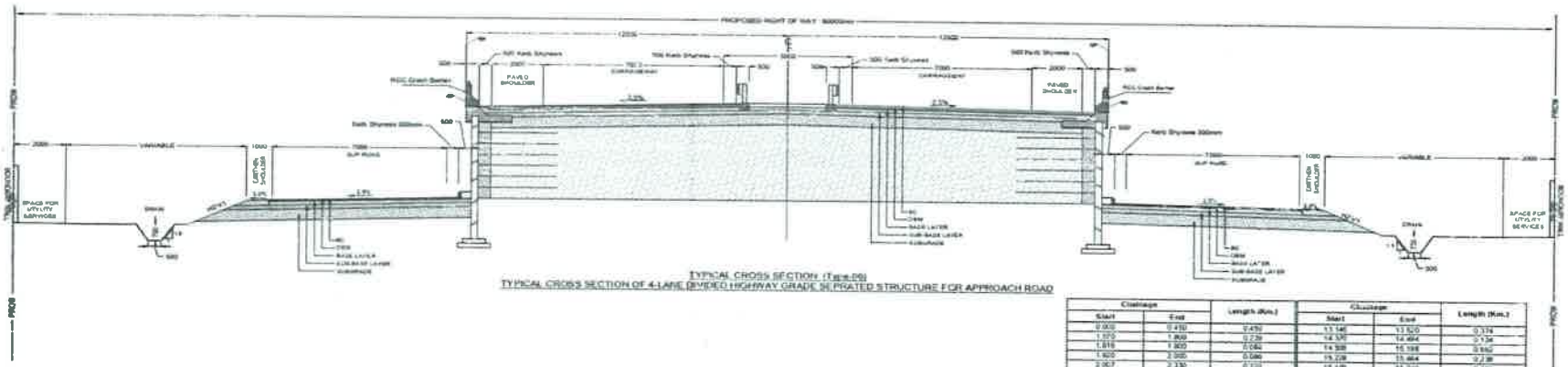


TYPICAL CROSS SECTION (Type-09)

TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY GRADE SEPARATED STRUCTURE FOR APPROACH ROAD

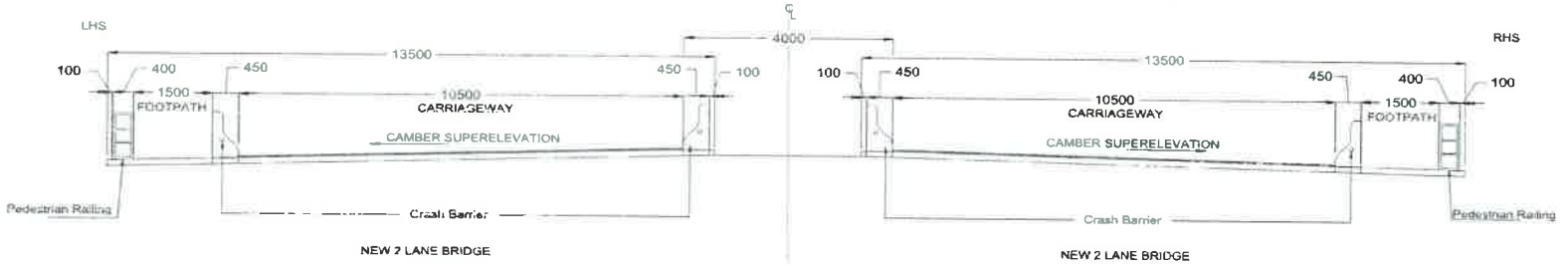
Chainage Start	Chainage End	Length (Km.)
0.000	0.470	0.470
1.070	1.800	0.730
1.816	1.900	0.084
1.900	2.000	0.086
2.007	2.330	0.323
3.309	3.804	0.504
3.961	4.190	0.329
4.990	5.205	0.256
5.307	5.240	0.073
5.309	5.740	0.094
5.367	5.901	0.503
6.470	6.998	0.546
7.506	7.580	0.677
8.300	8.619	0.339
8.631	8.811	0.180
8.916	9.450	0.132
9.955	10.234	0.979
10.245	10.690	0.445
11.900	12.360	0.460
12.267	12.363	0.096
12.423 to 12.440 & 12.467 to 12.730		0.270
12.800	12.870	0.170
12.870	13.118	0.248

Chainage Start	Chainage End	Length (Km.)
13.140	13.520	0.379
14.370	14.494	0.124
14.928	15.198	0.592
15.228	15.464	0.236
15.676	15.770	0.284
16.080	16.360	0.210
16.402	16.765	0.363
19.500	19.944	0.444
19.966	20.700	0.734
20.900	21.234	0.334
21.240	21.670	0.430
21.677 to 21.713 & 21.745 to 21.830		0.12
21.837	22.294	0.457
22.308	22.486	0.184
23.160	23.590	0.430
23.853	23.733	0.280
23.737	24.000	0.263
24.400	24.714	0.314
24.726	25.060	0.334
25.460	25.710	0.250
25.770 to 25.810 & 25.917 to 26.230		0.42
Total		13.331

ALL DIMENSIONS ARE IN 'MILLIMETRE'

		CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT : MSV International Inc. in Association with Sterling Indo Tech Consultant Pvt Ltd.	PROJECT : Consultancy Services for carrying out Feasibility study and detailed project preparation for improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala Bhaiedpur Narangarh Kala Amb Road (Rd-72) in the State of Haryana.	DRAWING: TCS-6	TRAINING NO.: A/TC/S /08 DATE : 2K22
						DRAWN (A) Jitendra / DESIGNED (B) Nilesh / APPROVED (C) Ani Jain

4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).



TYPICAL CROSS SECTION (Type-07)
CROSS SECTION OF BRIDGE WITH FOOTPATH
(CROSS SECTION OF BRIDGE AT DECK LEVEL WITH FOOTPATH FOUR LANE DIVIDED HIGHWAY,
NEW BRIDGE FOR 4 LANE STANDARDS

Chainage		Length
Start	End	(Km.)
1.530	1.570	0.040
11.070	11.170	0.100
16.765	16.915	0.150
26.990	27.110	0.120
31.096	31.103	0.007
31.896	31.903	0.007
32.180	32.200	0.020
Total		0.444

ALL DIMENSIONS ARE IN 'MILLIMETRE'

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA

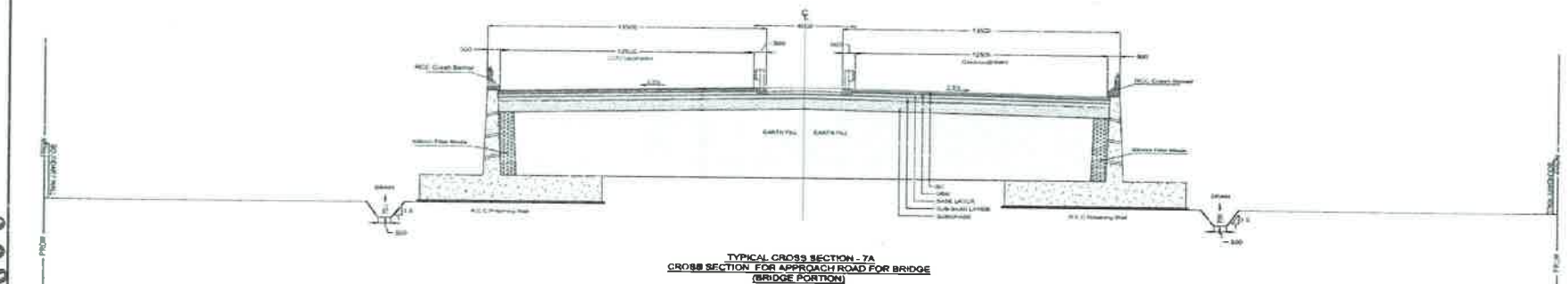
CONSULTANT: MSV International Inc In Association with Sterling Infac Tech Consultant Pvt Ltd

PROJECT: Consultancy Services for Carrying out Feasibility study and detailed project preparation for improvement, Up-gradation, Redesigning, Rehabilitation and Upgradation including 4 laning of Ambala-Shahzadpur-Narangarh Kala Amb Road (NH 72) in the State of Haryana

DRAWING: TCS - 7

DRAWN (A) | DESIGNED (B) | APPROVED (C)

201



TYPICAL CROSS SECTION - 7A
CROSS SECTION FOR APPROACH ROAD FOR BRIDGE
(BRIDGE PORTION)

Chainage		Length (Km.)
Start	End	
9.135	9.330	0.195
10.744	11.070	0.325
11.570	11.730	0.160
11.815	12.140	0.325
Total		1.550

ALL DIMENSIONS ARE IN 'MILLIMETRE'

CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA

CONSULTANT : MSV International Inc In Association with Sterling Indo Tech Consultant Pvt Ltd.

PROJECT : Consultancy Services for carrying out Feasibility Study and detailed project preparation for Improvement, Upgradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Shahzadpur-Naraingarh- Kala Amb Road (NH-72) in the State of Haryana.

DRAWING: TCS - 7A

DRAWING NO.: A/TCS/7/0

DATE: 2022

DRAWN (A)	DESIGNED (B)	APPROVED (C)
Jitendra	Nitish	Atul Jain

4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH-(O).

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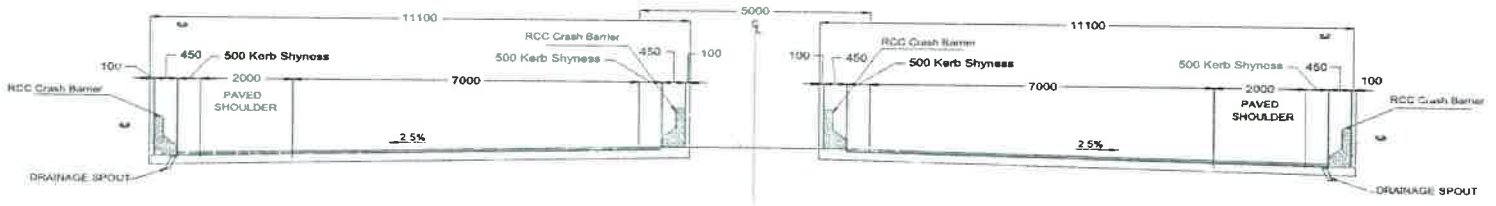


TYPICAL CROSS SECTION - 8A

TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY INTERCHANGE AT DECK SLAB (TRUMPET PORTION)

Start Ch.	End Ch.	Length (Km.)
-0.000	-0.060	-0.060

ALL DIMENSIONS ARE IN 'MILLIMETRE'

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA

CONSULTANT: MSV International Inc. in Association with Sterling Indo Tech Consultant Pvt.Ltd.

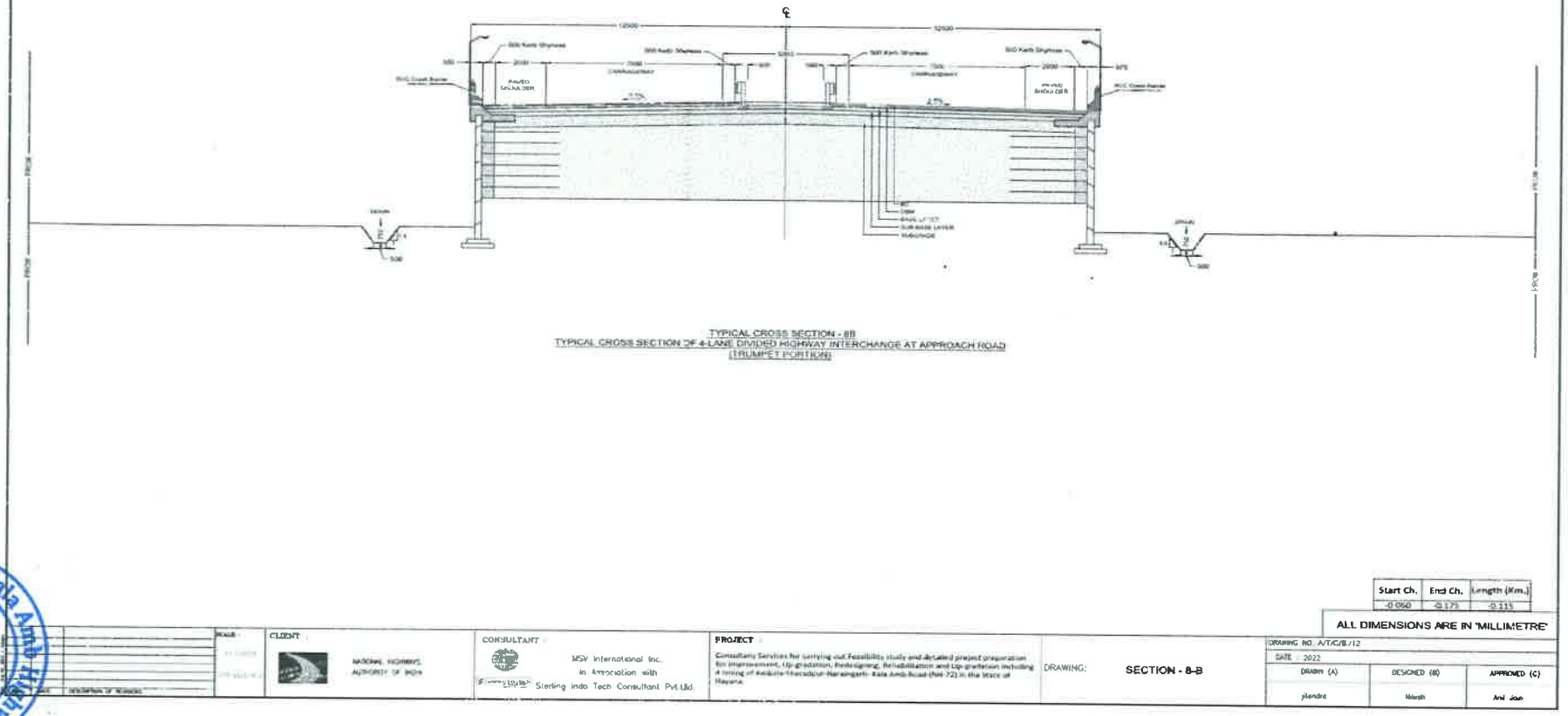
PROJECT: Consultancy Services for carrying out Feasibility Study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Jagadhari-Naraingarh-Kala Amb-Baliko (NH 72) in the State of Haryana

DRAWING: SECTION - 8-A

DRAWING NO.: AJKC/S/11

DATE : 2022

DRAWN (R)	DESIGNED (U)	APPROVED (C)
Jitendra	Mohan	Anil Jain



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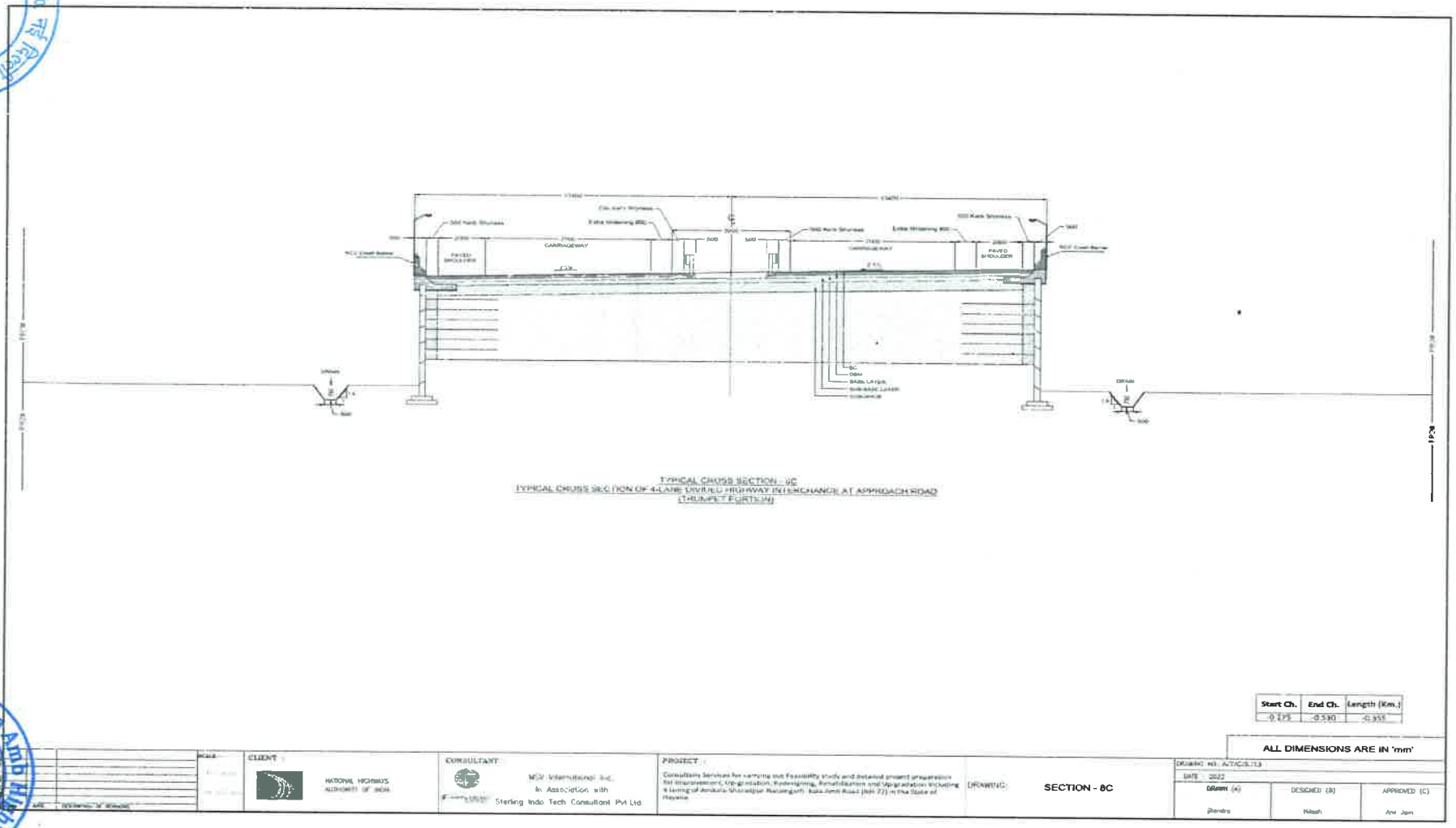
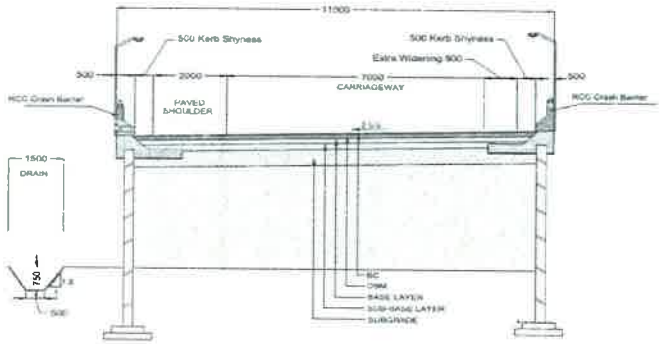
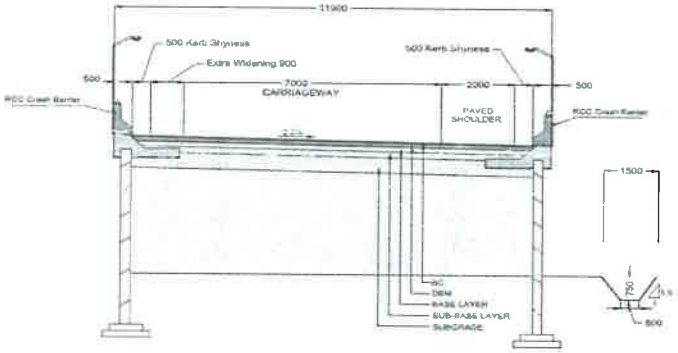

TYPICAL CROSS SECTION - 8C
TYPICAL CROSS SECTION OF 4-LANE DIVIDED HIGHWAY IN INTERCHANGE AT APPROACH ROAD (TRUMPET PORTION)
Start Ch.
End Ch.
Length (Km.)
0.175
0.530
0.355
ALL DIMENSIONS ARE IN 'mm'
CLIENT :
NATIONAL HIGHWAYS AUTHORITY OF INDIA
CONSULTANT :
In Association with
Sterling Indo Tech Consultant Pvt Ltd
PROJECT :
DRAWING :
SECTION - 8C
DESIGNED (B)
APPROVED (C)



TYPICAL CROSS SECTION - 8D
TYPICAL CROSS SECTION OF 2-LANE CARRIAGEWAY
(TRUMPET PORTION)

Start Ch.	End Ch.	Length (Km.)
-0.530	0.770	1.1481



TYPICAL CROSS SECTION - 8E
TYPICAL CROSS SECTION OF 2-LANE CARRIAGEWAY
(TRUMPET PORTION)

Start Ch.	End Ch.	Length (Km.)
-0.530	-0.800	-0.270

ALL DIMENSIONS ARE IN 'mm'

SCALE :-	CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT : MGV International Inc In Association with Sterling Indo Tech Consultant Pvt.Ltd.	PROJECT : Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Widening, Rehabilitation and Up-gradation including strengthening of Ambala-Shahzadpur-Narangarh- Kala Amb Road (NH-72) in the State of Haryana.	DRAWING: SECTION - 8D	DRAWING NO : A/T/C/S/14 DATE : 2022
					DRAWN (A) Jitendra
					DESIGNED (B) Nitesh
					APPROVED (C) Anil Jain

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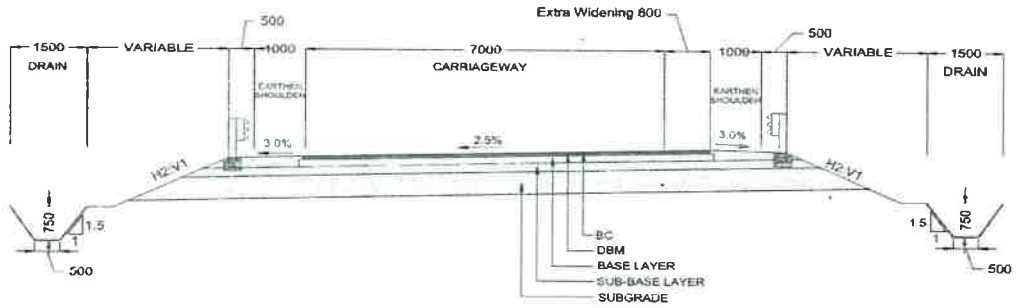
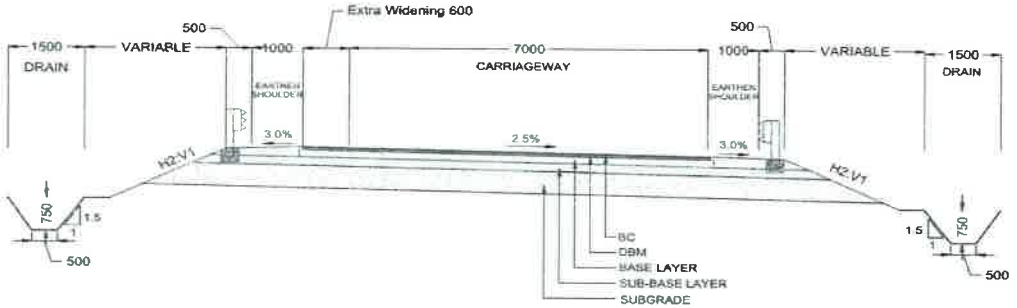


TYPICAL CROSS SECTION - 8F
TYPICAL CROSS SECTION OF 2-LANE CARRIAGEWAY
(TRUMPET PORTION)



TYPICAL CROSS SECTION - 8G
TYPICAL CROSS SECTION OF 2-LANE CARRIAGEWAY
(TRUMPET PORTION)

SCALE -	CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT : MSV International Inc In Association with Sterling Indo Tech Consultant Pvt Ltd.	PROJECT : Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Shazadpur-Naraingarh-Kala Amb Road (NH-72) in the State of Haryana	DRAWING: SECTION - 8F & 8G	DRAWING NO. : A/TICS/15
					DATE : 2022
				DRAWN (A) : ylendra	DESIGNED (B) : Nilesh
					APPROVED (C) : Anil Jain

* ALL DIMENSIONS ARE IN 'MILLIMETRE'

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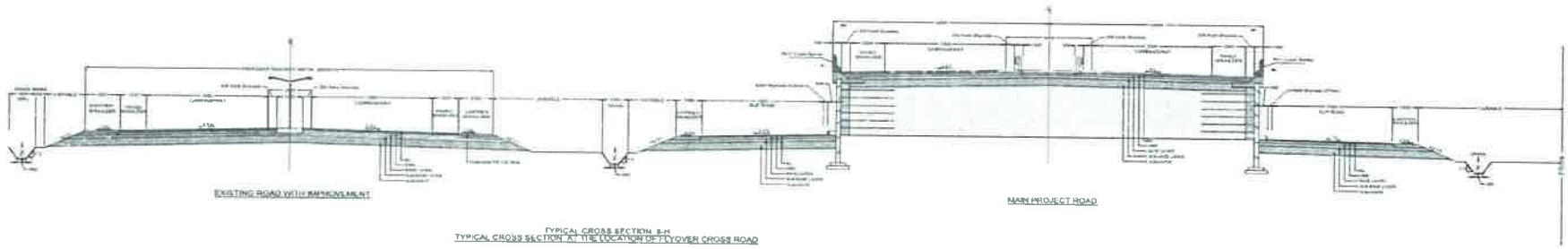

TYPICAL CROSS SECTION B-H
TYPICAL CROSS SECTION AT THE LOCATION OF FLYOVER CROSS ROAD

ALL DIMENSIONS ARE IN 'MILLIMETRE'

CLIENT: NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT: WAY International Inc. In Association with Sterling Infra Tech Consultant Pvt Ltd	PROJECT: Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Shahzadpur-Narayangarh- Kala Amb Road (NH-72) in the State of Haryana.	DRAWING: SECTION - BH	DRAWN (A) Jitendra	DESIGNED (U) Nitesh
				DATE : 2022	APPROVED (C) Anil Jain

4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O)

TYPICAL CROSS SECTION (LOOP/RAMP)

Trumpet at intersection of Ambala-Kala Amb road with Ring Road. Minimum number of traffic lanes required in the opening year on Loop/ Ramp for interchange is as follows:

Sr. No.	Interchange & Chainage (in Km)	Directions	Description/ location	Lane Configuration	Remarks
1	0.000 (0.000 to -.0.800)	Ring road(LHS) to Kala Amb	Entry Road	2 Lane +PS	Applicable Typical Cross Section (to be followed TCS-08A to 8G)
2		Ring road(RHS) to Kala Amb	Entry Road	2 Lane +PS	
3		Kala Amb to Ring road(LHS)	Exit Road	2 Lane +PS	
4		Kala Amb to Ring road (RHS)	Exit Road	2 Lane +PS	

Sr. No.	Flyover & Chainage (in Km)	Directions	Description/ location	Lane Configuration	Remarks
1	25.740	NH-72 to Kala Amb	Entry Road	2 Lane +PS	(Layout Plan attached)
2		NH-72 to Ring Road	Entry Road	2 Lane +PS	
3		Kala Amb to NH-72	Exit Road	2 Lane +PS	
4		Kala Amb to Ring Road	Exit Road	2 Lane +PS	

Note:-

- *The width of Paved Carriageway shall be minimum as given in TCS. However, where toll plaza has to be constructed on Loop/Ramp, the width of Paved Carriageway shall be as per the width of toll plaza lane configuration given in Schedule C including taper length as per manual.*
- *The lane configuration and width of all structures shall be as per respective paragraph of this schedule.*
- *The above lengths are tentative and minimum specified without acceleration / deceleration lane and taper length. The acceleration / deceleration lane and taper shall be constructed as per Schedule D.*

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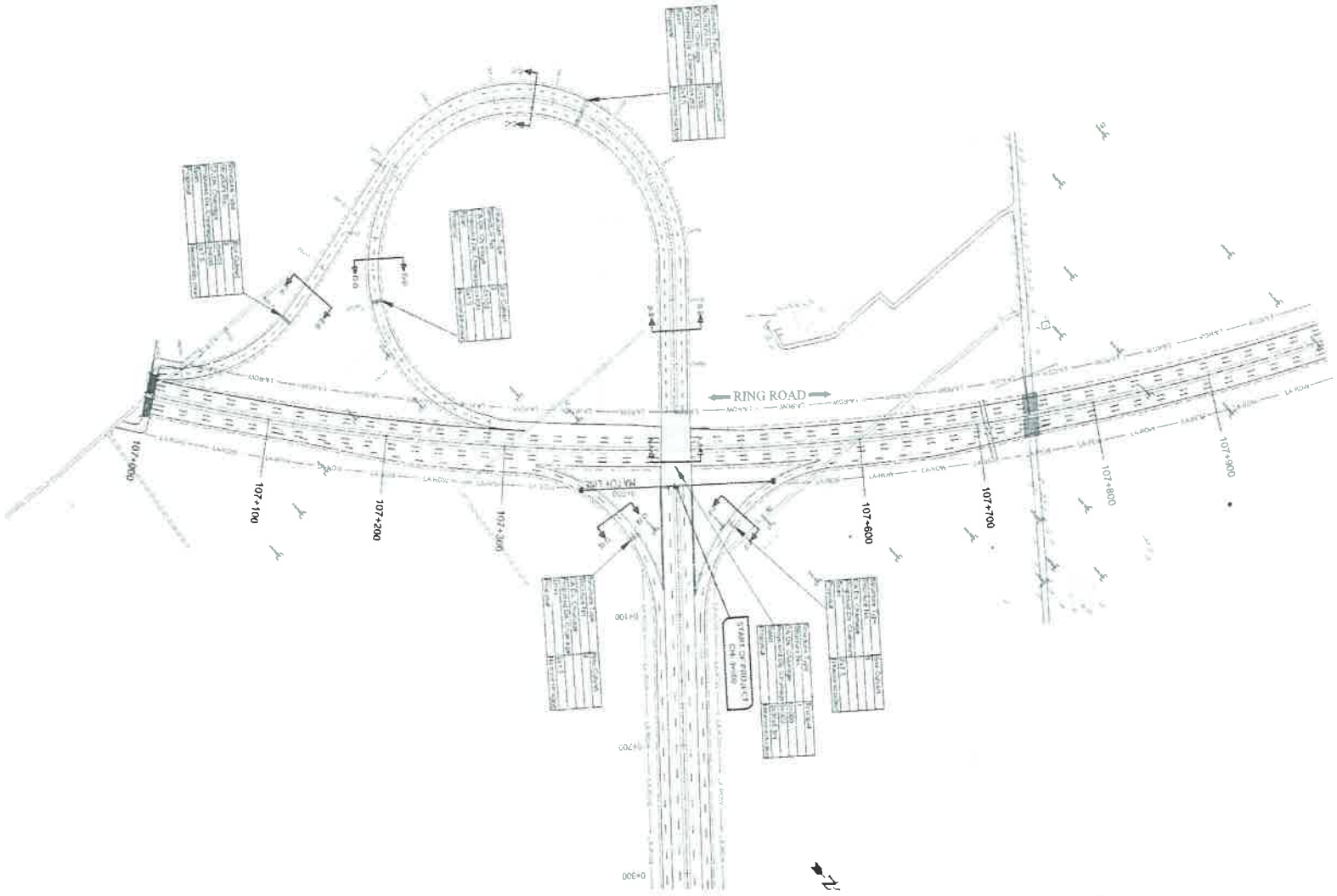

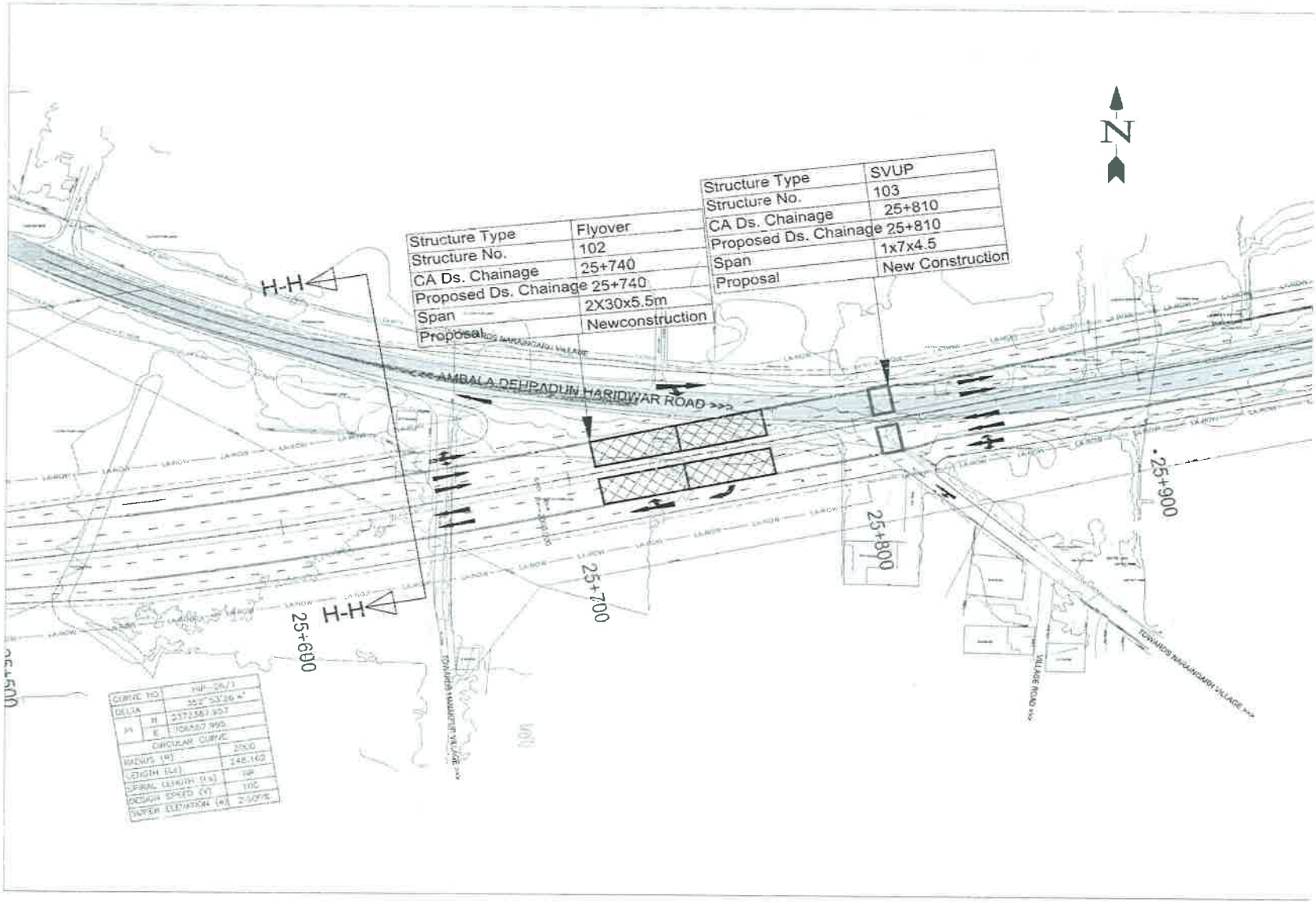
N
H-H
H-H
AMBALA DEHRADUN HARIDWAR ROAD >>>
25+600
25+700
25+800
25+900
TOWARDS NAGANSAHIB VILLAGE >>>
TOWARDS MANJHATAN VILLAGE
TULSI ROAD >>>
Structure Type Flyover
Structure No. 102
CA Ds. Chainage 25+740
Proposed Ds. Chainage 25+740
Span 2X30x5.5m
Proposal Newconstruction
Structure Type SVUP
Structure No. 103
CA Ds. Chainage 25+810
Proposed Ds. Chainage 25+810
Span 1x7x4.5
Proposal New Construction

Annexure – II
(Schedule – B)

Following drawings are enclosed in digital form in CD marked as **Annexure II** of **Schedule B.**

a) Alignment Plan & Longitudinal Profile
b) GAD of Structures
c) Traffic Signage Plan

SCHEDULE – C

(See Clause 2.1)

PROJECT FACILITIES

1. Project Facilities

1.1 The Concessionaire shall construct the Project Facilities in accordance with the provisions of this Agreement. Such Project Facilities shall include.

a) Toll plazas
b) Road side furniture
c) Operation and Maintenance Centers
d) Way side amenities / Service Areas
e) Smaller Parking Places with Toilet Facilities Service Area
f) Bus Bays and Bus Shelters
g) Truck Parking Areas
h) Pedestrian Facilities/ Cattle Crossings/SVUP
i) Lighting
j) Environmental Management Plan
k) Land Scaping and Tree Plantation
l) Advanced Traffic Management System (ATMS)
m) Noise Barriers
n) Utilities
o) Rain water harvesting

1.2 Project Facilities to be completed on or before project completion date have been described in Annex-I of this Schedule-C.

Annex - I
(Schedule-C)

1. Project Facilities

The Concessionaire shall construct the Project Facilities described in this Annex-I to form part of the Project Highway. The Project Facilities shall include:

a) Toll plaza;
b) Roadside Furniture;
c) Pedestrian Facilities;
d) Landscaping and Tree plantation;
e) Truck lay-byes;
f) Bus-bays and bus shelters;
g) Rain water harvesting
h) Others
   i) Street Lighting
   ii) Highway Patrol Units
   iii) A.T.M.S.
   iv) Rest Areas
   v) Emergency Medical Services
   vi) Crane Services
   vii) Communication Services
   viii) Operation and Maintenance center

2. Description of Project Facilities

Each of the Project Facilities is briefly described below:

2.1 Toll Plazas

The Toll Plazas on main carriageway shall be provided as per Schedule D and minimum lane requirement in the opening year are as follows. Toll lanes to be decided as per NHAI Policy Circular No: 17.5.82 dated 24.05.2021.

Sr. No.	Design Chainage (Km)		Minimum Number of Lanes	Remarks	Location
1	17.180	17.840	4+4	Rigid pavement	Exact location shall be decided in consultation with Independent Engineer and NHAI

Entry approach to each toll plaza shall be having Weigh in Motion equipment as per Schedule D and as per NHAI Policy Circular No: 17.5.82 dated 24.05.2021.

Based on the minimum toll lane requirement as given above, toll booths, toll plaza complex, weigh bridges, electrical systems, toll plaza and all other facilities

required/mentioned in manual shall be provided as per Schedule D and as per NHAI Policy Circular No: 17.5.82 dated 24.05.2021 with approval from IE and NHAI. All the structures shall be RCC framed structure as per schedule D.

No. of toll lanes specified above are minimum indicative. The Concessionaire shall design and provide toll lane as per IRC: SP:84-2019 subject to minimum specified above. Any increase in no. of toll lane shall not be treated as change of scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article 16.

RE wall/Retaining wall shall be provided at toll plaza locations to restrict the embankment slope within the right of way.

Toll Plaza shall be aesthetically pleasant and architectural drawing should be as per satisfaction of authority.

Typical Layout plan and Section Elevation of 4+4 (8) Lane Toll Plaza drawing is attached as **Appendix C-V**

2.2 Road side furniture

2.2.1 Kilometer and Hectometer Stones

Kilometer and Hectometer stones shall be provided on both sides of the project highway in accordance with **Schedule - D**.

2.2.2 Road Signs

The Road Signs on Highway shall include road side signs, overhead signs, kerb mounted signs and shall be provided in accordance with IRC-67-2012 and **Schedule - D**.

2.2.3 Road Marking

The Road Marking on Highway shall be provided in accordance with IRC-35-2015 and **Schedule - D**.

2.2.4 Road Delineators

The Road Delineators on Highway shall be provided in accordance with IRC:79-2019 and **Schedule - D**.

2.2.5 Road Studs

Road Studs on Highway shall be provided in accordance with IRC:35-2015 and **Schedule - D**.

2.2.6 Traffic Impact Attenuators

The Traffic Impact Attenuators on Highway shall be provided in accordance with **Schedule - D**.

2.2.7 Overhead/Traffic Signs (excluding overhead signs at Toll Plaza

Excluding overhead signs at Toll Plaza location which are to be provided as per manual of specifications and standards as referred in Schedule-D, the over-head traffic signs shall be provided at following tentative locations, which shall be finalized in consultation with Independent Engineer/Project Director, NHAI.

Sl. No.	Location	Type of Sign
1	0.000	Over Head Gantry
2	1.909	Over Head Gantry
3	5.291	Over Head Gantry
4	12.393	Over Head Gantry

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Sl. No.	Location	Type of Sign
5	13.131	Over Head Gantry
6	15.213	Over Head Gantry
7	21.730	Over Head Gantry
8	23.620	Over Head Gantry
9	25.757	Over Head Gantry
10	33.000	Over Head Gantry

Note: Above are minimum number of overhead gantry to be provided. The actual numbers and location of Traffic Signages shall be determined by the Concessionaire in accordance with the IRC: SP: 84-2019 requirements with approval from the Independent Engineer. Any increase in the number and type of road sign boards and overhead gantry shall not constitute change of scope.

2.2.8 Crash Barriers

Thrie Beam crash barriers shall be provided in entire length as per TCS referred in schedule-B but excluding stretches covered by bridges/RE wall/structures, or where New Jersey crash barriers to be provided.

Thrie beam Crash Barrier shall be provided in a minimum length 100.00 Km at median, Road edge etc. Any increase in length as per site condition shall not constitute change of scope.

Concrete Crash barriers shall be provided on bridges/structures/ VUPs/ LVUPs/ SVUPs, RE Walls, retaining wall as specified in Schedule B and Schedule D.

As per NHAI Circular dated 01.01.2020, before erecting thrie beam crash barrier on National Highway, it should be crash tested 'Road restraint system' and should meet the requirements of EN 1317 Part-2: Performance classes, impact test acceptance criteria and test methods for safety barriers and vehicle parapets and/or to the requirement of the American Manual for Assessing Safety Hardware (MASH). The manufacturer or the concessionaire shall demonstrate the compliance of these requirements by submission of videos of actual crash testing along with authenticated crash test reports. The crash tests must have been conducted in accredited crash test laboratories/ institutions.

The selection, design, installation and maintenance of the crash barrier must consider the operation of the barrier as the entire system. This should also include all addition components such as transition, end terminals etc. All road safety barrier installed on the road network must be installed and maintained by qualified personnel. The primary criteria for the approval of the crash barrier is that it must have been successfully crash tested and result evaluated in accordance with EN 1317 part-Z and/ or MASH.

The posts, spacers, beam and fasteners of crash barriers shall be galvanized by hot dip process unless otherwise specified. The galvanizing on all other steel parts shall conform to the relevant IS specifications. All fittings (bolts, nuts and washers) shall confirm to the IS1364 and IS 1367.

2.2.9 Cement concrete safety Barrier

Cement Concrete safety Barrier shall be provided on bridges, structures, VUPs, LVUPs, SVUPs and Re wall, retaining wall, interchange (Trumpet) etc. As per fig 29 of IRC 119-2015 A minimum length of 36126 m concrete safety barrier shall be provided. Any increase in length as per site condition shall not constitute a change of scope.

2.2.10 Boundary Wall/ Boundary Pillar

RCC Boundary wall shall be provided on both side at PROW in open area in a length of 2x28.041=56.082 Km. and height 1.5 m as per drawing at Appendix C-III. Boundary wall drawing is attached as **Appendix C-III.**

2.3 Operation and Maintenance centers

Dedicated operation and maintenance center shall be provided in accordance to Schedule D.

2.4 Way side Amenities / Rest Areas

2.4.1 Facilities

A) Way side Amenities: Nil

B) Rest area

Rest Areas shall be provided as per Clause 12.9 of IRC: SP-84:2019 at the following location.

Design Chainage (km)		Length (m)	Side	No.
From	To			
NIL				

2.4.2 Specifications and Standards for above facilities

The Project shall be constructed in conformity with the Specifications and Standards specified in this schedule and Schedule-D.

2.5 Pedestrian Facilities

Pedestrian facilities shall be provided as stipulated in section 12.4 of the Manual of specification and standards for Four-laning of Highways (IRC: SP:84-2019).

2.6 Truck Lay-Bye

As stipulated in section 12.6 of the Manual of Specifications and Standards for Four-laning of Highways (IRC: SP: 84-2019), The Location of Truck lay bye is given below:

Design Chainage (km)		Length (m)	Side	No.
From	To			
3.880	4.120	240	LHS	1
32.380	32.620	240	RHS	1

Note:- The Concessionaire shall design the Truck lay bye within the PROW as per Schedule-B and in consultation with NHAI and consultant of the project.

2.7 Bus Bays and Bus Shelters

Bus bays with Bus shelter shall be provided as stipulated in section 12.7 of the

Manual of Specifications and Standards for Four-laning of Highways (IRC: SP: 84-2019) at following locations:-

S No.	Design Chainage (in km)	Side	No. of Bus Lay bye with bus shelters	Remarks
1	3+700	LHS	1	-
2	3+960	RHS	1	-
3	5+100	LHS	1	-
4	5+500	RHS	1	-
5	9+500	LHS	1	-
6	9+750	RHS	1	-
7	12+600	LHS	1	-
8	12+750	RHS	1	-
9	15+100	LHS	1	-
10	15+300	RHS	1	-
11	16+500	LHS	1	-
12	16+650	RHS	1	-
13	20+550	LHS	1	-
14	20+700	RHS	1	-
15	29+700	LHS	1	-
16	31+700	RHS	1	-
17	32+400	LHS	1	-
18	32+900	RHS	1	-

Note:- The Concessionaire shall design the Bus Bays and Bus Shelters within the PROW as per Schedule-B and in consultation with NHAI and consultant of the project.

Bus bay drawing is attached as **Appendix C-II.**

2.8 Lighting

The Concessionaire shall provide LED based lighting at slip road, service road, cross road below VUP, LVUP, SVUP, flyover,6x3m size box culvert, over VUP, LVUP, SVUP, flyover, and at at grade intersection with cross road and locations as specified in Section 12.5.3 of the Manual of Specifications and Standards for Four-laning of Highways (IRC: SP: 84-2019) and as per **Schedule – D**.

Minimum number and type of lighting shall be as follows and any increase as per site condition and as per direction of IE and NHAI shall not constitute change of scope:

1 Single arm light poles with all accessories = 104 nos
2. Double arm light poles with all accessories = 2000 nos.
3. Solar Lights at Bus lay byes, Truck lay byes & Rest Ares = 200 nos.
4. High Mast Lights with all accessories = 05 no.

Minimum level illumination on locations of the Project Highway, Slip Roads, Cross Roads below and above VUP/LVUP/SVUP and Flyovers, at grade intersections with Cross roads, where exterior lighting is provided shall be 40 lux. In general, 'code of practice for lighting of public thoroughfare IS 1944 shall be followed. All facility buildings shall be illuminated adequately.

The electrical connection with all its infrastructures, Operation & maintenance cost of streetlight shall be borne by the concessionaire and additional battery backup shall be provided during construction and concession period.

2.9 Environmental Management Plan

The Concessionaire shall implement the Environmental Management plan & action Plan for undertaking possible mitigation measures in accordance with guidelines for Highway Projects of the Ministry of Environment and Forests and Wild life Department. The conditions & directions stipulated by the MOEF &CC shall be made available by the Authority.

2.10 Land Scaping and Tree Plantation

The Concessionaire shall do landscaping and plant trees and shrubs of required numbers and types at the appropriate locations within Right of Way and in the land earmarked by the Authority for afforestation as per Schedule D as given below.

I. **Shrubs:** Shrubs as Median plantation including maintenance shall be as per provision of IRC SP-21.

II. **Land Scaping:** landscaping of the highway shall be done as per Manual and IRC: SP-21 at all the locations envisaged therein, but not limited to the following

(a) Below the Grade Separated intersections, Entry & Exit Ramps and Islands of At grade intersections, at interchange (trumpet) etc.

(b) At Toll Plaza Area, land scaping and tree Plantation shall be provided in accordance with the Manual of Specifications and Standards as referred in Schedule D and in accordance with National Green Highway Policy 2015.

III. **Plantation:** Plantation shall be done in available open land within PROW as per Manual and IRC: SP-21.

Minimum number of trees/Shrubs to be planted are 12,000 Nos in median and 20,000 tree in Avenue. In lieu of trees cut during construction within ROW 40,000 Nos plants in addition to above shall be planted in land earmarked by forest department/Authority.

Total plantation to be done shall be 12,000 Nos (Median) +20,000 Nos. (Avenue) + 40,000 Nos. (Forest land) = 72,000 Nos (total).

Drip irrigation system for median plantation by gravity/pressure sources with all necessary components / systems and emitting devices at plants shall be provided.

The Concessionaire shall maintain the trees and shrubs in good condition during concession period as per the maintenance schedule.

Geotagging of all plants (trees and shrubs) shall be done by concessionaire.

2.11 Pedestrian facilities

Pedestrian facilities shall be provided as per section 9.8 of IRC:84-2019. Pedestrian guard rails shall be provided at hazardous locations, At Junctions/Intersections, Schools, Bus Stops, Central Reserves etc. as per section 9.8 IRC:84-2019 but not limited to following: -

S. No.	Start Chainage	End Chainage	Length (Km)
01	29.100	29.500	0.400x2
02	30.750	31.096	0.346x2
03	31.103	31.896	0.793x2
04	31.903	32.180	0.277x2
05	32.200	33.015	0.815x2
Total Length (Km)			**2.631x2 = 5.262**

2.12 Advanced Traffic Management System (ATMS)

Advance Traffic Management System shall be provided as specified as per Schedule B and Schedule – D and as per manual IRC: SP 84; 2019 and as per ATMS functional.

The Concessionaire is required to design, install, operate and maintain Highway Traffic Management System (HTMS) / Advanced Traffic Management System (ATMS) as part of the project facilities.

2.13 Noise Barriers

The Concessionaire shall provide Noise barriers at the following locations:

Sl. No.	Design Chainage	Location	Remarks
NIL			

2.14 Anti-Glare Screen

Anti-glare screen shall be provided in the median where median width is 2.5m (including kerb shyness) for enhancing road safety in minimum length of 6.421 Km.

Specifications of anti-glare screen shall be as per the following:

- Top of the Screen shall be at least 1.8m above the finished road level
- Shall be able to block light at angles from 0° to 20°
- Shall be installed inclined to the median
- Spacing (D) and the angle of inclination (x) shall be decided on the basis of the curvature of the road following the equation given below:
    - Cut-off angle = 20°+Θ, as defined by National Cooperative Highway Research Program (NCHRP): 66, 1979
    - x = angle of inclination w.r.t. median centre line
    - Spacing of anti-glare screen (D) in meters = B x [cot (x) + cot(20°+Θ)], where

  Θ = degree of curvature of road in degree = 1746 / R, where R = radius of median centerline in metres
  B = width of the anti-glare screen in metres
- Shall be double sided along with retro-reflective marking along edges of both sides of the screen
- Shall be water resistant, resistant against corrosion and UV radiation and can stand against most arduous traffic conditions
- Shall be acceptable at temperature between -10°C and +60°C
- The system structure shall be capable to withstand wind speed of 150 km/h
- Shall have no sharp edges and corners on which people can get hurt
- Easy to install

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- Shall not discolor
- Aesthetically pleasing with green body to make the drive comfortable

The Concessionaire shall provide Anti-glare at the following locations:

S. No.	Chainage		Length (Km.)
	From	To	
01	26.2	26.9	0.70
02	27.22	31.096	3.876
03	31.103	31.896	0.793
04	31.903	32.18	0.277
05	32.2	33.015	0.815
Total			**6.461**

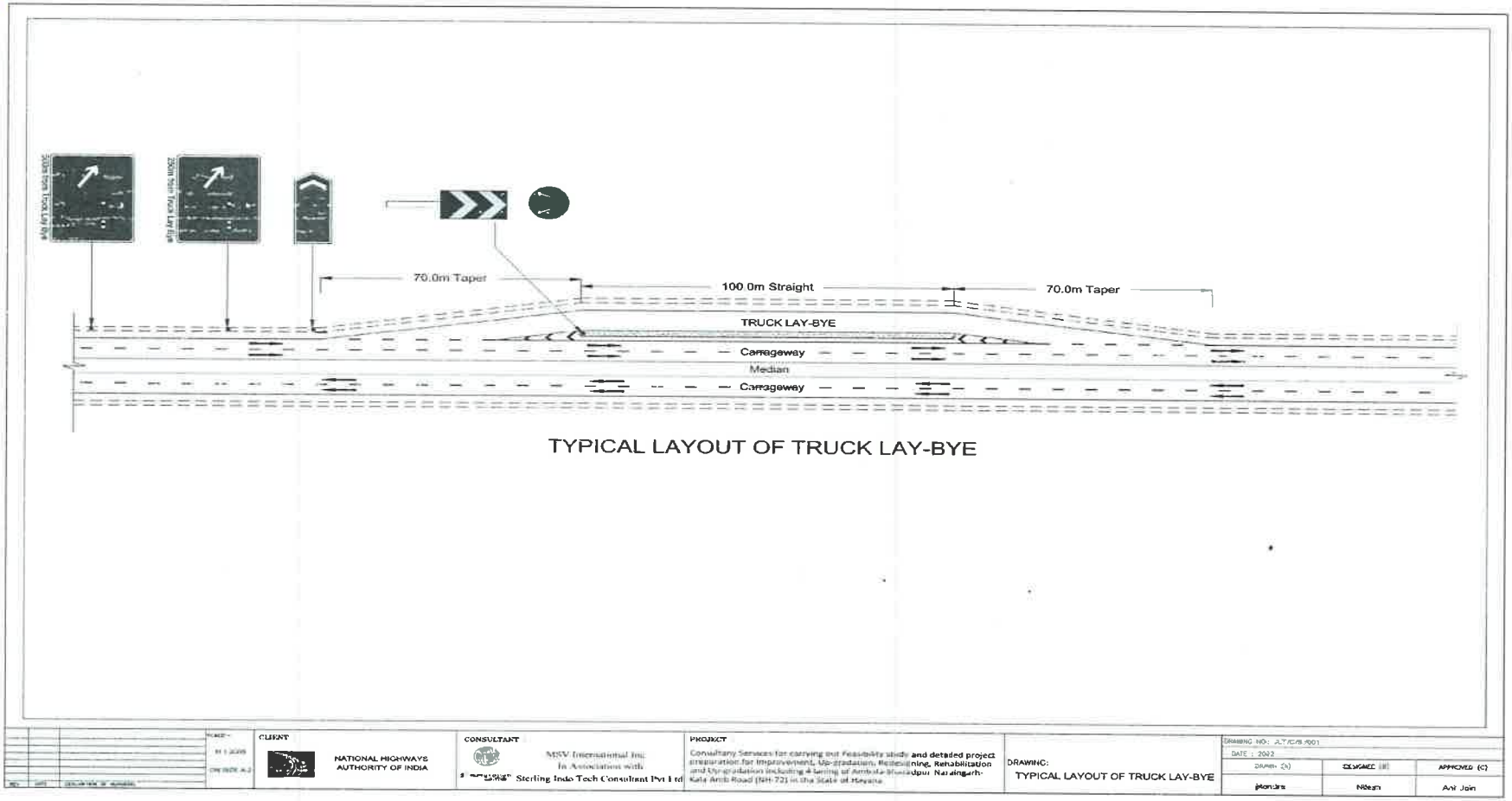
2.15 Utilities Ducts

Provision of accommodating utilities shall be made within utility corridor on either side of Project Highway. Box culverts proposed in Schedule B shall be used for crossing of underground utilities, wherever required. Location for such utility crossing shall be finalized in consultation with Independent Engineer.

2.16 Rain Water Harvesting

As per Ministry of Environment and Forests Notification, New Delhi dated 14.01.1997 (as amended on 13.01.1998, 05.01.1999 & 6.11.2000), the construction of rain water harvesting structure is mandatory in and around Water Crisis area, notified by the Central Ground Water Board. Rain water harvesting shall be provided at every 500m in the entire project length and shall be executed as per requirement of IRC SP: 42-2014, IRC SP: 50-2013, RW/NH-33044/14/2003-S&R(R) Pt-II Dated 3 Sept.2019 and MoRTH Circular No. No. RW/NH-33044/14/2003-S&R(R) (Pt-II) Dated 5 Sept.2013. Rain water harvesting shall also be provided at all WSA. Rain Water Harvesting drawing is attached as Appendix C-IV.

Appendix C-I



TYPICAL LAYOUT OF TRUCK LAY-BYE

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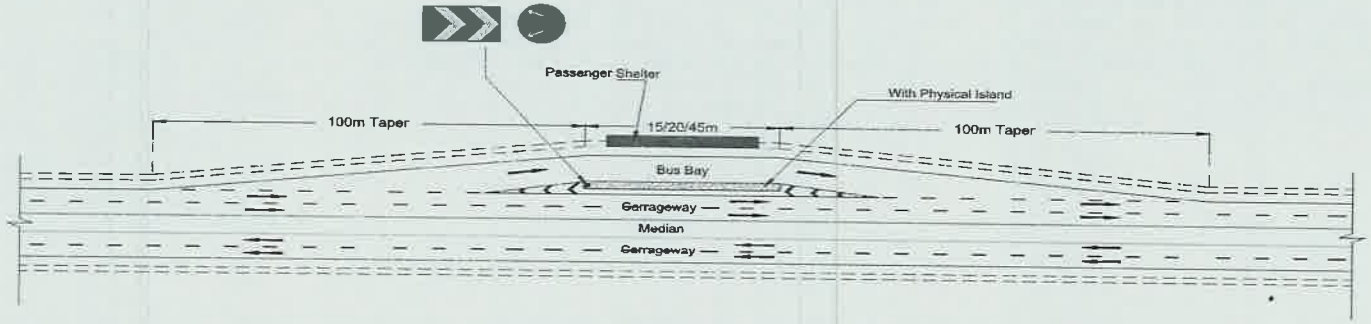
Appendix C-II



TYPICAL LAYOUT OF BUS BYE

SCALE :- H.1:2000 V.NA ON SIZE A-2	CLIENT : NATIONAL HIGHWAYS AUTHORITY OF INDIA	CONSULTANT : MSV International Inc In Association with Sterling Indo Tech Consultant Pvt Ltd	PROJECT: Consultancy Services for carrying out Feasibility study and detailed project preparation for Improvement, Up-gradation, Redesigning, Rehabilitation and Up-gradation including 4 laning of Ambala-Shazadpur-Naraingarh-Kala Amb Road (NH-72) in the State of Haryana.	DRAWING: TYPICAL LAYOUT OF BUS BYE	DRAWING NO.: AJT/C/S.A02 DATE : 2022

DRAWN (A)	DESIGNED (B)	APPROVED (C)
Jitendra	Nilesh	Anil Jain

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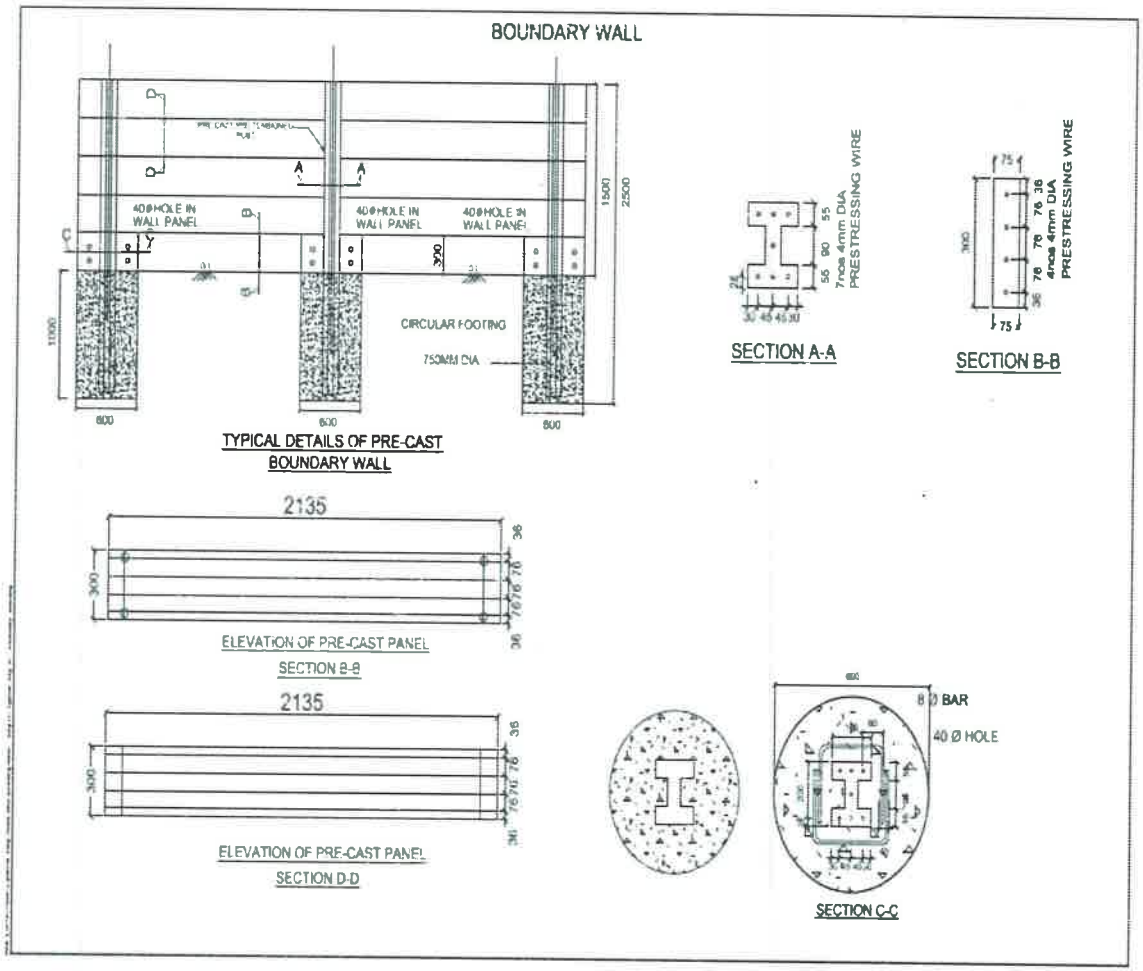
Road Boundary wall

Appendix C-III



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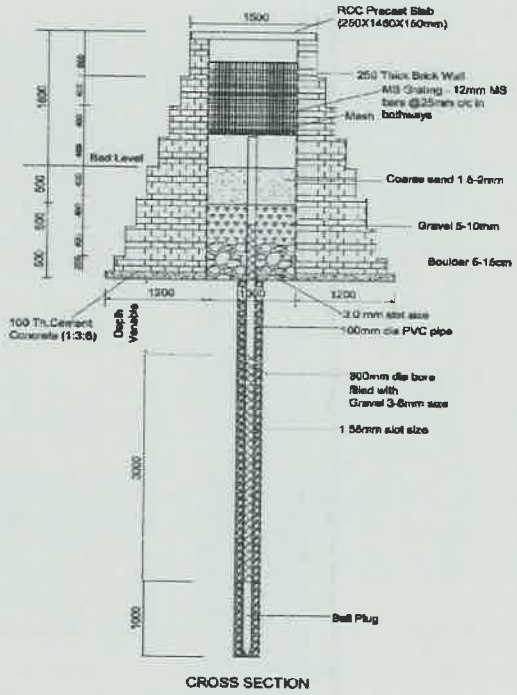
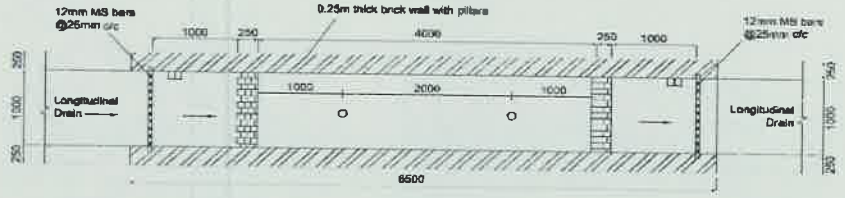
RAIN WATER HARVESTING

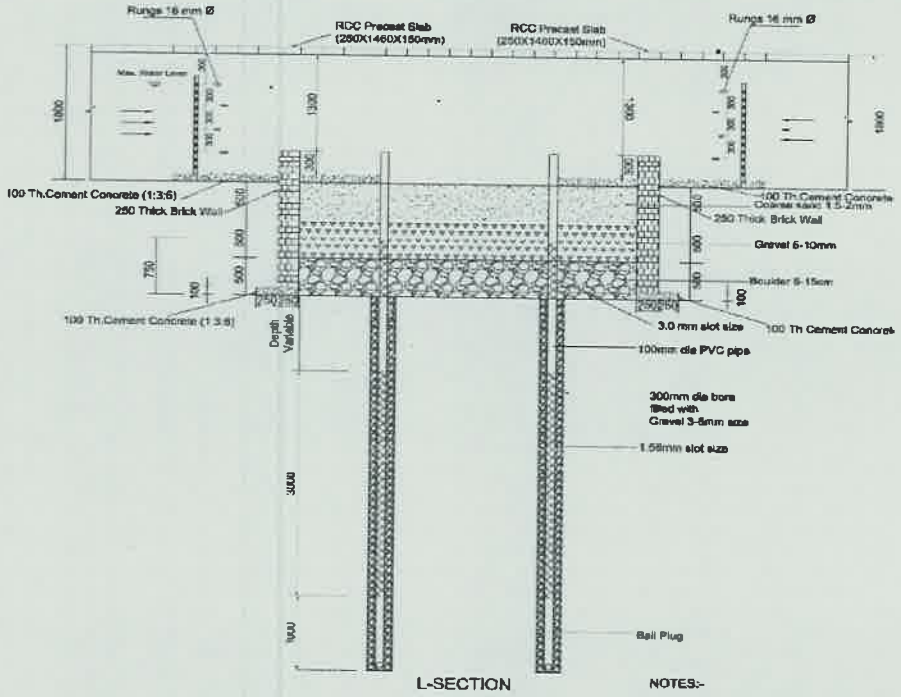
Appendix C-IV



CROSS SECTION



PLAN



L-SECTION

NOTES:-

All dimensions are in mm unless otherwise specified.

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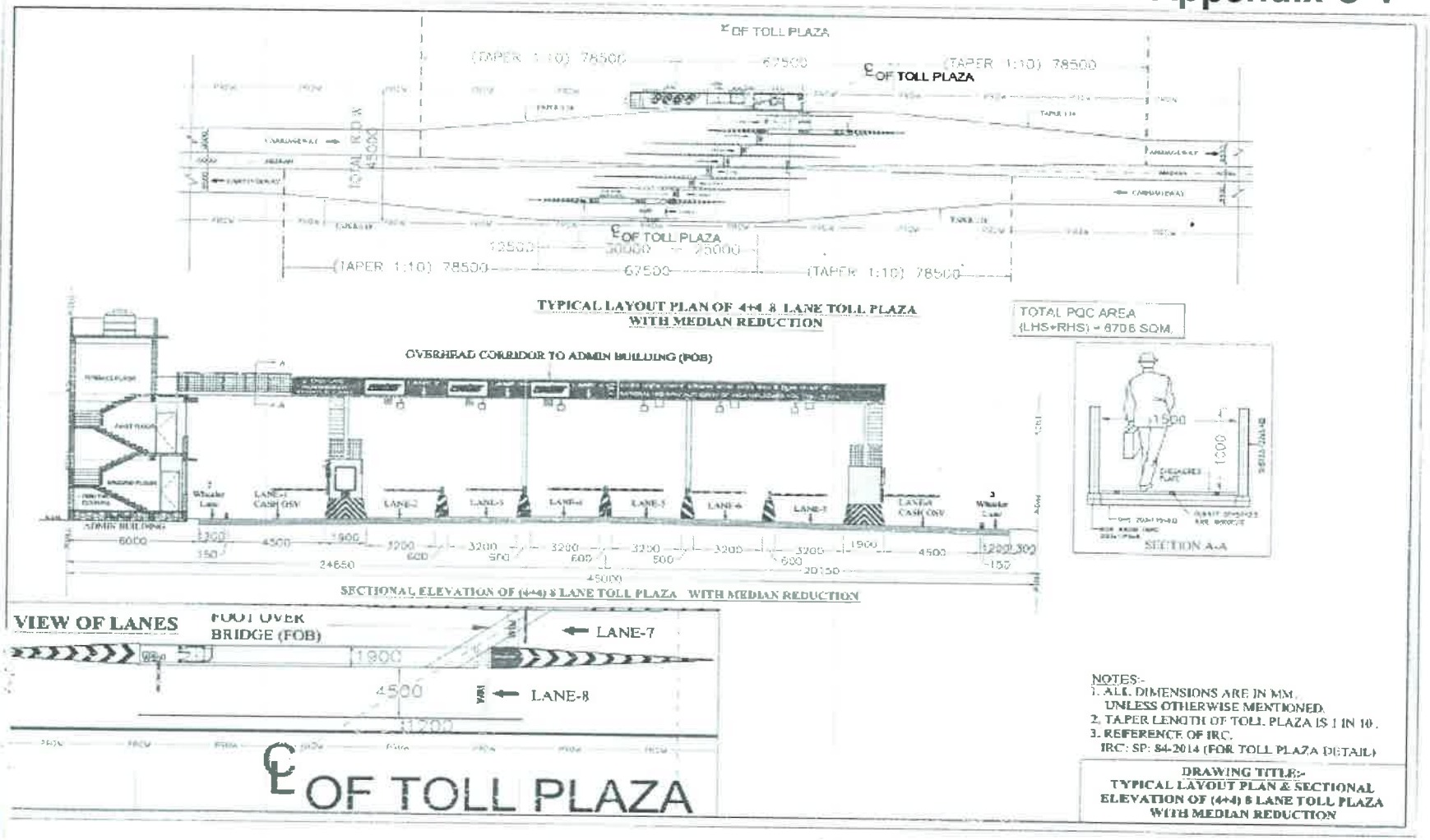
Appendix C-V



Typical Layout plan and Section Elevation of 4+4 (8) Lane Toll Plaza

SCHEDULE – D

(See Clause 2.1)

SPECIFICATIONS AND STANDARDS

1. Construction

The Concessionaire shall comply with the Specifications and Standards set forth in Annex-I of this Schedule-D for construction of the Project Highway.

2. Design Standards

The Project Highway including Project Facilities shall conform to design requirements set out in the following documents.

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Annex - I
(Schedule-D)

SPECIFICATIONS AND STANDARDS FOR THE PROJECT

1 Manual of Specifications and Standards to apply

(i) Four laning of the Project Highway shall conform to the all relevant IRC codes 'Manual of Specifications and Standards for Highway' published as IRC: SP: 84-2019 (Referred to as "Manual in this Schedule), NHAI Policy Guidelines specified in Policy Circular No. 17.5.82 dated 24th May 2021 all relevant IRC codes, all NHAI policy guidelines specified in policy circular with all amendments and additions up to Bid date and MORTH Specifications for Road and Bridge Works (5th revision). Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Independent Engineer.

(ii) As regards, the work of utility shifting, the relevant specifications, relevant rules, regulations and acts of Utility Owning Department/Agencies shall be applicable

2 Deviations from the Manual

Notwithstanding anything to the contrary contained in the aforesaid Manual, the Specifications and Standards shall apply to the Project Highway, and for purposes of this Agreement, the aforesaid Manual shall be deemed to be amended to the extent set forth below:

Sl. No.	Clause No.	Details of Item	Description of Deviation
1	2.5.1	Median	The median shall be as given in Schedule B (TCS).
2	2.10.2	Lateral & vertical clearance at VUP /LVUP/SVUP	The lateral and vertical clearance of all underpasses shall be as given in Schedule B.
3	2.6.1	Shoulders	The shoulders shall be as given in Schedule B (TCS).
4	2.17	Typical Cross Section	The typical cross section shall be as given in Schedule B.
5	5.2 and 5.5	Type of Pavement and Design Requirements	The type of pavement shall as specified in Schedule B.
6	7.3	Overall width of structures	The Overall Deck Configuration of all structures shall be as per Schedule B.
7	6.2	Side Drains	Lined/unlined Side Drains shall be provided throughout the Project as per typical cross section except cross drainage (River, nala, canal etc.)
8	Section 10	Toll Plaza	As per NHAI Circular No. 17.5.82 dated 24.05.2021.
9	7.19 Fig. 7.8	Cross-section of grade separated structure vehicular underpass and elevated section	For all Underpass/VUP/LVUP/SVUP • 10m carriageway width, Overall carriageway width 11.100m shall be provided. • 0.450m RCC Concrete crash barrier

Sl. No.	Clause No.	Details of Item	Description of Deviation
10	7.3 Fig. 7.2A	Cross-Section of Bridges at Deck Level-with Footpath	For Bridge • 10.5m main carriageway width, Overall carriageway width 13.5m shall be provided • 0.400m PGR • 1.5m footpath • 0.450m RCC Concrete crash barrier shall be provided.
11	9.7.1.4	Cross-Section of Bridge and Grade separated structures at approach road	• As per TCS

Deficient Curves: For rolling Terrain as per IRC 38: 1988 design speed is 100 km/h. Accordingly curves having speed less than this have been considered as deficient curves to accommodate within 30m ROW in forest area and detail are as below: -

Horizontal curve:-

S. No.	START CHAINAGE (km)	END CHAINAGE (km)	HORIZONTAL CURVE LENGTH (m)	RADIUS (m)	DESIGN SPEED (kmph)	SUPER-ELEVATION (%)	SIDE
1	26+260.469	26+370.333	109.864	185	65	5.000	Right
2	26+524.421	26+942.820	418.399	500	65	3.756	Left
3	27+134.069	27+288.662	154.593	140	65	5.000	Left
4	27+354.725	27+447.484	92.759	142	65	5.000	Right

Vertical curve:-

S. No.	START CHAINAGE (km)	END CHAINAGE (km)	VERTICAL CURVE LENGTH (m)	DESIGN SPEED (kmph)
1	25+325.780	25+770.000	300	80
2	25+709.545	26+164.099	300	80

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Annex - II
(Schedule-D)

ADVANCED TRAFFIC MANAGEMENT SYSTEMS (ATMS)

The following Specifications and Standards shall be applied in addition to 'IRC: SP: 84-2019' with all amendments and additions till date.

Functional & Technical Specifications of ATMS on NH as enclosed as Annex-II (Schedule-D).

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Annex-II

Advance Traffic Management System (ATMS) on National Highways

Functional and Technical Specifications

National Highways Authority of India

Gadkari, Sector-10, Dwarka, New Delhi-110075

Abbreviations

The following abbreviations shall refer to the words presented hereunder throughout Particular Technical Specifications:

Acronym	Definition
ANPR	Automatic Number Plate Reader
ANSI	American National Standards Institute
API	Application Programming Interface
ATCC	Automatic Traffic Counter and Classifier
ATMS	Advance Traffic Management System
ATS	Automatic Transfer Switch
CCD	Charge Coupled Device
CCTV	Closed Circuit Television
CIF	Common Intermediate Format
CMOS	Complementary Metal-Oxide-Semiconductor
CSMA/CD	Carrier Sense Multiple Access with Collision Detect
D/D	Detailed Engineering Design
DC Power	Direct Current Power
DCT	Discrete Cosine Transform
DDR	Dual Data Rate
DEG	Diesel Engine Generator
DLP	Defects Liability period
DSF	Dispersion- Shifted Fibre
ECC	Error Correcting Code
ECS	Emergency Call System
EIRP	Equivalent Isotropically Radiated Power
EIRR	Economic Internal Rate of Return
ETC	Electronic Toll Collection
ETSI	European Telecommunications Standards Institute
F/S	Feasibility Study
FOC	Fibre Optic Cable
FON	Fibre Optic Node
FTP	File Transfer Protocol
GBIC	Gigabit Interface Converter
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HDTV	High-definition Television
HTTP	Hypertext Transfer Protocol
IC	Interchange
IC Card	Integrated Circuit Card (ICC)
IHMCL	Indian Highway Management Company Limited
IP	Internet Protocol
IP-PBX	Internet Protocol - Private Branch Exchange
ISO	International Organization for Standardization
IT	Information Technology
ITS	Intelligent Transport System
IMS	Incident Monitoring System
ITU-R	International Telecommunication Union – Radio communications Sector
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
JPEG	Joint Photographic Experts Group
LAN	Local Area Network

Acronym	Definition
LED	Light-emitting Diode
MCBF	Mean Cycle Between Failures
MoRTH	Ministry of Road Transport and Highway
MPEG	Moving Picture Experts Group
MTBF	Mean Time Between Failures
MTTR	Mean Time to Repair
NH	National Highway
NHAI	National Highways Authority of India
NTP	Network Time Protocol
VRS	Video Recording Server
O&M	Operation and Maintenance
OD	Origin/Destination
ONVIF	Open Network Video Interface Forum
P/Q	Prequalification
PA	Parking Area
PBX	Private Branch Exchange
PCS	Physical Coding Sublayer
PCU	Passenger Car Unit
PDB	Power Distribution Board
PIU	Project Implementation Unit
PMU	Project Management Unit
PPP	Point – to – Point Protocol
PTZ	Pan, Tilt, and Zoom (function)
PVC	Polyvinyl Chloride
QCIF	Quarter Common Intermediate Format
RAID	Redundant Array of Inexpensive Disks
RFP	Request for Proposal
SDH	Synchronous Digital Hierarchy
SDTV	Standard-definition Television
SIM	Subscriber Identity Module
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
TCP	Transmission Control Protocol
TEDI	Transport Engineering Design. Incorporated
TMCS	Traffic Monitor Camera System
TMC	Traffic Management Centre
TMS	Toll Management System
TOR	Terms of Reference
TTMS	Travel Time Measurement System
UDP	User Datagram Protocol
UPS	Uninterruptible Power Supply
VIDS	Video Incident Detection System
VoIP	Voice over IP
VSDS	Vehicle Speed Detection System

Section 01 General Requirements

1. Background

This document is a part of a set of documents to facilitate NHAI for implementation of the Advanced Traffic Management System on National Highways. Government of India, Ministry of Road Transport and particularly, NHAI have taken the initiative to provide guidelines for ATMS implementation in the past and the references can be found in IRC:SP:87-2013 (Manual of Specification and Standards for Six-laning of Highways through PPP), IRC:SP:84- 2014 (Manual of Specification and Standards for Four-laning of Highways through PPP), and MoRTH manual prescribing Specification for Road and Bridge Works (5th Revision) etc. As these references focused broadly on road infrastructure development, this document is focused mainly on implementation of comprehensive and integrated Advanced Traffic Management System (ATMS) on National Highways to serve the desired purpose of Intelligent Transportation Systems meant to deliver tangible service to address the road safety.

An efficient and integrated Advance Traffic Management System shall be a proactive tool to assist NHAI in achieving MoRTH's vision "**To make the transport on roads efficient, safe, and sustainable. To reduce the fatalities on roads by half compared to 2010 reported deaths**."

The Ministry is also working to improve the quality of accident data collection with use of IT based systems which would also help in getting the real-time causative analysis of the road accidents. It will be prudent to implement Intelligent Transportation system to enhance road safety and effective incident management.

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

- Early detection of incidents and provide early warning to road-users for accident prevention,
- To save lives by enabling the victim to be rescued within the golden hour, and
- Efficient traffic management during incident management.
- Maximizing traffic throughput on the highway

The objective of ATMS envisaged by the Authority 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 traveller 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 Authority in substantial reduction in accidents due to early incident detection and warning, saving of human lives within the 'Golden hour'. The ATMS system shall assist in reduction of traffic congestion incidents there by improvement in average travel time (within speed limit) by 20-30% 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 Concessionaire with ITS Consultant and NHAI 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 expressway with the help of PTZ surveillance cameras and video incident detection 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.

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The work shall include Design, Supply, Installation, Testing, Commissioning, Configuration, System Integration, Operations and Maintenance of Advance Traffic Management System (ATMS) on the National Highway.

The project shall be a complete turnkey solution with provision of skilled resources at all locations for operations.

This Document describes functional requirements envisaged by NHAI. In addition, the minimum technical specifications have been prescribed in this document, wherever indispensable. The Concessionaire is responsible for the design of complete project and the system architecture as per the best industry practices, to deliver state-of-the-art solution to NHAI. Any consideration affecting safety, security, redundancy, and compliance to stipulated provision prescribed by government authorities is the responsibility of the Concessionaire and shall be duly taken care of to ensure adherence to minimum functional and technical requirement stipulated in this document as well as the SLA parameters.

2. Scope of work

a. The 'Concessionaire' hereafter may be called as 'Contractor' or 'System Integrator' shall conduct the field survey, preparation of design drawings and supply of ATMS equipment and materials, spare parts, test equipment, tools and materials, factory inspection (inspection of equipment & materials upon delivery), training, transportation and site delivery, construction and installation, preparation of as-built drawings, testing and commissioning, Operations and Maintenance of the ATMS project.

b. The scope of the works under this Docuemnt is deployment of Advance Traffic Management System (ATMS) including the Digital Transmission System, on Turnkey basis by the Concessionaire and Operations and Manitenance period as specified in the concession agreement.

c. The Concessionaire shall set up the control center and sub-centres in the space provided by NHAI for the same. The control center and sub-centres, having minimum 250 sqm plinth area, shall include Operation room (suitable to accommodate the video wall and ATMS operators workstations such that the minimum distance between video wall and first row of workstation is minimum 3 meters), Server room, UPS room, Spare room, Incharge cabin, NHAI cabin, Independent Engineer cabin, pantry, toilet, etc of suitable size to accommodate the equipment and staff requried for the project. The scope of civil works, interior works, MEP works, for construction and setting up the Control centre and sub-centres, including all related electrical, lighting, electrical connection, DG set, power backup, HVAC works, access control, building CCTV, PTZ cameras outside building, firefighting system, alarm, fire extinguishers, raised floor, housekeeping, building cleaning, maintenance, reccuring charges including electricty bills, telephone bills, DG fuel, servicing, security, etc. shall be decided by the Concessionaire.

d. The Concessionaire 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.

e. The requirements stated herein shall be construed as minimum requirement and meeting the respective requirements shall not relieve the Concessionaire from the responsibility of supplying the ATMS that functions efficiently as a system and carry out its Operation & Maintenance for a period of five years as stipulated.

f. The Concessionaire shall check and review the design and this document prepared by the NHAI, and execute the supplemental and/or additional and/or detailed design work as necessary at the Concessionaire's cost and time, so that the Concessionaire will supply and deliver the workable Advanced Traffic Management System (ATMS) which will suit the intended purpose when completed. The Concessionaire shall promptly notify the NHAI and the Independent Engineer (appointed by NHAI for supervision of the ITS/ATMS works), of any error, omission, fault or any other defect in the design of or this 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.

g. The Concessionaire shall provide the entire system and facilities on a "single responsibility" basis such that the Contract Price covers all Concessionaire's obligations mentioned in or to be reasonably inferred from this documents 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 Concessionaire's responsibilities for testing and commissioning of the

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systems and facilities, and where required by this document, the acquisition of all permits, approvals and licensc, etc.; the training services and such other items and services as may be specified in this document.

h. The Concessionaire shall be responsible for Integration of ATMS system and sub-systems with the NHAI Mobile App for the road users as per the requirement raised from time to time by the IT Divison of the NHAI or its authorized agency.

i. The Concessionaire shall be responsible for Integration of ATMS system and sub-systems with the NHAI Command and Control Centre at NHAI HQ, RO, PIU, ATMS TMC/Control Cetnre of other NH/SH projects connected to the project, 1033 control centre, Dial 112/100, Smart City ICCC, Disater Management Centres, Police Control room, NIC ITMS, Vahan database, Enforcement Agency, etc. for seemless flow and excahnge of data and information from project to NHAI offices / control centres/ command centres as per the requirement raised from time to time by the IT/Electronics division of NHAI or its authorized agency.

j. The component systems comprising ATMS to be constructed under the Contract shall include but not be limited to the following component systems:

Section 01	General Requirements
Section 02	Design Requirements
Section 03	Central Processing System (CPS)
Section 04	Traffic Monitor Camera System (TMCS)
Section 05	Video Incident Detection System (VIDS)
Section 06	Vehicle Speed Detection System (VSDS)
Section 07	Adaptive Traffic Signal Control System (ATSC)
Section 08	Power and Other Cables, Power conditioning equipment
Section 09	Digital Transmission System (DTS)
Section 10	Facility Monitoring System (FMS)

3. Work Demarcation between ATMS works and Civil works

a. Work Demarcation between ATMS works and Civil works are the following.

b. The Concessionaire shall coordinate with civil contractor and shall consider detail demarcation.

1. Highway

Item	ATMS Project	Civil Project
Power Cable	Cable, Conduit and Manhole at equipment location	ROW
OF Cable	1. Cable and Conduit to Equipment from Handhole/ Manhole 2. Conduit and Handhole/ Manhole along with Highway/ Expressway	ROW
Equipment	1. Foundation 2. Earthing at each location	ROW

2. Buildings

Item	ATMS Project	Civil Project
Traffic Management Centre/ Sub-Centre	Civil works	Suitable space for setting up the Control Center and Sub-Centre on the project stretch. (In case the building suitable for setting up the control center/sub-centre is provided by the Civil, the scope of ATMS shall be reduced accordingly)
	Electrical, HVAC, DG set, Access Control, Surveillance System, Fire	- Scope shall be decided by the EPC Contractor/ Concessionaire.

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Item	ATMS Project	Civil Project
	Fighting System, Building Management System, Power backup, Control console, Technical Furniture including all necessary racks and housings for ATMS system for Traffic Management Centre and Sub-Centre (as applicable), housekeeping, building cleaning, maintenance, recuring charges including electricty bills, telephone bills, security, etc.	- **Nil**, in case of work awarded by NHAI.
	Raised floor for Control/Server room	Not Applicable
	Complete Control Room Interior works, lighting, Distribution board Power socket, Earthing, etc.	Not Applicable
	Network system and telephone exchanges / intercom at Traffic Management Centre	Not Applicable
	Cable duct for ATMS Cable and power cable	Not Applicable

4. Standards

a. All equipment's of the Concessionaire (included by the Concessionaire in the proposal), supplies shall be new and subject to the Factory Acceptance Test (FAT) to the satisfaction of the Independent Engineer. Unless other standards are specifically required to be complied with herein or in the Contract, all materials and components used under the Contract and all design calculations and tests shall be performed in accordance with Indian standards.

b. In the absence of such standards in India, relevant clauses of international standards including but not limited to International Electro technical Commission (IEC), Institute of Electrical and Electronic Engineers (IEEE), International Organization for Standardization (ISO), International Telecommunication Union Telecommunication Standardization Sector (ITU-T) shall be applied.

c. In the absence of such standards in India and the international standards mentioned above, industry standards generally accepted and approved in one of the major industrialized countries such as Great Britain, Japan, U.S.A, and Germany shall be applicable.

d. Whenever in this Document reference is made to the Japanese Industrial Standards (JIS), British Standards (BS), American Association of State Highway Transportation Officials (AASHTO) standards, American Society for Testing and Materials (ASTM) standards, and American National Standards Institute (ANSI) standards, and the like, it shall be understood that equivalent internationally acknowledged standards will be accepted.

e. If Concessionaire offers materials, equipment, design calculations or tests which conform to the standards other than those specified standards, full details of the differences between the proposed standard and the specified standards shall be submitted when required by the Independent Engineer.

4.1 Digital Transmission System

The following standards or de-facto standards shall apply to the digital transmission system:

No.	Item	Standards
1.	BER/CER/DER	ISO/IEC 8825-1:1995 Information technology - ASN.1 encoding rule - Part 2: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)
2.	Ethernet	8802-3:1995(ISO/IEC) [ANSI/IEEE Std 802.3, 1995 Edition] Information technology -- Telecommunications and information exchange between

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		systems -- Local and metropolitan area networks -- Specific requirement -- Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications. 8802-3:1996(ISO/IEC) [ANSI/IEEE Std 802.3, 1996 Edition] Information technology -- Telecommunications and information exchange between system -- Local and Metropolitan area networks -- Specific requirement -- Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications. EIA/TIA568B (AT and T-258A) Commercial Building Telecommunications Wiring Standard, 1991
3.	Fast Ethernet	IEEE 802.3u-1995 IEEE Standards for Local and metropolitan area networks: Supplement to Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications: Media access control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100Mb/s Operation, Type 100BaseT (Clauses 21-30) (ANSI) EIA/TIA568B (AT and T-258A) Commercial Building Telecommunications Wiring Standard, 1991
4.	FDDI	ANSI X3.166-1989 (R1995) Fibre Distributed Data Interface (FDDI) Physical Layer Medium Dependent (PMD) ANSI X3.148-1988 (R1994) Information Systems - Fibre Distributed Data Interface (FDDI) - Token Ring Physical Layer Protocol (PHY) ANSI X3.139-1987 (R1997) Information Systems - Fibre Distributed Data Interface (FDDI) - Token Ring Media Access Control (MAC) ISO/IEC 9314-3:1990 Information Processing systems - Fibre distributed Data Interface (FDDI) - Part 3: Physical Layer Medium Department (PMD) ISO 9314-2:1989 Information processing systems - Fibre Distributed Data Interface (FDDI) - Part 2: Token Ring Media Access Control (MAC) ISO 9314-1:1989 Information processing systems - Fibre Distributed Data Interface (FDDI) - Part 1: Token Ring Physical Layer Protocol (PHY)
5.	FTP	RFC 959 File Transfer Protocol, J. Postel, J.K. Reynolds, Oct-01-1985
6.	Giga Ethernet	IEEE 802.3ab: Physical coding sublayer (PCS), physical medium attachment (PMA) sublayer and baseband medium, type 1000BASE-T IEEE 802.3z: Media Access Control(MAC) Parameters, Physical Layer, Repeater and Management Parameters for 1000 Mb/s Operation
7.	G.703a	TTC JT-G703-a Leased Line Secondary Rate User-Network Interface Layer1
8.	HTTP	RFC 1945 Hypertext Transfer Protocol -- HTTP/1.0. R. Fielding, H. Frystyk, T. Berners-Lee, May 1996 RFC 2068 Hypertext Transfer Protocol -- HTTP/1.1. R. Fielding, J. Gettys, J. Mogul, H. Frystyk, T. Berners-Lee, January 1997 (Status: PROPOSED STANDARD) RFC 2616 Hypertext Transfer Protocol /1.1 June 1999 RFC 2617 HTTP Authentication: Basic and Digest Access Authentication, June 1999
9.	H.261	ITU-T Recommendation H.261 (1993), Video codec for audio-visual services at p x 64kbit/s
10.	IP	RFC 791 Internet Protocol. J. Postel. Sep-01-1981
11.	I.430	TTC JT-I430 ISDN Basic User-Network Interface Layer1
12.	I.431	TTC JT-I431-a ISDN Primary-Rate User-Network Interface Layer1
13.	MPEG 2	ISO/IEC 13818-1:1996 Information technology - Generic coding of moving pictures and associated audio information: Systems ISO/IEC 13818-2:1996 Information technology - Generic coding of moving pictures and associated audio information: Video ISO/IEC 13818-3:1998 Information technology - Generic coding of moving pictures and associated audio information - Part 3: Audio ITU-T Recommendation H.222.0(07/95) - Information technology - Generic of moving pictures and associated audio information: Systems

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		ITU-T Recommendation H.262(07/95) - Information technology - Generic of moving pictures and associated audio information: Video
14.	MPEG 4	ISO/IEC 14496-1:2010 Information technology – Coding of audio-visual objects –Part 1: Systems ISO/IEC 14496-2:2004 Information technology – Coding of audio-visual objects –Part 2: Visual ISO/IEC 14496-3:2009 Information technology – Coding of audio-visual objects –Part 3: Audio
15.	PER	ISO/IEC 8825-2:1996 Information technology - ASN.1 encoding rule - Part 2: Specification of Packed Encoding Rules (PER)
16.	PPP	RFC 1661 The Point-to-Point Protocol (PPP), W. Simpson, July 1994
17.	SNMP	RFC 1157 Simple Network Management Protocol (SNMP), J.D. Case, M. Fedor, M.L. Schoffstall, C. Davin, May-01-1990
18.	TCP	RFC 793 Transmission Control Protocol. J. Postel. Sep-01-1981
19.	TFTP	RFC 1350 The TFTP Protocol (Revision 2), K. Sollins, July 1992
20.	UDP	RFC 768 User Datagram Protocol. J. Postel. Aug-28-1980
21.	V.24/V.28	ITU-T Recommendation V.24(10/96) - List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit - terminating equipment (DCE) ITU-T Recommendation V.28(03/93) - Electrical characteristics for unbalanced double - current interchange circuits
22.	X.21	ITU-T Recommendation X.21(09/92) - Interface between Data Terminal Equipment Data Circuit - terminating Equipment for synchronous operation on public data network

4.2 Local Area Network

The following standards shall apply to the local area network:

No.	Item	Standards
1	ANSI/TIA/EIA-568B	Commercial Building Telecommunications Cabling Standard

4.3 ATMS System / Sub System

The ATMS systems / sub-systems implementation on the Project shall meet the applicable latest versions of the international/national standards, included herein:

No.	Sub-system	Items	Designed to conform	Certified to standard
1	Video Surveillance System (CCTV) /TMCS / Video Incident Detection System (VIDS)/ VSDS Camera	CCTV Fixed Camera	PAL, BS EN 62676 1-2, ONVIF specifications profile S & G, BS EN 62676-2-2, BS EN 62676-2-3	EN 61000, EN 60529(IP66) BIS, UL, RoHS
		PTZ Camera		
		Road-side Housing and Support Structure	BS EN 12767	EN 60529 (IP56)
2	VADS	Display		EN 12966 EN 60529 (IP56)
		Road-side Housing and Support Structure	BS EN 12767	EN 60529 (IP56)
3	ATMS Control Centre		EN 50132-7, Relevant NTCIP standards, IEC 12207	
		Ergonomic design of Control rooms	ISO 11064	ISO 11064

		Ingress design of the projection of Graphics display		IEC-60529

4.4 Cable Installation Work

The following standards shall apply to the cable installation work:

No.	Item	Standards
	BS 2484	Specification for straight concrete and clay ware cable covers
	BS 4121	Specification for mechanical glands for rubber and plastic insulated cables
	BS 6121	Mechanical cable glands
	BS CP 1013	Code of practice for maintenance of electrical switchgear and control gear for voltage up to and including 1 KV.
	BS EN 12613	Plastic warning device for underground cables and pipelines with visual characteristics
	ISO/IEC 14763	Information Technology: Implementation and operation of customer premises cabling

Note: If Concessionaire offers materials, equipment, design calculations or tests which conform to the standards other than specified standards, full details of the differences between the proposed standard and the specified standards shall be submitted when required by the NHAI.

4.5 Other Standards

The following standards shall apply as and where applicable:

No.	Standard	Relevant to
1	IS/ IEC 61508	Functional Safety
2	IS 14700, CENELEC EN 50081-1, CENELEC EN 50082-1,	EMC Compatibility / EMC Emission compliance / EMC immunity
3	BIS 732 / BS 7671	Electrical wiring installation / wiring regulations (BS 7671)
4	IS 2309	Lighting protection
5	IS 3043	Electrical Earthing
6	IS 5216	Safety procedures and practices in Electrical works
7	IS 7689	Control of undesirable static electricity
8	IS 694, IS 1554	PVC installed cables
9	EN 61280-4-1	Fibre-optic test related
10	IS 14927	Cable trunking and ducting systems
11	EN 50173	Generic/ structured cabling
12	IEC 60529	Degrees of protection provided by Enclosures
13	IS 9000 Part XIV Sect. II	Change of temperature test
14	IEC-571; IS: 9000 Part-III Sect. 3	Dry heat test
15	IS: 9000 Part II Sect. III	Cold test
16	IS: 9000 Part V Sect. 2 Variant 1	Damp heat test (Cyclic)
17	IS: 9000 Part IV	Damp heat test (Steady state storage)
18	IS: 9000 Part XI procedure 3	Salt mist test
19	IS 9000 Part XII	Dust test
20	IEC 61643-1	Anti-lightning and surge protection
21	OHSAS 18001:2007	OEM compliance for health and safety measurement system
22	14001: 2015	OEM compliance for environmental management
23	ISO 27001	OEM compliance for information security standard
24	IRC:SP:110:2017	ITS System for Urban Roads
25	IRC: 93-1986	Guidelines on Design and Installation of Road Traffic Signals

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No.	Standard	Relevant to
26	IRC: 103-2012	Guidelines for Pedestrian Facilities

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5. Project Management

5.1 Concessionaire's Personnel and Their Responsibilities

a. The Concessionaire shall provide all personnel necessary for the execution of the Works, such as the Project Manager and senior personnel to fulfil the Concessionaire's obligations under the Contract. These personnel shall be able to read, write and converse in English.

b. The Concessionaire shall form a multi-disciplinary team for undertaking this assignment. The agency shall be fully responsible to deploy its resources / personnel whose qualifications and experience fully commensurate with the task/responsibilities assigned and to achieve the objectives of this Contract. The Personnel deployed should be experienced enough and should have proficiency in the requisite techniques / skills so as to provide practical, realistic, and actionable service.

c. The Concessionaire will make available technical person who is adequately skilled enough to independently resolve any operational issues in the complete system and regularly interact with NHAI. **Aadhar enabled Biometric Fingerprint machine** shall be installed at each location / TMC unit by the Concessionaire for daily attendance management of the Project and O&M staff.

d. The Concessionaire shall submit the attendance record with each service invoice and Independent Engineer shall have the access to the logs of biometric attendance management system for verification of the actual manpower working days in a month.

e. The Manpower proposed shall be dedicated for the project and shall not be proposed for any other project or assigned any other project. The resource cannot be change for at least two years. In case of any variation or change in the manpower / person proposed in the Technical Proposal and manpower / person deployed upon successful award of the works, minimum 20% remuneration of the proposed role for the total contract period 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.).

f. Detailed requirement of technical resources for control centre organisation and staffing is mentioned below.

5.1.1 Senior Personnel

The Concessionaire shall assign one (1) Project Engineer (ATMS) and one (1) O&M Manager (Operation and Maintenance, Installation Engineering) with minimum 10 years of relevent experience in same field as a full time participant to the Project during the course of the Works. They may be stationed at the Project site. The senior engineer shall be involved in technical discussions and shall conduct the training courses and all testing procedures. The senior engineer shall also be involved in the installation works as necessary.
They shall be Graduate (BE/ B/Tech or higher) in the field of traffic engineering, electrical engineering, electronics, computer, IT, instrumentation, telecommunication, or communication.

5.1.2 Project Meeting

The Concessionaire shall be available for progress meetings which will be called for by the NHAI. The notice of such meetings shall be given by the NHAI in writing and delivered to the Concessionaire via email at least two (2) days in advance of the planned meeting date.

5.1.3 Progress Report

The Concessionaire shall prepare three (03) copies of monthly progress report every month and submit to the NHAI. The format of the report shall be agreed upon by the NHAI and the Concessionaire.

5.1.4 Operations and Maintenance Personnel

The Concessionaire shall provide adequately skilled technical and operations personnel during the O&M phase for operating and maintaining the ATMS system and sub-systems, as listed in operations and maintenance section of the RFP.

a. The personnel shall address any down time/ trouble shooting as and when required at any location of service.
b. The resources shall be available on full time basis 365 days in the year at control centres.
c. Final deployment of the skilled technical resources shall be subject to interview or concurrence the Independent Engineer.

5.1.5 Curriculum Vitae

Within a month after the date of the Contract execution, the Concessionaire shall submit to the NHAI, detailed written statements including the names, duties, curriculum vitae of all foreign and local personnel candidates to be employed. Where subsequent changes or additions in foreign personnel are proposed, these replacements or additions shall have at least equivalent experience and qualifications, and detailed written statements of their experience and qualifications shall be submitted to the NHAI prior to their assignment.

5.1.6 Removal and/or Replacement of Personnel

a. Except as NHAI/ Independent Engineer may otherwise agree, no changes shall be made in the above Key Personnel. If, for any reason beyond the reasonable control of the Concessionaire, it becomes necessary to replace any of the Personnel, the Service Provider shall forthwith provide as a replacement a person of equivalent or better qualifications.

b. If NHAI/ Independent Engineer (i) finds that any of the Personnel has committed serious misconduct or has been charged with having committed a criminal action, or (ii) has reasonable cause to be dissatisfied with the performance of any of the Personnel, then the Service Provider shall, at the written request specifying the grounds therefore, forthwith provide as a replacement a person with qualifications and experience acceptable to the Independent Engineer.

5.1.7 Sub-Contracting / Assignment

a. If any activity / services / infrastructure and / or any obligations in whole or in part under this project is required to be / subcontracted/ outsourced by the Concessionaire, the Concessionaire shall inform and seek approval of the same from the Independent Engineer including the terms and condition set-forth by the Concessionaire in its sub-contracting agreement. For avoidance of any doubt the Concessionaire shall remain solely responsible for all the works / delivery of services to NHAI under the scope of this project.
b. The Concessionaire shall inform and seek approval of the same from the Independent Engineer to sub-contract the non-key services such as civil works, interior and furnishing of control centre to any agencies specialised to do such work.

5.1.8 Performance standards

a. The Concessionaire shall undertake to perform the services with the highest standards of professional and ethical competence and integrity.
b. Keeping in view the sensitivity involved, the personnel deployed should maintain confidentiality / integrity at all times and work in a professional manner to protect the interest of NHAI. The firm shall promptly replace any personnel assigned under this project that NHAI/ Independent Engineer considers unsatisfactory.

6. Time Schedule

1.	System Design	: within 1.5 months from the date of signing of the Contract
2.	Procurement	: within 3 months from the date of approval of the System Design
3.	Installation	: 3 months from the start of delivery of material at site
4.	Testing & Commissioning	: 1 month from the date of Installation of the system
5.	Trial run	: 1 month from the date of commissioning
6.	O&M period	: 60 months from the date of issue of Commissioning Certificate

7. Liquidated damages/ Penalties

7.1 Delays in setting up the system

Failure by the Contractor to complete the works or completion of punch points of SIT/SAT within 30 days of issuance of notice by the Independent Engineer or delay in completion of work for any of the milestones i.e. beyond the stipulated time as mentioned in the above Time Schedule and in case of any failure to have remedied all reported defects within the time prescribed by the Independent Engineer / NHAI, i.e. as per the cure period of up to 15 days shall result in the application of the penalties for delays. The penalty will be applicable @ 0.5% of the total contract value of the ATMS works per week of delay in system commissioning or delay in completion any of the above six milestones (system design, etc.) up to a maximum of 10% of the Contract value of the ATMS works.

1. Once the liquidated damages reach maximum limit, NHAI shall consider termination of the contract and forfeiture of the performance bank guarantee. NHAI shall also debar the Contractor from further participation in NHAI's subsequent tenders / projects due to its non-performance for a period decided by it.
2. Upon termination of the Agreement due to service defaults, NHAI may choose to allocate the said site to any other Contractor, at its sole discretion and at the risk and cost of the defaulting Contractor.
3. In case of delay due to reasons beyond the control of the Contractor, upon such request from the Contractor and recommendation from the Independent Engineer, NHAI may, in its sole discretion, consider suitable extension of time (EOT) without imposing any liquidated damages upon the Contractor. However, the Contractor shall submit such request at least 30 days before the completion schedule / timeline/ milestone. In case of the delay in submission of the request for EOT, the penalty will be applied @ 0.5% of the total contract value of ATMS works per week of delay in submission of request for EOT.

7.2 Non-Compliance to Safety Standards at site

Failure by the Concessionaire's personnel in maintaining the safety standards at the site at any time shall attract penalty on every instance noticed by the Independent Engineer / NHAI.

1. Staff working without safety gears, etc. – penalty of INR 1,00,000 per instance. In case of repeated instance by the same staff member of the Concessionaire, the penalty shall be doubled per instance. The Concessionaire shall have to replace the repeated offenders / sub-Concessionaire (safety lapses more than 3 times) with immediate effect.
2. Improper safety measures at site / safety hazard to the commuters due to poor workmanship, etc., / Concessionaire's vehicle wrongly parked at site / Concessionaire's vehicle moving in wrong direction / working during low visibility hours or at night time without proper safety measures warning signages and lighting/ improper traffic diversion / non-standard warning signages etc. / unauthorised lane closure / traffic rule violation/ etc. – minimum penalty of INR 10,00,000 per instance shall be imposed on recommendation of the Independent Engineer. In case of repeated instance, the penalty shall be doubled per instance. The Concessionaire shall have to replace the repeated offenders / sub-Concessionaire (safety lapses more than 2 times) with immediate effect. NHAI shall also take legal action against the errant staff / sub-Concessionaire / Concessionaire, as such safety lapses may lead to major safety concern / hazard for the road users as well as the workers.

7.3 Penalty for Delay in Staff Mobilisation

Delay in submission of detailed written statements and/or mobilization of aforesaid Key Personnel shall attract penalty @ INR 1,00,000/- (Rupees One Lacs) per day per Key Personnel. In case the delay is more than 3 weeks, NHAI reserves the right to encash the Bid Security and PBG towards the aforesaid penalty and may proceed with the revocation of LOA or termination of the project, as the case may be.

7.4 Other Penalties

Penalty of INR 10,000 to INR 1,00,000 shall be levied on the Contractor for delay of each working day from the due date of submission / expiry: i) the insurance policy documents, ii) design documents, iii)

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manuals, iv) monthly /periodic reports, v) Bank Guarantee, vi) Schedule, vii) testing, viii) any other documents report directed by NHAI/Independent Engineer, to be submitted during the entire period of the Contract, etc.

8. Selection of Concessionaire, Sub-Contractor and OEM

1. The firm as determined non-performing or having been terminated from any project during last three years by Ministry of Road Transport & Highways, Government of India or its executing agencies like NHAI, NHIDCL etc. or any other Ministry / PSU / State / Central Government or its Department/ Enforcement agencies/ Autonomous Body etc. will not be eligible.
2. A Company will not be eligible for ATMS works, in case the penalty for SLA/SLR non-compliance during O&M period have reached the maximum penalty limit on any ATMS/ITMS/ITS project.
3. The Concessionaire must have experience of successfully executing the Project having similar nature of work during last 10 financial years
   Similar works: Establishment of state-of-the-art ITS/ ATMS/ HTMS/ ITMS system with at least 1 Traffic Management Centre/ Integrated Command and Control Centre on the National/State/Urban Highway or Expressway or stretch of equal to of more than 40% length of this Project involving at least 5 key activities that have been satisfactorily completed within last 10 years as a prime contractor (single entity or JV member) under reputed PSUs / Central Government or its Department/ Enforcement agencies/ Autonomous Body etc.
   i. Traffic Monitoring Camera System
   ii. Vehicle Speed Detection System
   iii. Automatic Number Plate Recognition System
   iv. Video based Incident / Violation Detection System
   v. RLVD (Red Light Violation Detection) System
   vi. Adaptive Traffic Signal Control System
   vii. Digital Transmission System with OFC Connectivity
   viii. Central Processing System
   ix. Video Analytics / Management System
4. The OEM of each component/ equipment should have direct presence in India from last 10 years having own service and support offices to ensure smooth after sales service support on site.
1. The Concessionaire must submit the datasheet of each component in the Technical Submission as part of the Technical proposal and design document, clearly mentioning the make, model, country of origin, and end of life of each component/ equipment in the MAC.
2. To ensure seamless integration, the Contractor shall deploy equipment of same OEM having seamless interoperability for each categories of the solution components as mentioned below:
   i. Computing – Workstations, Servers and storage
   ii. Network – Router and switches
   iii. Graphics Display, its Controller and Software
   iv. Surveillance & Access Control – Cameras, VRS, Video Analytics & Management Software, Box Camera Housing etc.
   v. Security – Firewalls and any other security solution
   vi. Interior works and technical furniture at control centres
3. The Concessionaire must submit the documentary proof for the above-mentioned requirement and non-compliance matrix for the Functional and Technical Specifications in the Technical Submission as part of the Technical proposal and design document.
4. Subcontractors/manufacturers for the sub-systems and major items of supply or services must meet the following minimum criteria:
   i. Subcontractor and manufacturers shall have at least two similar contract experiences within 10 years.
   ii. Subcontractor and manufacturers shall be Indian OEM/ Manufacturers or Class-I 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".
   iii. Subcontractor and manufacturers shall have direct presence in India having own service and support offices to ensure smooth on-site after sales service support.
5. The requirement mentioned in the ToR / Technical Specification document are the minimum requirement. The Contractor shall provide the latest standards or higher specification to meet the functional and technical requirement. In case any specification mentioned in the document are

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obsolete, he shall provide the latest equipment of higher specification, fully meeting the functional and technical requirement. The Contractor must promptly highlight the compatibility issues in the Non-Compliance Matrix in the technical proposal and design document. 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 obsolete /end of life component, by submitting the proof and undertaking from the OEM proposed in the Technical proposal and design document.

6. **Undertaking for Country of Origin**: The Concessionaire shall ensure that none of the key component or its sub-component such as PTZ / TMCS Cameras, VIDS system, Vehicle Speed Detection System, Control Centre / Command Centre / TMC equipment including security devices are procured / sourced from the OEM from any of the region and / or company barred / banned / blacklisted / having territory dispute / threat to sovereignty and integrity / restricted by the any of the Defense Department / any of the Government Department / Authority / PSU / Ministries etc. in India. The technical proposal and design document shall be considered as non-compliance in case this requirement is not fully met by the Concessionaire. The Concessionaire shall submit an undertaking fully complying to this requirement.

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

8. **Preference shall be given to Indian OEM/ Manufacturers and "Make in India" 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".** All ATMS/ITS equipment shall be procured from Indian OEM/ Manufacturers and preference shall be given to "Make in India" preferably to "Class-I local supplier" as defined in the revised order by DPIIT. The Contractor shall submit the proof of non-availability of the products/ items/ goods/ services in India which are proposed to be procured from Non-Local supplier or imported.

9. Factory Tests, Inspection and Certification

9.1 General

All equipment, components, spare parts, and software to be delivered or installed under this Contract shall be tested, inspected, and certified prior to delivery in accordance with these specifications.

9.2 Test Procedures

a. For off-the-shelf or routinely manufactured equipment or components, a test or inspection certificate shall accompany each delivery and no Factory acceptance test (FAT) shall be required. The Concessionaire shall submit the factory's routine testing procedures for each key component.

b. The FAT for equipment, components or software requiring special order, tooling or development is mandatory and shall be conducted by the Independent Engineer at the factory/manufacturing unit. The Concessionaire shall submit to the Independent Engineer proposed factory test items and test procedures for review as soon as the System Detailed Design is accepted. The test items shall include as a minimum the following:
   1) Functional tests (all equipment and software)
   2) Power supply tests (all equipment)

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3) Input voltage fluctuation (Sampling test)
4) Instantaneous interruption (Sampling test)
5) Environmental tests for temperature and humidity ranges as specified (sampling test)
6) Insulation resistance (sampling test)
7) Dielectric strength (sampling test)
8) Rainproof test for field equipment (sampling test)
9) Equipment Interface Tests -- Equipment interface tests shall be conducted for all servers, database, network switches, network adapters, toll collection equipment and communication equipment in the factory.

These tests shall be executed by interfacing as many different kinds of equipment as possible so as to ascertain their suitability as system components. Where there is no appropriate equipment at that particular time to connect to certain equipment, the test shall be executed by connecting to a simulator.

c. Mandatory Factory Acceptance Tests
Due to the high number of equipment estimated for the project and stringent performance requirements, only the customised equipment (special order). fabricated items, and ATMS software shall undergo Factory Acceptance tests in presence of Independent Engineer, NHAI personnel and / or NHAI's representatives.

d. The Concessionaire shall notify the NHAI at least 07 days in advance of each factory acceptance test to be undertaken and shall make arrangements for the NHAI to attend the tests if requested. The Concessionaire shall also bear all expenses of such tests including travel (including any travel abroad), boarding and lodging expenses of Independent Engineer and up to 4 NHAI personnel and / or their representatives.

e. In case of equipment other than those identified under c) above, should Independent Engineer decide not to attend any of the tests, the tests shall be carried out by the Contractor, and the duly certified copies of the test results shall be submitted by the Contractor.

f. If the Independent Engineer is satisfied with the test results, he shall notify the Concessionaire in writing to that effect, and the Concessionaire may then ship the equipment. If the Independent Engineer decides that equipment is defective or produced not in accordance with the Contract, he may reject the equipment, and will inform the Concessionaire of the reasons in writing within 30 days.

9.3 Defects

Should a defect be detected during one of the tests, the cause of the defect shall be ascertained and documented. For minor defects which do not require re-design of the equipment, the defect shall be rectified, and the test be repeated. If a design change is required, the Independent Engineer shall be so informed, and the revised design shall be submitted to the Independent Engineer for review and approval.

9.4 Test Certificate

Test certificates will be issued only for the actual equipment that has passed the tests. For sampling test of equipment, if any defect is detected in any one sample, the entire lot shall be tested, and the results shall be reported to the Independent Engineer for his review.

9.5 System Integration Test (SIT)

a. The SIT shall also incorporate the network-manageable portions of the ATMS system including the ATMS system interface to the TMC, sub-centres and NHAI HQ Command centre.

b. The SIT shall begin after earlier stages of testing have been successfully completed (i.e. FAT and SAT) and accepted by the Independent Engineer. When possible, the SIT shall be conducted during the harshest environment period deemed for that particular equipment. The duration of the SIT will be agreed with the Independent Engineer prior to starting.

c. 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 Concessionaire, results in the Project, or any system, subsystem, ATMS equipment, or ancillary component thereof to cease operation.

d. The SIT shall be re-started after the identified deficiency has been corrected.
e. If the total number of System Shutdowns exceeds three (3) due to the same system or subsystem, ATMS equipment, or ancillary component.
   (i) The system, subsystem, ATMS equipment, or ancillary component shall be removed and replaced with a new and unused unit.
   (ii) All applicable FAT and SAT, as deemed necessary by the Independent Engineer shall be performed and the SIT shall be restarted upon written approval from the Independent Engineer
f. Time extensions shall not be granted to perform the SIT due to any failures. Failures during the SIT shall be rectified at no additional cost to the NHAI.
g. Upon the successful completion of the SIT and all the required submittals, testing, training, and documentation have been successfully submitted to and approved by the Independent Engineer, the Independent Engineer shall provide written notice of Final Acceptance.
h. The notice of Final Acceptance implies that the system is ready for commercial operation subject to adequate training provided to the Operations and Maintenance personnel.

9.6 Inspection

All equipment shall be inspected before delivery and upon arrival at the site. The inspection shall be performed on the following items:
1) Painted surfaces and colour
2) Condition of assembly
3) Design and dimensions
4) Parts arrangement

9.7 Cost of Test and Inspection

The testing cost as allowed, shall cover full cost of providing all facilities, labour, consumable parts, and appliances required in connection with all inspection and tests of completion on the site or on the manufacturer's premises, and all other expenses as may be required by the NHAI or Independent Engineer to attend the test.

9.8 Tests on Completion

9.8.1 General

The Concessionaire shall keep a clear record of all tests conducted. The record shall include time, place, equipment, procedure, functions, persons attending, and faults or problems encountered. The test results, even if they are not satisfactory, shall be documented and submitted to the Independent Engineer and NHAI for review.

9.9 Tests on Completion for a Portion of Works

9.9.1 Procedure

a. The Concessionaire shall give due notice to the Independent Engineer and NHAI of atleast seven (7) days in advance of the proposed date and contents of the Tests on Completion for a Portion of Works.
b. Tests on Completion shall be performed for the portion of Works completed in the previous one-month period.
c. When the Independent Engineer has received satisfactory test results, he shall notify the Concessionaire in writing that the equipment is ready for trial operations. If the Independent Engineer decides the equipment is not in accordance with the Contract, he may reject the equipment, and he shall inform the Concessionaire as to the reasons why the equipment was rejected in writing within a reasonable time.

9.9.2 Test Items

a. After the delivery and installation of the equipment at the site, tests on completion for that portion of Works shall be conducted for each of equipment.
b. Appearance of the equipment and required operations in standalone mode shall be examined in this test. Test items to be tested at Tests on completion are specified in the section of component systems in these specifications.

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9.9.3 Testing apparatus

a. Each equipment shall be provided with indicator, lamp, monitor or other means to confirm normal operation of the equipment.
b. Alternatively, the Concessionaire shall supply suitable number of portable testing apparatus or computer as part of equipment. Control of monitoring the equipment shall be possible through the testing apparatus.
c. All test equipment shall have a valid calibration certification from certified government lab.

9.10 Tests on Completion for the Whole of Works

9.10.1 General

During the Test on Completion, all the functions of the equipment required under the Contract shall be tested. The test shall be conducted with the attendance of the NHAI and Independent Engineer.

9.10.2 Procedure

a. The Concessionaire shall submit, at least 14 days in advance, to Independent Engineer the date(s) on which the Tests on Completion for the Whole Works are to be undertaken.
b. The Concessionaire shall forward to the Independent Engineer duly certified copies of the test results when the tests have been successfully completed. When the Independent Engineer has received the test document and is satisfied with the test results for trial operations, he will notify the Concessionaire in writing that the whole works are ready for trial operations.
c. If major defects are uncovered in the tests, the Concessionaire shall prepare and submit to the Independent Engineer for review and approval a proposal to remedy the defects. The Concessionaire shall not take corrective actions before the proposed remedies have received the Independent Engineer's approval. Minor faults and defects detected during the Tests on Completion may be corrected during the trial operation period.

9.11 Test Conditions and parameters

The following conditions and parameters shall be applicable for each stage of testing i.e. FAT, SAT, SIT, and Additional tests:

a. 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.
b. The Independent Engineer 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 Independent Engineer shall be given minimum seven (7) full business days' prior notification before rescheduling another test trial.
c. ATMS Equipment that fails to conform to the requirements of any test will be considered defective and the equipment will be rejected by the Independent Engineer. 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 re-test provided all issues of non-compliance have been corrected and re-tested and evidence thereof submitted to the Independent Engineer. 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 Independent Engineer and NHAI prior to a new test date being scheduled.
d. In the event, the ATMS equipment malfunctions during the test period, the Independent Engineer 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.
e. If ATMS equipment has been modified or replaced as a result of a defect, a report shall be prepared and delivered to the Independent Engineer 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 Independent Engineer, develops, the Independent Engineer may direct that design and construction modifications be made

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to all similar units without additional cost to the NHAI. In the case of problems common to many units, all units shall be modified at no additional cost to the NHAI.

f. The Test procedures and guidelines mentioned in the RFP are the minimum requirement to be fulfilled by the Concessionaire. In addition to the minimum tests prescribed in the RFP, the Independent Engineer shall instruct the Concessionaire to conduct the test he deems relevant for any subsection at the Factory and / or at site, as applicable.

g. Time extensions shall not be granted to perform the FAT/ SAT / SIT / Additional tests due to any failures. Failures during any test shall be resolved by the Concessionaire at no additional cost to the NHAI.

h. The SAT shall be conducted for each and every piece of ATMS equipment and ancillary components.

i. If any ATMS equipment or ancillary component fails to pass its test more than twice, it shall be replaced with new ATMS equipment or ancillary component of same make and model and the entire test shall be repeated until proven successful.

j. The ATMS equipment provider shall ensure that the required testing equipment, including a portable computer and test software is provided for the SAT.

k. Equipment installation shall be inspected to confirm compliance to equipment manufacturer's installation good practice recommendations.

l. 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.

m. The FAT / SAT 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.

10. Defects Liability Period (DLP)

1. Any minor defects in the system identified by the Independent Engineer and provided to the Concessionaire in the form of a written notice during the Final Acceptance above shall be rectified during the Defects Liability Period. The above defects list shall also include any defects that surface during the DLP, which shall also be rectified by the Service Provider during the defined DLP itself
2. Suitable tests for confirming the rectification of defects shall be performed by the Concessionaire to the satisfaction of the Independent Engineer.
3. The DLP shall be in force for a period specified in the Concession Agreement succeeding the Completion Certificate.

11. Power Supply

a. Provision for power supply and DG sets (excluding UPS) at the TMC (Traffic Management Centre) and Sub-centres shall be in the scope of the Civil Contractor (EPC/ HAM/ Concessionaire, as applicable). The provision of DG set and power supply arrangement and recurring costs shall be completely in the scope of Concessionaire, in case the work of ATMS is awarded by NHAI. The Concessionaire shall examine the power supply status during the site survey and submit the additional requirement to the Civil Contractor along with the proposal in case of any additional requirement. The additional power and DG requirement shall be finalised within the design phase. Any additional requirement raised by the Concessionaire post design approval may not be considered and the Concessionaire shall be responsible to make the arrangement at its own cost.

b. The Concessionaire shall perform all the necessary application procedures to the Power Company required for the power to be supplied for the field equipment. All the expenses charged by Power Companies regarding such applications shall be borne by the Concessionaire unless until specified by the Civil Contractor. The work to be undertaken by Power Companies shall be up to the boundary of property and the responsibility shall lie between the NHAI/ Civil Contractor and Power Companies, as well as the expenses incurred there from, shall be in the scope of the Concessionaire.

c. The Concessionaire shall make all necessary arrangements for the electricity requirement, for the execution of the Works and as well the O&M period. for the entire period of the Contract for the field equipment.

d. The fixed charges, installation charges, recurring charges, electricity bill, DG set fuel, maintenance etc. for each field equipment, Concessionaire's site office, or any other facility being used by the Concessionaire under the scope of the Contract shall be completely in the scope of the Concessionaire

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for the entire Contract period i.e. Design phase, procurement, installation, testing, trail-run, commissioning, operations and maintenance period. The Authority shall not be responsible for any provision for power supply during implementation as well as operations and maintenance period.

e. All UPS required for ATMS system for TMC, sub-centres, field equipment shall be in the scope of the Concessionaire.

12. Work Area Safety and Traffic Control

12.1 General

a. Obstructions and excavations in the work areas shall be adequately fenced and guarded at all times and proper traffic control devices shall be installed to protect the workers and the public. Particular attention shall be paid to the positioning of traffic barriers and traffic cones. Unnecessary blocking of traffic lanes shall not be permitted. Roads and sidewalks shall not be used for the unnecessary storage of materials.

b. Adequate traffic control devices shall be in place before work begins and all such devices shall be removed immediately when the work is completed. As work progresses, warning devices which were appropriate at one time but are no longer applicable shall be removed immediately.

c. Signs, lights, barriers and other traffic control devices shall be maintained in good order and in the correct position during the day and night. Signs shall be neat, clear and legible at all times.

d. Compensation for meeting the requirements of this section shall be included in the various bid items and no separate payments will be made, therefore.

e. Penalties shall be applicable as prescribed in the Penalty clause above, in case of any non-compliance or safety violation.

12.2 Highway Lane Closure

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

12.3 Warning Signs

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

b. A "LANE CLOSED AHEAD" and a "LANE CLOSED" sign shall be placed upstream of the lane closure site at a distance of approximately 100 meters and 50 meters respectively when one lane of the roadway is closed. These signs shall be placed further upstream of the work area if more than one lane of the roadway is closed.

c. All work area warning signs shall be made of reflective sheet or material if the signs are to remain in place during hours of darkness.

d. The design, specifications, quantity, location, placement of the Signages shall fully comply with latest version of IRC 67 2012, IRC SP 99:2013 and/ or applicable latest international and IRC codes.

12.4 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. waring flashers shall be kept alight at each such location.

12.5 Traffic Cones and barriers

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.

12.6 Plant and Equipment

a. In all cases where traffic is permitted to use the whole or a portion of the existing road before the work is completed, all plant items and similar obstructions shall be removed from the road at night, if at all possible. Otherwise, they shall be delineated at night if they stay within 2 meters of the edge of the roadway by two red lights suspended vertically from the point of obstruction nearest to the roadway. The lights may be omitted in cases where there is permanent obstruction, such as trees being less than 2 meters from the edge of roadway and the plant or equipment are not closer to the road than the permanent obstruction.

b. During the day, a red flag shall be projected beyond the extremity of all plant items (other than vehicles) adjacent to the traffic lane.

c. The Contractor shall take all the safety measures as per the site requirement and prescribed by NHAI/ Independent Engineer.

12.7 Vehicles

Vehicles which are used to carry out operations on the roadway and which are required to travel slowly or to stop frequently shall be made as conspicuous as possible. This shall he achieved by painting them in a distinctive colour or painting the rear portion with diagonal stripes of a contrasting colour or providing flashing lights on the top of the vehicle. They shall also have a plate of sufficient size on the rear side with the words **"Slow Moving"** and shall be visible from 100 meters.

13. Documentation

13.1 General

a. The documentation shall contain complete details of how the System was actually built, and how it works, together with complete operating and maintenance information. The documentation shall consist of the following manuals and drawings:
   1) System design manual
   2) Software manual
   3) Hardware manual
   4) Installation manual
   5) Operator's manual
   6) Maintenance manual
   7) Product 'End of Life' Plan
   8) As built drawing

b. The documentation shall be a detailed presentation with text and illustrations. All documentation shall be in English and shall be subject to the approval by the Independent Engineer.

c. The documentation process shall include the preparation, editing, submittal for approval, publication, delivery and acceptance of the documentation in accordance with the requirements of the Contract.

d. Documentation shall use SI units in accordance with ISO 80000-1

e. Detailed design drawings and structural calculations for each type of pole, gantry or structure (including foundations) used to mount ATMS equipment shall be submitted to the Independent Engineer for approval after due certification by a Licensed Structural Engineer. The design calculations shall be carried out in accordance with relevant MoRTH/IRC standards where applicable.

f. The drawings shall show materials specification and finishes for each item of equipment proposed for use. All weld types and sizes shall be identified on the design and construction drawings.

g. Power schematic diagrams for all ATMS installations shall be submitted to the Independent Engineer for approval.

h. Telecommunications schematic diagram shall be submitted to the Independent Engineer for approval. The telecommunications diagram shall include all systems, subsystems and components, including connections to modems, devices and the telecommunications access and backbone network.

i. As-built record drawings shall include longitude and latitude data accurate to within two (2) metres for each of the ATMS equipment and infrastructure installed.

j. Documentation should be organized so that unnecessary repetition is avoided. Topics likely to be frequently referenced by the Concessionaire (e.g. operating and maintenance instructions) should be given prominence. As it is recognized that the volume of the documentation and drawings to be provided will vary considerably with the complexity of the equipment being supplied (ranging from one ring binder to several volumes), the Independent Engineer should be consulted for its agreement on the presentation and layout of the documents to be provided.

k. Installation instructions to be included in the package of any item of equipment likely to be installed separately or in conjunction with the ATMS equipment, shall be in the form of a leaflet or similar. It shall have sufficient information (with diagrams) for the item concerned to be correctly installed in position and connected and describe any necessary set-up procedure.

l. Maintenance information cards or booklets, one set of which is to be secured within each equipment enclosure or cabinet shall be encapsulated in a durable weatherproof format. They shall show the general layout of equipment and component modules and references in schematic form, and set-up addresses for on-site replacement of component modules.

m. The format and extent of electronic media and/or hardcopy presentation of technical documents shall be agreed upon by the Independent Engineer before final versions are produced.

13.2 Submittals

a. All ATMS equipment shall, as a minimum, meet all the requirements listed in these specifications. Future technological advances may allow for ATMS equipment to be provided that exceed the minimum requirements in these Specifications.

b. Systems and subsystems that minimizes the possibility of either the failure of any single component or the complete module failure shall be provided by the Concessionaire in Technical Proposal and later in Design Document. Failure of one component or module shall not cause the failure of any other component or module.

c. Product data, design and construction drawings for all of the components shall be submitted to the Independent Engineer for approval.

d. Heat-load calculation sheets accompanied by related manufacturer's data sheets to support justification of proposed cooling systems shall be submitted to the Independent Engineer for approval. Power consumption calculations to support proposed power distribution type and size shall also be submitted.

13.3 Presentation of Documentation

a. All documentation shall be prepared in a clear, concise manner with appropriate illustrations. Except otherwise specified by the Independent Engineer / NHAI, all documentation except drawings shall be **double side printed** on A4 size sheets. All documentation shall carry an issue number, revision number and date. A uniform style and format shall be followed as much as possible.

b. The draft of all the reports and documents shall be submitted to the Independent Engineer in electronic form (PDF) only, for review and approval before submission of printed copies.

c. Three (3) printed copies (double side printed) and three (3) sets of electronic files on CD-ROM or DVD of all documentation, manuals and drawings of as built conditions shall be submitted. Electronic file shall be in the latest version of portable document format. In addition, as-built drawing in the latest version of AutoCAD at the time of submission of Technical Proposal must be included on CD-ROM or DVD.

d. In order to maintain liaison between parts of the Concessionaire and the NHAI, documentation concerning each part of the Contract shall be produced as part of each component job and not left until the preparation of the final manuals. Effort may be saved, and familiarity with the presentation of information will be maintained by writing the documentation during the Contract in a form suitable for inclusion in the relevant final manuals.

e. All system manuals shall be available at the beginning of classroom training. Re-issues shall be provided if site commissioning and testing makes this necessary.

f. If changes or modifications are required in any of the documents previously submitted, the Concessionaire shall fully describe the changes or modifications, and immediately submit them to the Independent Engineer for approval.

13.4 Standard Documentation

Standard documentation shall be provided for the computer and peripherals (hardware and software), programming manuals including the languages to be used, transmission equipment, air conditioner, power supplies, and other standard products to be supplied under the Contract.

13.5 System Design Manual

a. The intent of the system design manual is to give an overall description of the ATMS including the digital transmission system and associated systems supplied under the Contract. The manual may be divided into sections to cover all and every aspect of the systems. The description shall be plain, and the detail of operation shall be left to other manuals with adequate reference to them. The manual should provide cross references to the appropriate manuals of the system when necessary to do so.

b. The system design manual shall completely define all functions, inputs, and outputs including methods of entering inputs, methods of obtaining outputs, data structure and content, format, sequence, and timing. The system structure and organization shall be described including all the data flow paths through the system and all the data files in the system. This description shall clearly present the functional relationship of the computer program modules with one another and with all peripheral, monitor display, control desks, central controllers, transmission equipment. detector, control centre equipment, office equipment, field equipment or other equipment. An overall system flow diagram shall be provided.

13.6 Software Manual

The software manual shall be project oriented. The software manual shall therefore include the application programs and database details.

13.6.1 Structure

The manual shall describe the overall software structure with particular attention to the points at which further user programs can be interfaced. It is essential that the relationship of program modules, their priority, and their calling sequences are explained in such a manner that it may be clearly understood, especially by any competent programmer who wishes to specify or interface a new program into the system.

13.6.2 Program Logic/Function

Operational objectives for each program shall be described. All logic and transformations on the input data in order to generate output data and accomplish system functions shall be described, together with their interaction, sequencing and time requirements. Derivations of any mathematical equations shall be stated if appropriate.

13.6.3 Flowcharts

Each major section of the programming logic as described above shall be presented in greater detail. The detail shall be developed into a format of flowcharts or other graphical methods using statement and decision blocks to show the flow of information. Within each statement and decision block sufficient information shall be presented to describe what is being accomplished. Mathematical or engineering terminology and equations shall be incorporated when necessary to fully describe the operations to be performed.

13.6.4 Output Formats

Sample output formats both printout and monitor display shall be provided from actual printer output and monitor display with explanation for each item on the output format.

13.6.5 Data File in Database

The format of all data in the database shall be given together with the structure, type, format, length, default value, and range of allowable value, if any. For constant file that contains system parameters and constant, their value shall also be shown.

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13.7 Hardware Manual

a. This manual shall provide a complete description of the hardware of all the system equipment and components to be supplied under the Contract. Documents regarding component systems shall be bound in separate volume for convenience of use.
b. The following information shall be provided for each applicable equipment or component:

13.7.1 Functional Descriptions

All information necessary to fully explain the basic function or use of the equipment shall be provided. It shall include a block diagram presentation of the equipment.

13.7.2 Operating Procedure

a. The operating procedure shall be fully described in a simple and clear language. Appropriate illustrations shall be provided. Explanation and use shall be given to all the keys and switches. Meaning of all meters and indicators shall also be explained.
b. A list of applicable test instruments and tools required to perform necessary measurements shall be included. Setup tests and calibration procedures shall also be described if applicable.

13.8 Installation Manual

a. This manual shall provide a complete description of the installation procedures of all the system equipment and components to be supplied under the Contract. Documents regarding component systems shall be bound in separate volume for convenience of use.
b. The following information shall be provided for each applicable equipment or component:

13.8.1 Installation instructions

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

13.8.2 Commissioning instructions

Set-up details of addresses, operating parameters, control ranges and limits, etc. Commissioning procedures and tests.

13.9 Operator's Manual

a. This manual shall comprise a concise set of procedures, the system operator may require operating the system with a minimum of detailed technical description of the internal working of the various parts of the system. Cross references to the appropriate manuals for detailed technical descriptions however shall be provided.
b. The manual shall list specific procedures to be followed for both hardware and software operations, which may have to be followed either by programmers or hardware engineers. Instructions shall therefore be basic and detailed. A step by step procedure shall be given for switching on and off power, controlling the equipment and for starting up and shutting down the system. This shall include loading of the operating programs, checking that they are running correctly, operation of variable message signs, TMCS camera, monitor display, graphic display, and use of utility programs through keyboard and monitor display.
c. In addition to the routine operation, procedures shall be given for fault diagnosis. Typical symptoms shall be listed, with corresponding corrective or emergency action to be taken.

13.10 Maintenance Manual

This manual shall describe both preventive and corrective maintenance procedures in such detail that maintenance personnel can perform the proper maintenance work by reading this manual.

13.10.1Preventive Maintenance

The manufacturer's recommended procedures for proper preventive maintenance shall be indicated to ensure reliable equipment operation. Specifications including defined tolerances for all electrical, mechanical and other applicable measurements and adjustments shall be listed. Periodical repainting servicing shall also be described. List of parts that require periodic replacement shall be included.

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13.10.2Corrective Maintenance

a. This section shall provide the information necessary for isolation and repair of failure and malfunctions. Accuracies, limitations and tolerances for all electrical, physical and other applicable measurements shall be described. Instructions for disassembly, overhaul and reassembly, including workshop performance requirements shall be provided.

b. Fully detailed step by step instructions shall be given where a failure to follow special procedures would endanger the life of the operating or maintenance personnel, damage to the equipment, improper operation, etc. Instructions and specifications shall be included for such maintenance work that may be accomplished by specialized technicians and engineers in a modern electro-mechanical workshop. Instructions concerning special test set up, component fabrication, use of special tools, jigs and test equipment shall be included.

c. Maintenance procedures shall cover the diagnosis of faults, testing and setting up adjustments, replacements of units and operation of test equipment.

13.11 Product 'End of Life' Plan

a. Instructions for dismantling the equipment without causing damage
b. Details of re-usable/recyclable components, materials and the coding system used to identify them,
c. Details of any precious metals
d. Details of any hazardous substances, heavy metals or other pollutants with instructions on their safe handling and disposal.

13.12 As-Built Drawings for Whole Works

a. The Concessionaire shall submit three (3) copies of as-built plans and drawings to the NHAI within reasonable time after the Tests on Completion for the Whole Works but not later than three (3) months prior to the Completion. As-built plans and drawings to be submitted by the Concessionaire shall include but not be limited to:
   1) Detail drawings of all equipment,
   2) Variable message sign support, TMCS camera pole, detector pole (if any), etc. with fittings (civil structure plans and drawings),
   3) Equipment layout,
   4) Communication cable network diagram, fibre assignment diagram and final BOQ for the cable work
   5) Conduit route diagram, handhole, manhole layout and final BOQ for the conduit work
   6) Traffic Management Centre operator room and machine room layout,
   7) Data cable connection diagram at Traffic Management Centre and other ,
   8) Power distribution diagram,
   9) Traffic Management Centre and sub-centre building,

b. These plans and drawings shall incorporate changes made during the installation and training. A uniform legend shall be used throughout the documentation.

13.13 Programs on CD Disk

As part of the documentation, The Concessionaire shall provide a copy of all source programs which have been coded for this system on a CD-ROM or DVD ready for compilation. The source programs shall be written in English and compatible with the flowcharts and program listings. In addition, a copy of the operating system, utility programs and other programs used in the CPU shall be provided on a CD-ROM or DVD which can be readily loaded.

14. Quality Assurance

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

b. The Independent Engineer shall audit the potential supplier's quality system and test facilities before approving use of the proposed supplier. NHAI reserves the right for the same.

c. The following requirements must also be considered:

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i. The design and installation of Electrical Installations shall comply with the requirements of the Bureau of Indian Standards.

ii. The Concessionaire shall be required to provide, at their own expense, samples of the proposed equipment and all associated approvals, test reports and schedules to verify that the equipment meets all of the NHAI's requirements.

15. On-line Access Facility during the Operations & Maintenance phase

a. The systems commissioned by the Concessionaire shall provide, during the entire period of the Contract, adequate remote access (via-internet) to the Independent Engineer and NHAI for on-line evaluation of the functioning of each equipment / sub-system, including all field equipment. The Concessionaire shall also provide the Independent Engineer and NHAI a suitable tool for the same. In the case of TMCS, VIDS, ANPR Cameras, this tool shall also support the facility of observing real-time images from each camera by remote operation of the Pan-Tilt-Zoom facility. NHAI reserves the right to include the results of any such examination by NHAI and / or Independent Engineer in the achieved service levels for the period under evaluation.

b. The toll shall also provide the real-time access of the ATMS Dashboard, GIS Map, NMS, FMS, Report module for entire stretch as well as each sub-centre, etc.

c. For the purpose of enabling the above on-line access facility, each of the equipment / sub-systems shall be Internet Protocol (IP) based supporting the Simple Network Management Protocol (SNMP).

d. The above tool shall also include a feature by which the NHAI and Independent Engineer can generate detailed performance, violation, event, incident, operation and maintenance reports without the need for any support / intervention from the Concessionaire's personnel.

e. The tool shall also provide the feature to playback any video without affecting the Control Room operations.

f. The limited access shall also be provided in the Police Control Rooms, Dial 112, and City ICCC. The access shall be provided to other enforcement agency also only upon approval of NHAI. The agencies shall be able to view ATMS dashboard, GIS Map, live and recorded feed from all the cameras, reports relevant to the department. The reports to be provided shall be finalised in consultation with Independent Engineer and concerned agency and shall be approved by NHAI. The Police and enforcement department shall have the option to search any vehicle details by entering the vehicle number, along with date time location filters, as applicable. The authorised users shall also have the option to download / save any video recording, image, relevant report (as per the permission), etc.

g. The ATMS central processing system shall keep the logs of each and every activity of the users on the On-line Access Facility, included IP address, username, data access, downloaded video / clip logs, etc.

16. Integration

a. Integration activities of the ATMS project shall be coordinated and undertaken such that all systems, subsystems, ATMS equipment and ancillary components are integrated with the ATMS Control Centre hardware and in accordance with the detailed project design specifications.

b. All integration activates shall be coordinated with the Independent Engineer prior to commencement of any integration activities and shall be agreed in accordance with the project program.

c. Integration activities shall include the telecommunication nodes (i.e. Managed Ethernet Switches) with the existing and/or proposed fibre optic Ethernet telecommunications network for the design and connectivity of the ATMS Project.

d. All ATMS equipment shall be managed and operated by the ATMS Control Centre. The ATMS equipment shall be integrated as identified in the design drawings and/or specifications, into the ATMS Control Centre.

e. The ATMS System shall be integrated with the AFS (ANPR cum FASTag System) deployed by NHAI under a separate contract for user fee collection system on the project / NH Stretch.

f. Concessionaire shall integrate the VIDS system installed on the project / NH stretch by NHAI under a separate contract for blackspot monitoring.

g. The ATMS System shall be integrated with the RO Control Centre (RCC), Incident Management System (IMS) deployed at PIU, and ITS Command Centre (ICC) at NHAI HQ for seamless streaming of data / video of all cameras installed on the project by the Concessionaire, incident

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monitoring / management, facility management system at each of these locations, as per the requirement of NHAI.

17. Training

17.1 General

a. A training program as specified herein shall be provided for the management, operation, and maintenance of the Highway/expressway management system, digital transmission system and associated systems. All training shall be conducted either in Project City or at site.
b. The objectives of the training are for the Independent Engineer and NHAI officials to understand the functions and the operation of the various systems, and to make them familiar with the proper use of the equipment, software supplied, traffic management operation under the contract.
c. The Concessionaire shall develop all materials required for training in English and furnish three (03) copies of each manual, class note, visual aid, and other instructional materials to the Independent Engineer and NHAI for distribution to the attendants. The manuals, instructions, and training notes shall be in loose-leaf binder form.
d. The outline of the lectures or demonstrations and a sample or description of all training aids shall be submitted to the Engineer for review at least thirty (30) days prior to their proposed presentation or use. Written approval by the Independent Engineer of these materials shall be required prior to the scheduling of training sessions and/or the production in quantity of any training materials.
e. 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 Concessionaire to the satisfaction of the Independent Engineer and the NHAI.

17.2 Management and Operations Training

a. The management and operations training shall include classroom instructions, on site demonstrations, and follow-up reviews. The training shall be designed for the Engineers and control centre operators (up to 20 persons) and shall cover all operating procedures and database management of all equipment comprising the ATMS.
b. The initial classroom instructions and on-site demonstrations shall be completed during trial operation for whole works and the follow-up reviews shall be completed during the first two (2) months of the guarantee period. The contents of this training shall include as a minimum the following:

17.2.1 Training program - System Management (Minimum of 12 contact hours)

1) System operation
2) Operations overview
3) Data requests and data displays
4) Functions and duties of control centre personnel

17.2.2 Training program - Control Procedures (Minimum of 24 contact hours)

1) Server, operator console and peripheral equipment operations
2) Orderly start-up and shut-down
3) Use of diagnostic programs and procedures
4) Response to alarms, errors and faults
5) Interpretation of alarms and fault messages
6) Operation of TMCS equipment
7) Operation of the VIDS equipment
8) Operation of the ATCC application
9) Operation of the TTMS application
10) Operation of the Probe data system
11) Operation of the VSDS equipment
12) Operation of Graphic Display and monitor display

17.2.3 Training Program - Analyst Procedures (Minimum of 24 contact hours)

1) Data requests and data displays of operator console

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2) Data base management
3) Coding input
4) Edit checks
5) Insertion, deletion and alteration of data
6) Modifications
7) Addition, deletion or alteration of default values and parameters
8) Interpretation of displays and reports

17.2.4 Training program - Maintenance Training

a. The maintenance training shall cover trouble shooting and maintenance procedures for all newly installed equipment and the use of maintenance tools, equipment, and test instruments. It shall be completed within six (6) months of the issuance of the Certificate of Completion for the Whole Works.
b. The training shall include at least 80 contact hours of classroom instructions and hands-on workshop sessions, and on-the-job training:
c. The classroom lectures shall cover at least the following:

17.2.5 Training program - Traffic Management Centre

1) Central Processing System Server and operator console
2) Peripherals
3) Graphic Display
4) Data gathering processor
5) TMC server
6) ATMS Software
7) ATCC application
8) TTMS application
9) Probe data system
10) VSDS server
11) Communications and Ethernet
12) Layer switch, router, and hub if applicable
13) Wireless communication system
14) Facility monitoring central controller
15) Metallic and optical fibre cable
16) Power supply and distribution

17.2.6 Field equipment

1) TMCS equipment
2) VIDS equipment
3) VSDS equipment
4) Facility monitoring equipment

17.2.7 Workshop

A workshop shall be conducted on

1) Test equipment
2) Test procedures
3) Repair procedures

Further,

a. Hands-on training shall focus on the diagnosis of the fault and malfunction and include but not be limited to the following:
   1) Diagnosis of TMCS
   2) Diagnosis of VIDS
   3) Diagnosis of ATCC application
   4) Diagnosis of TTMS application
   5) Diagnosis of VSDS
   6) Diagnosis of Ethernet
   7) Diagnosis of data transmission system

8) Diagnosis of facility monitoring system

b. On-the-job operation and maintenance training shall be provided for NHAI operation and maintenance staff or staff of concessionaire (up to 15 persons) and shall commence on the conclusion of the classroom and workshop training sessions and continue until Taking Over Certificate of the Works. Indian counterpart staff will be designated for this purpose. Salaries overtime pay and cost of allowances of these staff will not be the responsibility of the Concessionaire, but the Concessionaire shall be fully responsible for providing all necessary instructions, manuals and tools, and for all other non-salary related cost. The Concessionaire shall specify the equipment, tools, and other items to be provided in the Technical Proposal.

17.2.8 Training program – Operations

1) Introduction to the Operations and Maintenance procedures for the highway (based on the O&M manual)
2) Routine monitoring of the Highway
3) Incident Management procedures
4) Incident detection and validation
5) Incident logging
6) The use of checklists for fail-safe incident management
7) Communication with other stakeholders of incident management
8) Active monitoring of Incident management
9) System performance monitoring
10) Routine monitoring
11) Logging failures / events
12) Communication with maintenance engineers

18. System Operation and Maintenance

a. The Concessionaire shall perform System Operation and Maintenance (O&M) for a period specified in the Concession Agreement meeting the requirements provided in the relevant Schedules.

b. The Concessionaire shall deploy adequate number of trained personnel at site and at their back office to ensure that the above requirements are met. The Concessionaire shall submit, to the Independent Engineer and NHAI, weekly reports on their Operation and Maintenance.

19. Information Security

a. The Concessionaire is 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(E) dated 11th April 2011.

b. The Concessionaire is required to ensure that the system being provided shall adhere to the model framework of cyber security requirements set for Smart City (K-15016/61/2016-SC-1, Government of India, Ministry of Urban Development).

c. The Concessionaire shall have familiarly with ISO 27001 or procure the necessary expertise in developing and delivering solutions in line with information system security best practice. **At least one of the System Maintenance Engineer/ Manager deployed at site shall have relevant information security certification from any renowned institute.**

20. Spares, Consumables and Maintenance Equipment

20.1 General

The Concessionaire shall furnish the specific spare parts, consumables and maintenance equipment as indicated in the Tender Schedule.

20.2 Recommended Spare Parts and Maintenance Equipment

a. The Concessionaire shall provide in his Technical Proposal detailed information on spare parts and consumables necessary for the continuous operation and maintenance of the equipment to be installed under this Contract through the guarantee period and five (05) additional years following the system acceptance. The information shall include identification, source of supply, and availability for the next

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10 years. Recommended quantities for five years of maintenance for these spare parts and consumables shall be listed in the Technical Proposal "Spare Parts and Maintenance Equipment".

b. The Concessionaire shall also identify maintenance equipment, tools, testers, and measuring apparatus which will be required to effectively maintain the highway/expressway management system and provide all necessary details in his Technical Proposal. The costs of furnishing the equipment shall be quoted in the "Proposed Rates and prices of Recommended Spare Parts and Maintenance Equipment." The recommended maintenance equipment should include, among others, the following:
   1) Maintenance computer (workstation type)
   2) Field maintenance computer (Industrial Grade Laptops)
   3) Digital multi meter
   4) Level meter
   5) Insulation resistant meter
   6) Dielectric strength meter
   7) Ground resistance meter
   8) Oscilloscope
   9) Network analyser

c. Operation, simulation and diagnosis software developed specifically to the equipment to be supplied under the CONTRACT shall be supplied in CD-ROM or DVD. They shall be also installed in the maintenance computer.

d. The NHAI reserves the option to require the Concessionaire to furnish any or all of the recommended spare parts, consumables, and maintenance equipment.

20,3 Parts Supply Guarantee

a. The Concessionaire (Concessionaire), his legitimate successor or his designate, shall guarantee for a period of seven (7) years from the date of commencement of the O&M period and that he will supply promptly upon the written request from the NHAI any parts, components or equipment incorporated in the System even after completion of the Contract period. This Clause shall not necessarily be construed to read that the Concessionaire be required to maintain the inventory to cover the entire items for anticipated requirement for such purpose through the 7 years' period. Because of discontinuation of production of such particular items or because of any reasons beyond his control, if the Concessionaire fails to supply the requested parts, components or equipment, he shall satisfy the need of the NHAI by whatever appropriate substitutes available with consent and approval of the NHAI, but always in such a manner and outcome that the substitutes can maintain or improve the Works' performance or capabilities as a whole.

b. The Concessionaire shall be paid as per the rates mentioned in the Indicative list of key components or as determined by the Authority, for supply of parts requested by NHAI after completion of the Contract period.

Section 02 Design Requirements

1. General

a. The Concessionaire shall undertake the detailed design of Advance Traffic Management System (ATMS), Digital Transmission System and associated facilities and works, hereinafter collectively referred to as ATMS. The ATMS shall meet all the design criteria stipulated in the System Specifications. The component systems comprising ATMS to be constructed under the Contract shall include but not be limited to the component systems:

b. All systems to be installed under this Contract shall be capable of continuous, unattended, 24 hours a day, 7 days a week operation under the environmental conditions prevailing on the Project Highway. Should the design require periodic replacement of any equipment or component, the replacement schedules of such equipment or component shall be described in the Technical Proposal and in the maintenance manual.

2. Technical Proposal

The Concessioanire shall shortlist the ATMS Sub-contractor and shall submit the Technical Proposal of the ATMS Sub-contractor to NHAI for review and approval of the Independent Engineer before awarding the work.

The technical proposal shall comprise of the following:

a. The Concessionaire shall describe the proposed works in sufficient detail in his Technical Proposal to enable the NHAI to evaluate the technical adequacy of the proposed system. The Technical Proposal shall include the statement of compliance with the Specifications indicating whether the proposed equipment comply with the specified requirements. If the proposed system does not comply with the Specifications, the details of differences shall be described together with the alternative features of facilities offered. The NHAI may reject the non-compliant proposal.

b. The Concessionaire shall propose and describe in detail in his Technical Proposal the approach, methodology, technology and procedure of the detailed design of the expressway management system, traffic management system, digital transmission system and associated works. Expected output of the detailed design shall be described together with the submission schedule for review and approval by the NHAI.

c. For the items for which type, procedure, method, or configuration is left to the supplier's design, The Concessionaire shall clearly indicate in the proposal the type, procedure, method or configuration he chooses with reason.

d. 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.

e. The Concessionaire shall not submit an alternative proposal. NHAI shall reject such alternative proposal.

f. The Technical Proposal shall be written in the same sequence as the Specifications. Where the supporting documents are provided, a cross reference shall be prepared. The Technical Proposal shall be written in English.

g. The Technical Proposal shall include the description of system as a whole and equipment comprising the System. The description shall include how the requirements of the Specifications are achieved. If necessary, block diagram, flowchart, timing chart or other explanatory documents shall be attached.

h. Equipment comprising the system shall be defined. For each equipment, the following items shall be stated:
   1) Electrical and/or mechanical specifications
   2) Specifications of interface with other equipment
   3) Human-machine interface, if applicable
   4) Environmental conditions
   5) Physical dimensions
   6) Power consumption
   7) Operation console layout
   8) Brand, make, model, and/or type (only one for each component)*
   9) Catalogue, brochure, or other supporting document (if any)

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

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i. The Concessionaire shall submit the layout plan of the Operation Room in the Technical Proposal for reference

j. The Concessionaire shall include in the Technical Proposal the software quality assurance program that he intends to adopt in developing the software.

k. The Concessionaire shall propose in the Technical Proposal the feasibility and ease with which such applications (additional software packages to run concurrently with the software provided under the Contract) might be implemented using the Advance Traffic Management System proposed by him and shall advise the spare memory capacity and processing power which could be available, but not necessarily provided, within the proposed computer to allow such applications to be implemented.

l. The Concessionaire shall state in the Technical Proposal, the third-party software that he proposes. If the Concessionaire proposes the third-party program that is of limited use, he shall explain the reason for using it in the Technical.

m. Systems and subsystems that minimize the possibility of either the failure of any single component or the module which may cause total system failure shall be provided by the Concessionaire in Technical Proposal and later in Design Document. Failure of one component or module shall not cause the failure of any other component or module.

n. The Concessionaire shall describe in his Technical Proposal application software to be provided to the servers and workstation in the Traffic Management Centre required hereunder.
   1) Graphical presentation of module and components comprising application of servers and workstation.
   2) Data processing flow in the form of class diagram, use case diagram, sequence diagram, or data flow diagram
   3) Scale or size of the module and components, and programming language used
   4) Extent of the development required for the Project

o. Attested copy of the Certifications, test reports, etc. specified in this Document.

p. Any other item / document / information specified in this Document for submission in Technical Proposal/ design document or sought by the Authority/ Independent Engineer.

3. Detailed Design

3.1 Design Briefing

Within 15 days of commencement date of the Works, the Concessionaire shall conduct a design briefing session in the development centre of the Concessionaire. The design briefing shall cover all the system components and civil works included in the Contract. The main objective of the briefing is to acquaint the Independent Engineer and NHAI with the design concept and outlines of the proposed systems, and to allow them to examine whether or not the Concessionaire's design complies with the Contract.

3.2 Design Review and Approval

a. Within 1.5 months of commencement date of the Works, the Concessionaire shall submit a Final System Detailed Design to the Independent Engineer 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.

b. The Concessionaire shall submit System Detailed Design for each component system as it is completed. The Concessionaire shall further focus on completing the design of all components to expedite the project implementation. If design change is necessary for the portion of the detailed design that has been submitted and approved due to the design of other portions, revised detailed design shall be submitted with the modification noted for approval.

c. The Concessionaire shall not, without specific approval in writing by the Independent Engineer, 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 Independent Engineer. The Concessionaire shall not implement any changes on the approved system design without prior approval of the Independent Engineer.

d. The approval of the System Detailed Design by the Independent Engineer, however, does not relieve the Concessionaire from delivering a fully operational and reliable system.

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3.3 Hardware System Design

The hardware portion of the System's detailed design shall include among others the following:

1) Functional and physical system block diagram of each component system.
2) Connection and interface between the blocks in the block diagram.
3) Functions, capacity, input, output, and method of operation.
4) Response time, delay, allowance, attenuation, loss and other figures as appropriate for applicable equipment.
5) Environmental and physical design specifications of the equipment. Manufacturer's product specification sheets may be accepted for standard products.
6) Power consumption of each equipment.
7) Cable network diagram.
8) Cable work plane plan.
9) Conduit line plan.
10) Equipment layout in the machine room at the Traffic Management Centre, at Service Area, and Toll Plaza Office.
11) Layout in the control room at the Traffic Management Centre including civil works, interior works and lighting plan.
12) Manner of installation.

3.4 Software System Design

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.

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

3.5 Operating Procedures

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.

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

4. System Configuration

The Concessionaire may adopt a system configuration as long as the functionality and performance of the system meet the system requirements specified herein. It is the Concessionaire's obligation to show that the proposed system will satisfy all the requirements in the system specifications.

4.1 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 shall complement each other and shall not be dedicated to a specific function. Breakdown of an operator console shall not affect the normal operation of the system and in any aspect. Database server shall have a redundant configuration of RAID system or similar highly reliable configuration.

4.2 Component Systems

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, while others are stand-alone system with no data exchange 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

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technology in each field but propriety technology available from a single vendor only shall be avoided.

2. All ATMS equipment shall work 24 hours a day on all days of the year.
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).
4. All Servers, Storage, Computing, LPU, Networking, Security devices etc. shall be BIS certified.
5. The MAC (Machine Authentication Code) address of all the equipment shall only be registered in the OEM's name.
6. All modules except ATMS CPS application shall be third-party COTS (Commercially available off-the-shelf) enterprise edition software and only third-party COTS enterprises edition software shall be provided for the software/ solution/ application / module specified as COTS in the ToR/BOQ and no customised or proprietary software/ module of the Contractor shall be provided for applications such as NMS, VMS/VAMS, GIS, etc., as approved by NHAI/Independent Engineer.

4.3 Reliability

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

4.4 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 like MQTT

4.5 Traffic Management System

The Traffic Management System shall have high reliability, accuracy and security in design. Stoppage of the total system shall not be allowed under any circumstances. Redundant hardware configuration shall be adopted for key components to ensure continuous operation. Data backup mechanism shall be used to prevent data loss. Operation log shall be kept to allow tracing of operation in case of any dubious event. Mechanism shall be incorporated in the system design to prevent illegal or fraudulent activities by the Control room operators.

5. Space for ATMS Facility

Suitable space for the Control Centre (i.e. Traffic Management Centre) and Sub-Centres, will be provided by the Civil Contractor for setting up of the Control Centre and Sub-Centres. The building shall be designed by the Civil Contractor in consultation with the Concessionaire such that it is sufficient to accommodate the entire system along with further scope for extension.

5.1 Traffic Management Centre and Sub-Centres

A Traffic Management Centre shall be constructed at the site near the Highway on the top floor of the Toll Plaza Control Building or any other suitable building on the project stretch with sufficient space for setting up TMC. All central equipment including server network, multi-screen wall map, data communication system, voice communication system and associated equipment will be accommodated in the office. System operator will station at the office and manage the traffic on the highway. One TMC shall be provided for each project stretch. Sub-Centre shall be provided at every toll plaza other than the Toll Plaza that accommodates TMC, such that entire stretch is proportionately divided in sections of up to 80 kms between the TMC and sub-centres.

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In case toll plaza building is not available, the TMC and sub-centre (as applicable) shall be constructed by the Concessionaire on the project stretch to fulfil the above requirement.

6. Power Supply

a. The input power supply of any equipment shall not be connected to any electric components except arresters without connecting first through fuses, power switches and circuit breakers.
b. All equipment shall be provided with a clearly visible label indicating the input power supply type (AC or DC) and voltage. All equipment shall operate with the power supply of 230V plus or minus 10 percent, and 50 Hertz plus or minus 3 percent. All field equipment shall operate normally under instantaneous power supply interruption of 20 millisecond or shorter.
c. The power supply voltage available in the field will be 230V AC. Unless specified otherwise or with the approval of the NHAI, all field equipment shall be designed to operate directly on 230 V AC. The Concessionaire shall be responsible for arranging the terminal devices necessary to receive the power supply.
d. System enclosures shall include a power distribution subsystem for supplying power to each component within the enclosure and related / inter- connected equipment. The circuit breakers shall be properly sized according to the expected loads of the concerned equipment and to meet relevant electrical code requirements.
e. 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.
f. 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.
g. The enclosure shall be earthed in accordance with the relevant BIS and NBC 2016 regulations.
h. The enclosure shall include a 230Vac 15 Amps 3-pin dual socket power outlet conforming to BIS standard.
i. The power sockets shall be installed in accordance with relevant BIS standard.
j. **Surge Protection Devices** (SPDs) shall be provided at main's entry level (LT Panel level / Entry panel – 230/400 V AC or at UPS level) 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 at equipment location and building. The SPD shall be rated in accordance with IEC 61643-11 and NBC 2016, the latest and valid standards. It shall be non-exhausting metal encapsulated, spark gap-based technology. The SPD shall be tested as per IEC 61643-11:2011 (or equivalent EN 61643-11:2012) from KEMA or VDE international independent test labs. The SPD shall be rated for 255 V. It shall be capable to discharge Lightning current (10/ 350 µs) of 25 kA for L-N and 100 KA for N-E. The device shall have voltage protection level of device shall be ≤ 1.5 KV including inbuilt fuse. The SPD shall have current extinguishing capability [L-N]/[N-PE] : 100 KArms / 100 Arms. The device shall have followed current limitation/Selectivity resulting in no tripping of a 35 A gL/gG fuse up to 50 KArms. The device shall have built in fuse and operation of SPD shall be independent of Line current. No requirement of additional overcurrent protection. The device shall have mechanical indication-based health indication for L-N and N-PE SPD along with the common potential free contact / changeover contact for remote monitoring.
k. **Network Surge Protection Device (SPD)**: The different components of system shall be installed with surge protection device in accordance with IS/IEC 62305-4, the selection/location shall be decided depending upon the criticality of the application. The communication interfaces shall be installed with suitable SPD. SPD for POE shall meet the latest standards and suitable SPD for 12V DC supply and 5V DC supply, as applicable and complying to IEC 61643-21 / EN 61643-21 shall be installed and shall be UL approved.

7. Design Life

All components and materials used in this Contract, excluding consumable items such as lamps, shall be of a design life of 10 years or longer, used for ATMS, and unless specifically stated otherwise in the System Specifications. The NHAI may approve components with a shorter design life if they are easily replaceable and a 10-year design life is generally considered infeasible or uneconomical. The replacement of such equipment shall be possible without displacing other component.

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8. Environmental Conditions

8.1 General

All equipment shall be designed to operate properly under the environmental conditions normally encountered at the site of the equipment and shall conform to the minimum requirements specified herein.

8.2 Environmental Conditions

a. Unless specified otherwise, indoor equipment shall be designed to operate in the temperature range of 0 to 35 degree Celsius, and the relative humidity range of 5 to 85 percent, whereas outdoor equipment shall operate in the ambient temperature and relative humidity ranges of -10 to +55 degrees Celsius and 40 to 90 percent non-condensing humidity, respectively. Adequate protection from moisture condensation, fungus, rust, insects, rodents, and dust shall be provided.

b. All equipment shall be adequately treated to prevent rust and corrosion due to high humidity or moisture condensation. All galvanized steel surface shall have a minimum plated zinc amount of 350 g/m2. Any signs of rust or corrosion occurring within the guarantee period shall be deemed a defect and the Concessionaire shall be responsible for correcting, at his own expense, the defect to the satisfaction of the NHAI.

8.3 Wind

All outdoor equipment and their support, individually and fully assembled and installed as a whole, shall withstand an instantaneous wind velocity of at least 30 m/sec. or the wind velocity recorded on the Project Stretch till date, whichever is higher. The Concessionaire shall also obtain the certificate from the concerned Metrological Department regarding the maximum recorded wind velocity on the highway/expressway stretch.

9. Cabling and Wiring

All cables and wires shall be of good quality, conforming to normally accepted industry standards, and shall be of the proper type and have sufficient ratings for the particular application.

a. All exposed ends of unconnected cables and wires shall be coated with watertight sealing compound or sealing tape to avoid damage to conductors. All communication cables used shall have a clearly marked label securely fixed near each end in accordance with the cable network diagram.

b. All cables and wires shall be adequately protected from the edges of equipment housing or other surrounding objects. All of the cables and wires shall be neatly arranged and securely placed in such a way that all terminals are relieved of the weight of the cables. Terminals shall be coded, identified and labelled according to wiring diagrams. Live metal shall be recessed or protected to avoid accidental contact.

10. Grounding

a. All exposed metal not forming part of the electrical circuitry, including equipment enclosures, cable supports, structure and pole shall be grounded to the earth.

b. Equipment which is supplied with voltages of 100 volt or more shall be provided with grounding terminals insulated from their frames. Control centre equipment shall be equipped with a grounding terminal of earth resistance of 10 ohms or less. Field equipment shall be equipped with a grounding terminal of earth resistance of 100 ohms or less.

c. Compensation for furnishing and installing grounding equipment shall be included in the prices of various BOQ items and no separate payment shall be made, therefore.

11. Protection against Lightning

a. All outdoor equipment shall incorporate gap arresters or other suitable device approved by the Independent Engineer to prevent lightning damages which may enter through input AC lines, communication cables, signal cables, detector feeder cables or other metallic elements exposed to the open air.

b. Compensation for furnishing and installing lightning protection equipment shall be included in the prices of various BOQ items and no separate payment shall be made, therefore.

c. Earthing of all equipment shall be made by using UL listed 3-meter copper bonded rod (minimum 250 micron) with 17 mm dia, complying with **NBC 2016, IS 3043 and IS/IEC 62305-1/2/3&4**

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standards. The resistance value shall be as low as possible in every case. Above ground metal piping in the process/valve area (subject to non-Cathodic protected) shall be Earthed.

d. From the viewpoint of lightning protection, a single integrated structure earth-termination system is preferable and is suitable for all purposes (i.e. lightning protection, power systems and telecommunication systems). The earthing system of a number of structures shall be interconnected so that a meshed earthing system is obtained. This will give low impedance between buildings and has significant lightning electromagnetic pulse (LEMP) protection advantages. Thus, different earthing systems like lightning protection earthing, electrical earthing,.safety earthing, electronics earthing etc shall be interconnected.

e. **Isolating spark gaps (ISG)** shall comply to IEC 62561-3, used at the places where direct interconnection is non-permissible to create equi-potential bonding throughout the earthing system at the event of lightning with lightning impulse current (10/350 µsec / Iimp) up to 100 kA and rated impulse sparkover voltage of ≤1.25 KV with IP 67 degree of protection.

12. Cabinets

a. All equipment cabinets for outdoor uses shall be of rainproof and rustproof construction with smooth exterior and adequate protection against moisture condensation and shall be made of high-quality steel or stainless-steel plates of adequate thickness. Steel plate cabinets shall be treated with sand blast before painting or equivalent rustproof measures.

b. Past experience has indicated that condensation may develop inside a completely enclosed outdoor cabinet connected with underground conduit due to breathing effect which is caused by a change in ambient temperature even when the conduit is sealed by foamed sealant. The Concessionaire shall state in his Technical Proposal how he will overcome this problem.

c. Cabinet doors shall permit complete access to the interior of the cabinet and shall encompass essentially the whole area of the front surface of the cabinet. All door hinge pins shall be of stainless-steel construction.

d. All outdoor equipment cabinets shall be equipped with a build-in lock and door open alarm integrated with the Control centres. All cabinets for the same type of equipment shall have an identical lock. The specified number of keys for each type of cabinet shall be furnished to Independent Engineer.

13. Pole

a. 12-meter poles shall be used to mount TMCS and VIDS cameras.

b. Pole cross section shall either be circular with a typical outer diameter of 150 mm or square cross section.

c. The joint(s) shall be seam welded.

d. The fully fabricated pole column shall be of stainless steel/galvanized /Enamel Painted/powder-coated to an appropriate minimum coating thickness.

e. The poles shall incorporate suitably designed holes on the sides to allow for electrical cables to enter or exit the pole undamaged.

f. The bottom portion of the pole shall be treated for corrosion resistance in accordance to the installation site.

g. 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.

h. 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. The access door shall of sliding type, top to bottom direction, so that it remains closed even when the clamp /hook to hold it is removed. The sliding rail shall be welded inside the pole.

i. 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.

j. Suitably sized powder coated terminal box and terminal block assembly shall be provided and be treated as a part of the 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 waterproof sealant to avoid water ingress into the box or the pole base.

14. Mounting Arrangements

a. All mounting arrangements for ATMS equipment shall comply with the requirements of that equipment as detailed in this specification.
b. The foundation and the foundation bolts for Ground mounted enclosures, 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 for poles, plates etc and up to 55 microns for the bolts and other accessories.
c. Galvanized Nuts, locknuts, locking pins washers etc. shall be supplied as a part of the foundation.
d. Fixing templates with a placement accuracy of at least +/- 1mm shall be provided to allow for the correct orientation and installation of the steel foundation on to the concrete base.
e. 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.

15. Ground Mounted Equipment Enclosures and Poles

15.1 Ground mounted enclosures

a. The ground mounted enclosure shall house telecommunications equipment, power and other related equipment necessary for the operation of ATMS equipment
b. The equipment must continue to work within its normal operating parameters in this environment, regardless of location.
c. 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.
d. 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.
e. Each enclosure door shall be equipped with an adjustable doorstop to hold the door open.
f. 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.
g. All internal connectors, components and wire terminations installed in the enclosure shall be labelled in accordance with the design drawings.
h. 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:
    (i) BIS requirements (or approved equivalent international standard).
i. 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.
j. 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.
k. 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.

16. Heating, Ventilation and Air Conditioning (HVAC) Subsystem

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

17. Installation

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

18. Radio Interference

All data processing and transmission equipment shall be designed to prevent radio interference with the satisfactory operation of other equipment regardless of whether the interference be due to radiation, induction or conduction.

19. Metering

All electrical and electronic equipment shall be provided with waveforms and voltage test points or voltage meters as necessary for indicating circuit conditions.

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Section 03 Central Processing System

1. General

a. The ATMS for the Project is composed of many components systems. These systems are expected to perform their functions to achieve overall objective for the efficient, safe and smooth traffic on the Highway/Expressway.

b. The Concessionaire shall provide and construct a central server system that manages various systems comprising the Highway/expressway-traffic surveillance and control system in an efficient manner, provides user-friendly human machine interface for the operator and records all events and incidents related to the Highway/expressway.

c. System shall be expandable to account for increase in field installed devices. Minimum 25% spare capacity (rounded off to the nearest higher whole number) should already be part of the quoted system.

d. All the supplied equipment shall operate on 230 V, 50 Hz single -phase power supply. Power for all the equipment will be conditioned using on-line UPS with minimum 4 hours or more back up. If any equipment operates on any voltage other than the supply voltage and supply frequency, necessary conversion/correction device for supply shall be supplied along with the equipment.

e. All the control equipment e.g. fileservers, database servers, video recording server, SAN/NAS/Raid backup device, decoders, networking equipment etc. shall be provided in standard Racks.

f. System shall have WAN connectivity for remote monitoring.

g. Online backup should be maintained to protect against storage failure.

h. Concessionaire shall provide all technical details regarding data formats, communication protocols, packet formats, etc. to enable Independent Engineer and NHAI to formulate national standards on successful implementation of the highway stretch.

i. All the modules supplied (CCTV, Speed display, Roadside Communication etc.) shall deliver data and reports that are safety-centric (fatal collations in a given stretch, violation of regulation etc.), enforcement-centric (number of tickets issued, comparison of violations on monthly basis etc.) as well as equipment-centric (failed packets, number of repairs carried out on field devices, down time on account of major faults etc.)

j. The system shall provide detailed reports related to the System Operations (including the actions of various stakeholders during Incident Management) and Maintenance. The format for the same shall be finalized by the service provider in consultation with Independent Engineer. Maintenance reports, at the minimum, shall include the current operational status of each equipment, actual events of Down-times of each equipment, actual events of Mean time to Repair of each equipment and actual events of Meantime between failure of each equipment and the preventive & repair maintenance log.

k. The system shall also provide a method to log and report road highway incidents. Data used for logging and reporting shall be 'picked-up' automatically from the road-side and other sensors to the maximum extent possible.

l. Further the system shall provide a facility of generating user-formatted reports that can, for example, bring together the occurrence of highway incidents, values of various sensors and the operational status of various equipment on a common timeline / scale.

2. Main Function

a. The central server system shall constantly monitor the operation of component systems and their subsystems. It shall be possible through the supervisory server to define/ modify the system configuration and add/remove any device connected to one of the component systems. It shall also be possible to change any system parameters defined and stored in the database.

b. Provision shall be made with preventive measures against inadequate change to the system parameters. Access to the system configuration function must be restricted to the authorized personnel and error check function shall be incorporated as much as possible. The configuration and parameters of the system shall be backed up to allow recovery.

c. Seamless data exchange (including incident/event management/ monitoring, video streaming of all cameras, access to reporting modules, facility management system, NMS etc.) between TMC, RCC at NHAI Regional Office, IMS at NHAI PIU, and ITS Command centre at NHAI HQ.

3. Equipment Location

a. The Concessionaire shall design the layout of the Operations Room and Server Room in the Traffic Management Centre. The Operations Room is the room where Graphic Display, TMCS monitor display, and console will be placed, and the operation of the Project will be monitored. The Server Room will be the place where the server, network equipment and other devices will be installed.

b. The layout shall be designed taking into consideration the function of the server and workstations to be placed in the room, the role of the staff and operators stationed in the room, position of Graphic Display and TMCS monitor screen, cable routes, viewing by visitors and other factors to establish a functional Operations Room and Server Room. The layout shall be approved by the Independent Engineer.

c. The Concessionaire shall submit the layout plan of the Operation Room in the Technical Proposal for reference.

4. System Functions

4.1 Event input and management

The central processing unit must have at least the following system and functions:

4.1.1 Basic concept of event management

Considering further information reuse for the Traffic Management and Traffic Information Provisioning, the system shall provide function to allow input and register the traffic data/events with location information in the specified management unit.
And also taking the actual O&M into account, the system shall cover all items which should be managed as traffic events.

4.1.2 Event generation

a. Judgment of traffic situation

i. Automatic event generation

1) Using the traffic data measured by appropriate field systems like ANPR data in real time, and live video data from VIDS and ANPR, the system shall be able to detect traffic jam situation automatically by using a user specified velocity parameter.
e.g. Judged as traffic jam in case of traffic velocity less than 20km/h.
2) Using the live video data monitored by VIDS in real time, the system shall be able to detect an abnormal situation (e.g. car incident) automatically.
3) Using the live video data from VIDS, TMCS, and ANPR data analysis, the system shall be able to detect the traffic violations (eg. Over speeding, wrong direction driving, wrong lane driving – bus/truck driving in car lane or car continously deriving in overtaking lane/truck lane, zig zag driving, dangerous driving, etc.) automatically.
4) Using the live video data from VIDS, TMCS, and ANPR data analysis, the system shall be able to detect the Faulty / non-standard number plate of the vehicles.
5) Using the live video data from VIDS, TMCS, and ANPR data analysis, the system shall be able to detect the faulty tail light (when the rear of the vehicle is within the viewing zone of the camera) and head light of the vehicles.
6) Automoatic validation request generation and E-Challan geration for above voilations post validation by the operator.

ii. Manual event registration

After confirming events by the following method, the operator shall be able to register events manually.

1) Incident reported by Highway emergency call (e.g. 1033)
2) Incident reported by Patrol vehicle
3) Incident found in camera for TMCS, VIDS, ANPR, VSDS, etc.
4) Incident reported by other sources, etc.

iii. Priority management of event (Seriousness and Distance)
Based on the pre-defined seriousness of events and the distance between event location, the system shall have function to prioritize information to be provided automatically.

iv. Association (connection) function
The system shall have function to associate the traffic situation and the causal traffic event automatically.
e.g. "Traffic Jam" caused by "Car Accident"

v. Complementing of missing data
The system shall provide function to the operator who is monitoring TMCS in O&M centre, for manual complementing/correction of the missing data or odd traffic information.
e.g. Even if the traffic jam was not detected by system, the operator shall be able to register as traffic jam by his own judgment.

b. Tuning of setting
For the above-mentioned event generation, threshold parameter shall be adjustable (i.e. can be tuned) for the daily operation.
e.g. Threshold velocity for traffic jam detection (20km/h → 30km/h)
e.g. Information delivery distance for non-serious event (within 5km → within 10km)
Note: For any / all of the above related to Event generation the ATMS service provider may utilise relevant Artificial Intelligence and / or Machine Learning algorithms built into the ATMS system. The Concessionaire shall indicate these features in the Technical Proposal.

4.1.3 Event management method

1) **Event entry and release**
The system shall have the function to associate the location (Up/Down lane), the event type, and the event detection time with TMCS camera which detect event. And it also shall provide event management method to register and release traffic events.
e.g. Register and Release events by pull down operation, specifying the type of event and the number of cameras which detected the event.

2) **Supporting function**
In general, the events (e.g. car incident) are supposed to be released by the operator manually. But to prevent neglecting release of events, the system shall provide notification function to ask confirmation of operator for events which keeps ongoing after specified time period.
e.g. Alarm is raised for the event which keeps ongoing more than 30 min

4.1.4 Relationship with another agency

1) Integration on related information of another agency
Supposing that the same level traffic information as Project in the future from the connected roads, traffic information status both for Project and the connected roads shall be integrated as one seamless traffic information.
e.g. Traffic jam which begins from other projects and ends in Project shall be merged into one information.

2) Increased capacity of connecting roads
The system shall be prepared for the expansion of the connected roads and information service area.

4.1.5 Call recording

Conversation of all Emergency calls including the call transferred to other telephone shall be automatically recorded in the storage device of the Emergency Telephone Console workstation with time stamp and operator details. It shall be possible to assign type of call for each record and search the recorded messages with type of call, date, operator, and location.

4.2 Internet Server and Project website

a. Information of road and traffic condition will be disseminated to the public via Internet. A website of Highway/expressway-traffic-information will be set up and the Concessionaire shall design the website layout and prepare the contents.

b. The site shall present the Highway/expressway graphically and the existing events such as congestion, maintenance work, lane closure and others that affect normal operation. They shall be indicated on the map by icons and colour. The map shall be updated, when there is any change in the event status without delay.

c. The highway map shall show also camera-icon at the installation points of TMCS camera. If a camera-icon is clicked, the site shall be designed to display in another window, live video taken by the selected camera with clicking. Resolution and frame rate of live video shall be variable to reduce the bandwidth required to access the site.

d. The Website shall be hosted on the NIC only and the link of this website shall be provided on the NHAI and MoRTH websites. The Concessionaire shall be responsible for coordinating with the concerned agencies and the cost of hosting and development charges shall be in the scope of the Concessionaire.

e. At least following information (Road and Traffic condition) shall be provided via Internet:

1) GIS Map
2) Live Video from TMCS camera
3) Traffic Condition like congestion
4) Traffic Event using Image Icon (Type and Location)
5) Traffic Violation details with an option to search by vehicle number
6) Traffic guidance in the form of alternate routes

f. SMS Server shall be set up for sending the SMS alerts to the road users and violators. The mobile number of the user shall be obtained from the NPCI FASTag Mapper and/ or Vaahan database. In case the mobile number is available / fetched from both mapper and database, the number obtained from NPCI FASTag Mapper shall be preferred. All the messages sent shall contain the emergency helpline number '1033' and other details specific for the project. The Concessionaire shall coordinate with the telecom service providers for sending the welcome message to the commuters entering the project stretch. The format shall be finalised in consultant with the Authority and Independent Engineer.

4.3 Information Exchange with Another agencies

Traffic information must be created including road traffic condition of other agencies. For that purpose, Concessionaire must introduce dedicated device to make information exchange with other organizations. Moreover, the system must include conversion/integration functions of data formats in order to recognize exchanged data as of continuous roads for the integrated traffic information provision.

5. Software

5.1 General

a. The ATMS software integrates the field equipment like CCTV cameras, VIDS with the Integrated Traffic Management (ITM) console to ensure the availability of an effective system for Traffic monitoring & incident / accident management. In addition, it shall also have the capability to integrate and exchange data (using standard protocols) with multiple IoT (Internet of Things) devices that have been temporarily / permanently located on the project highway for Traffic study / Traffic management / Road safety purposes.

b. The ATMS software shall be based on a modern architecture and shall optimally execute on the ITM workstation and the ATMS server to ensure that

i. The system response time should be instantaneous to support effective Traffic Management (i.e. Traffic monitoring and incident / accident management) actions on the ITM workstation.

ii. No information (data, video stream & audio stream) from any source is lost. Further all such information is made available on the Integrated Traffic Terminal, with no delay, precisely at the time they are required.

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iii. Effective integration with the CCTV system, VIDS system, and other relevant ATMS equipment is carried out in a seamless manner with no disruption of / disturbance to the Traffic management function (i.e. Traffic monitoring and incident / accident management). For such integration, standard interfaces (e.g. NTCIP) shall be used wherever available.

iv. All information (Data, video and audio streams) collected from various sources shall be archived in the ATMS server for quick retrieval by authorized personnel. However, the performance of the ATMS software in terms of response times shall not be affected during such a retrieval process.

c. The ATMS software shall be a modular system comprising of at least the following modules:
   i. Data acquisition module for acquiring data, video streams and audio streams from field equipment
   ii. Highway Traffic Monitoring module
   iii. Incident / Accident Management Module
   iv. Integrated audio communication module
   v. Report generation module
   vi. System Administration module
   vii. Road surface / condition monitoring module
   viii. Communication module for authorized access by external systems (e.g. NHAI's Regional control centre & the HQ ITS command centre)

d. The Concessionaire shall provide a set of software to operate on the servers, workstations, terminal equipment, and other components and devices to be provided under the Contract. The software shall function as a system to provide end results required in the Contract.

e. The software will be either the software that the Concessionaire has, modification of the existing software, or the new software to be developed for the Project. The copyright of the software specifically developed for the project shall remain with the Concessionaire.

f. The set of the software to be provided shall consist of those provided by third party and those specifically developed for the project. All third-party software shall be legally licensed and there shall be no restriction on the use in the Advanced Traffic Management System. They shall be registered under the name of NHAI and any supports and services provided by the software developer including update and revision shall be available to the NHAI.

g. The software to be specifically developed for the Project shall be fully tested and shall be free from bugs. The Concessionaire shall include in the Technical Proposal and design document the software quality assurance program that he intends to adopt in developing the software.

h. The programming of the applications shall be arranged in such a way that maximum flexibility is afforded by the design to allow the NHAI to implement modifications or additional equipment which may become available or desirable during the working life of the system. Such future modifications or changes shall not be the part of the current scope of the contract and shall be estimated and paid time to time by the NHAI if required but comprehensive documentation of the software and source codes shall be provided under the Contract to allow such changes to be implemented by the NHAI without recourse to the Concessionaire.

i. The NHAI may wish to implement additional software packages to run concurrently with the software provided under the Contract. These packages may include but will not be limited to the following:
   1) Programs allowing the TMC system to operate with other systems such as Toll Management System / ETC/ HES / AFS interfaced to the data network and involving bi-directional transfer of files.
   2) Analytical and statistical program to process the data collected by the system.
   3) Software that offers new service to the road users through Internet.

j. The Concessionaire shall propose in the Technical Proposal the feasibility and ease with which such applications might be implemented using the Advance Traffic Management System proposed by him and shall advise the spare memory capacity and processing power which could be available, but not necessarily provided, within the proposed computer to allow such applications to be implemented.

k. The Concessionaire shall be responsible for Integration of ATMS system and sub-systems with the NHAI Mobile App for the road users as per the requirement raised from time to time by the ITS department of NHAI or its authorized agency.

l. The Concessionaire shall be responsible for Integration of ATMS system and sub-systems with the NHAI Command Centre in NHAI HQ as per the requirement raised from time to time by the Electronics department of NHAI or its authorized agency.

m. The video steam captured and displayed at any location under this project shall be authenticated through Digital Watermarking containing NHAI logo with date and time stamping. The purpose of Digital Watermarking is to ensure following:
   1) Copyright protection
   2) Source tracking
   3) Broadcast monitoring
   4) Video authentication

5.2 Third Party Software

a. The third-party COTS software to be provided shall include but not be limited to the following:
   1) Server operating system
   2) Storage device operating system
   3) Client operating system
   4) Database management software
   5) Video Management and Analytics Software
   6) Firewall and antivirus program
   7) Network Management System
   8) GIS enterprise edition platform
   9) Facility Management System
   10) Network Video Management Software
   11) Microsoft office Pro 2016 or latest license for all workstations

b. All third-party programs to be provided shall be widely used and suitable for the application of Advanced traffic management system in terms of functions, capacity, speed, and interface with other software, maintenance and user friendliness. The Concessionaire shall state in the Technical Proposal of the Tender, the third-party software that he proposes. If the Concessionaire proposes the third-party program that is of limited use, he shall explain the reason for using it in the Technical Proposal of the Tender.

c. If the third-party software is provided in CD or DVD, the original CD or DVD shall be submitted as part of documentation. The requirement is not applicable to the software preinstalled in the server or workstation.

d. If the cost of the operating system is included in the Server and Workstation hardware price, the same may not be mentioned in the BOQ/commercial proposal/ schedule of prices.

5.3 Advance Traffic Management Centre software

a. The Concessionaire shall develop new software or modify the existing software to provide the Advance traffic management system functions specified herein and as per the General Technical Specifications and Particular Technical Specifications.

b. The software to be provided as Advance traffic management system software shall include but not be limited to the following:
   1) Core Advance Traffic Management Centre software
   2) Utility software
   3) Maintenance activity tracking and logging software
   4) Integration with Enterprise web enabled GIS and Image Processing module
   5) Integration with other third party COTS modules
   6) Road condition monitoring module

c. The actual configuration of software modules may not be limited to as listed above; but it shall fulfil the General Technical Specifications and Particular Technical Specifications.

d. All software shall be of modular construction and the interaction between the modules shall be kept minimum. They shall be designed to operate continuously, and no periodical maintenance of the software shall be required.

e. All the display on the display monitor and printed report shall be in English.

f. The utility software shall include but not be limited to the system backup and restoration, database backup and restoration, and access control and operation log functions. Usage of the server and workstations shall be controlled by log in/out procedure and different levels of access control shall be provided to restrict the use of certain software by unauthorized persons. All operations shall be recorded as log together with staff identification number.

g. The software that interacts with the system operator shall be provided with fault tolerant functions and access control functions. They shall be designed in such a way that any operation error shall not cause damage to the system, loss of data or system shut down.

h. All software shall be tested under the different conditions and cases including incorrect operation by the system operator and erroneous data to verify the sturdiness of the software. The software testing shall also include appropriate load and stress testing.

n. The ATMS software shall be a modular system comprising of at least the following modules:

1) Data acquisition module for acquiring data, video streams and audio streams from field equipment
2) Highway Traffic Monitoring module
3) Incident / Accident Management Module
4) Integrated audio communication module
5) Report generation module
6) System Administration module
7) Road Condition Monitoring module
8) Communication module for authorized access by external systems (e.g. NHAI's Regional control centre & the Main control centre)

Data Acquisition module

a) The Data Acquisition enables the acquiring of data from the various field equipment in the form of data strings, video streams and audio streams. Examples include
   - Data strings from VID system, VSDS system
   - Video Streams from TMCS Camera, VID Camera
   - Audio Streams related to conversations on the 1033 Emergency Telephone, Road-side Emergency Telephone

b) The module allows the user to configure the acquisition conditions as follows:
   - At regular intervals of time with the interval being user
   - On the occurrence of Traffic related events in the field (e.g. data from the VID system, instances of calls from Emergency helpline number and 1033)
   - On demand (e.g. Video stream from a Camera)
   - On the occurrence of system related events like equipment failure and restoration, user login / logout

c) The above information thus acquired shall be stored in the ATMS server using an established database package like Oracle and MS SQL.

Highway Traffic Management module

a) This module shall support effective Traffic monitoring on the highway including the display of the road on the Large display and Integrated Traffic Management (ITM) workstation, in the form of animated screens including Graphic User interfaces specified under Clause 816.1 to 816.17 of Specifications for Road and Bridge Works of MoRTH and including locations of all ATMS field devices on a GIS map with the ability to display alongside the current information (e.g. CCTV video Images, etc.) relevant for each field device, either permanently or on selecting the device with a mouse. The details of the project-specific composition of the GUI will be finalized during the project execution phase between the Concessionaire and Independent Engineer in consultant with NHAI.

b) The module shall display the events acquired by the system (Traffic related, and system related) on a window at the bottom of the ITM / Graphic display, with the window size in terms of the number of events displayed being user configurable.

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Further the system shall provide a feature for the user to acknowledge such events and subsequently shall display the same.

c) In addition to the above, the module shall also display the related event (where relevant e.g. a road-side emergency helpline call, VIDS event) on the GIS map using suitable animated icons. The animation shall suitably change when the event has been acknowledged and when the condition causing the event has disappeared.

Incident / Accident Management module

This module shall support Incident / Accident Management by

a) Allowing the Traffic Management console operator to locate and mark (with a mouse) an accident / incident on the GIS map of the highway and initiate the Incident management actions.

b) Displaying a contextual on-line checklist for the operator to follow in sequence. Further the clicking on each item of the checklist shall automatically activate the related ATMS equipment to aid in the management viz.,
   i) seamless audio connection for the Traffic Management console operator, via the integrated audio communication unit, irrespective of the communication media (Mobile radio, Mobile phone/landline, road-side Emergency telephone), to the ambulance, Trauma Care Centres, Patrol & other O&M vehicles
   ii) automatic Pan, Tilt and Zoom of the nearby camera to view the accident
   iii) Bringing on the message edit screen to create and dispatch messages to mobile apps of registered road users. The checklist itself shall be derived from the relevant Traffic Management and rescue procedures captured either in the Operation (O&M) manual of the highway or based on world-class practices relevant for the highway.

c) Logging the timestamp of the operator, who is operating each element of the checklist to aid in 'post-mortem' analysis of the operator's performance towards establishing his /her efficiency and further training needs.

d) Automatically performing pre-defined actions related to each of the above elements (e.g. Identification of the accident spot on the road, further shall control the nearby cameras to 'look' in the direction of the accident spot)

e) Aiding on-line tracking (via GPS) of the various O&M vehicles like the Ambulance, Tow-vehicle and the Patrol vehicle supported with dynamic display of information like shortest route, travel time to the accident spot, Trauma Care Centre etc.

f) Providing a user-programmable facility, as an aid, for the automatic generation of messages depending on incidents based on e.g. information measured by the cameras and sensors installed on the highway (e.g. the generation of a Visibility Alert signal in the event of visibility going below 1 km). This module shall alert the operator on generating the message which shall then be deployed on the operator's approval.

Integrated audio communication module

This module shall interface with and control the integrated audio communication unit to aid the operator seamlessly, communicate with various stakeholders via a host of communication media like telephone landlines, mobile telephony, mobile wireless etc. The Integrated Audio communication unit enables the Traffic Manager / operator to communicate with all stakeholders in a seamless manner irrespective of the medium of communications. Using a hardware like a digital telephone exchange that supports software control, this unit allows the Traffic manager wearing a headset with a microphone (or a handset) to seamlessly communicate with the stakeholders in traffic operations using various audio communication media like Mobile wireless radios, Mobile (GSM) telephones, Telephone landlines as well as the road-side Emergency Telephone. The communication is initiated on selection of a context sensitive checklist element or by selection of suitable icons on the ITM workstation screen during the Traffic monitoring or accident / incident management. This unit shall support

communication between the Traffic manager and a single stake holder or a group of stakeholders. As a back-up option this unit shall also enable such communication via physical pushbuttons located on the unit.

Report generation module

a. This module shall generate periodic as well as on-demand statistical reports using data received from WIM, Automatic Traffic counter cum Classifier and Met sensors for traffic planning and management, accurate forecasting. There shall also be a provision to generate reports to aid planning and strategizing enforcement.
b. The module shall provide a range of reports on demand including those
   - related to the acquired data,
   - Messages edited and sent,
   - Equipment availability,
   - System related events including those related to
     - System malfunction and restoration
     - User login – logout
     - VIDS events detected
     - Mobile App messages received
c. The module shall further provide detailed performance reports on all aspects ranging from detection of incidents, through the field Operations team (Patrol vehicles, Break-down cranes and Ambulances) actions, Traffic Management Console operator and other ATMS Control Centre operator actions.
d. Detailed formats of each report shall be provided by the Independent Engineer during Detail Design Phase.

System Administration module

This module shall essentially enable the definition and maintenance of user accounts.

Road Condition Monitoring module

a. This module shall be capable of detection and monitoring of the road condition, potholes, etc using the cameras installed on the Highway and Route patrolling / maintenance vehicles.
b. This module shall generate periodic as well as on-demand statistical reports using data received from cameras and sensors for planning, management, and forecasting. There shall also be a provision to generate reports to aid planning and strategizing road maintenance activities.
c. The module shall generate alert as soon as any bad road conditions such as cracks, potholes, damaged surface, road furniture, fencing, signage, plantation, dead animal, etc. are detected by the system.
d. The Module shall further provide the feature to manually logging/reporting the road condition at the control centres or through mobile app and website.

Communication module

This module will manage authorized access to the ATMS system by

1. Authorized NHAI personnel / representatives / Independent Engineer
2. Other authorized NHAI systems like the Regional office Control Centre ATMS system and the Main Control centre ATMS system
3. Any other system authorized by NHAI

Based on requests from the above entities the communication module shall provide the following information to the requesting entity:

i. Video Streams (Live and Archived)
ii. Audio streams (Live and Archived)
iii. Data strings and Data elements (Live and Archived)

The standard data exchange protocols for the above will be shared by NHAI with the successful Concessionaire.

i. **Enterprise web enabled GIS and Image Processing module** shall be deployed at the TMC and sub-centres that shall form the part of the Dashboard and shall have following functionalities:

a. Map analysis of ATMS planning and operations.
b. Asset Management of ATMS like TMCS, VIDS, VSDS, Route Patrol, Maintenance, Recovery vehicle location, and Route to reach the incident spot.
c. Identify surrounding development by other Authorities or illegal development which can potentially be a hazardous to road using temporal satellite imagery for example detection of queue length at the toll plazas, detecting the changes around highway like unauthorised structure built nearby highway or unauthorised occupancy on ROW/buffer area, nearby water body analysis, agriculture land and green belt analysis etc. This will help the NHAI to identify gaps and improve those by implementing various strategies like position of barricading at unauthorised access points, identifying the congestion at toll plazas, identifying water logging probability, removal of illegal encroachment, positioning of CCTV surveillance etc.
d. Demarking area of highway which is more susceptible to potential hinderances on highway like by cattle, wildlife, prohibited vehicle entry from etc. from nearby inhabitancies.
e. Road condition analysis on Map and satellite imagery for regular monitoring, improvement planning and implementation. Along with monitoring of implementation / upgradation works.
f. GIS based road maintenance planning and monitoring by marking them on Map and monitoring the activity through GIS enabled mobile app by tagging location and photographs of respective location of road asset and work in progress.
g. GIS enabled planning of diversions for safety of vehicle movement on maintenance area, installation area, and work in progress. This feature shall be made available by the Concessionaire to NHAI and Independent Engineer before the start of the installation of roadside equipment at the site, for planning of the diversion and monitoring of the work in progress.
h. The Software should have capability of visualising GIS layers, attribute integration and analysis of layers.
i. The software should support GPS data for showing emergency and maintenance vehicle on Map
j. The web module should have out of box standard GIS functions like: Pan, Zoom, Identify, Measurement (Line, Area). Search, query, etc.
k. The software should have tool for creation of topology. Symbology tools for visualizing the spatial data as per the defined colour scheme and annotation tools facility for visualizing the spatial data as per defined label placements or placing the labels from attribute table.
l. Software should have facility of advanced rule base labelling for dynamic placement of labels as per the extent, defined position and priority of layers by defining the different classes and should have the option to set the scale labels at specified scale.
m. Geo-Processing feature and functions like Buffer, Union, Intersection, Identity, Update, Eliminate, Dissolve, Clip/Erase, Convex Hull, Thiessen, Merge, simplify should be available.
n. It should have CAD tools for 2D & 3D GIS data conversion, CAD tool for Raster to vector (R2V) and topology creation.
o. The software CAD functionality should support native drawing file formats like DWG, DXF, DGN and should have capability to render photo-realistic 3D rendering.
p. The software should be COTS based and OGC certified.
q. It should have Image processing capability georeferencing, visual interpretation of the satellite imagery and classification tools to helps in classifying images in user defined classes. image enhancement algorithm such as Linear, Logarithmic, Histogram Equalize, Histogram Matching, Density Slice, Gaussian, Squire root, Tone Balancing, and Raster Vector Analysis,
r. The software should have image filtering, vegetation indices calculation, linear algebraic combination, band Math, change detection, image extraction, mosaicking,

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image visualization, filtering, georeferencing, atmospheric correction, transformation tools, change management, feature extraction, classification etc.

s. The software should support all type of Standard GIS Data format, Imagery formats, and RDBMS.

t. GIS Tools functionalities such as Data creation, Import/Export tools, Transformation Techniques, Theme management, Geometric correction.

u. The software should have feature to identify and query/question various spatial Data.

v. The software should have Map composer, report module and Map print layout functionality.

5.3.1 ATCC and TTMS Modules of ATMS Control centre software

ATCC and TTMS modules shall be provided with ATMS Control centre software. The ATCC functionality shall be provided for collection of traffic data and TTMS functionality shall be provided for estimation and calculation of traffic data. No additional hardware or field equipment shall be installed on the Project for ATCC and TTMS functionalities. The ATMS Software shall processes the data from ANPR and VIDS cameras for traffic counting and classification, and travel time estimation.

5.3.1.1 Automatic Traffic Counter and Classifier (ATCC) Module

The ATCC module shall be provided in the ATMS Software for automatic traffic counting and classification of vehicle class, based on the data collected through ANPR camera and VIDS camera.

The system shall identify and record all types of vehicles on the highway for effective monitoring and data collection at ATMS Control Centre. Besides, the system shall be capable of classifying any other vehicle category as per user needs. Vehicle classification should be user selectable based on length of vehicle and / or detuning of the loop inductivity. The software module shall be robust and be capable of operating with minimum maintenance.

Software and manuals to analyse the data from output of vehicle counts, classifications speeds and headways shall be provided. Capability of graphic/tabular presentation of analysed data shall also be offered.

System Accuracy Requirements

Parameter	Accuracy	Conditions
Average Speed	10 percent	There are at least 25 vehicles in the group, individual vehicle speeds are between 10 kmph and 195 kmph and the vehicles conform to normal highway driving behavior.
Average Headway	10 percent	There are at least 25 vehicles in the group, individual vehicle speeds are between 10 kmph and 195 kmph, individual vehicle headways are between 1 and 10 seconds and the vehicles conform to normal highway driving behavior.
Flows	5 percent	There are at least 100 vehicles of each category in group and vehicles conform to normal highway driving behavior.
Vehicle classification	5 percent	Out of a group of 100 vehicles, conforming to normal highway driving behavior, at least 95 shall be accurately classified as per the classification scheme as per MoRTH guidelines.
Occupancy	10 percent	There are at least 25 vehicles in the group, individual vehicle speeds are between 10 kmph and 195 kmph, individual vehicle headway are between 1 and 10 seconds and the vehicles conform to normal highway driving behavior.

The ATCC module shall be able to cross-verify the vehicle class, fetched by the VSDS system integrated with the Vahan Database. In case of any discrepancy, such transactions shall be audited by the operator using the ANPR image / video available in the ATCC central system.

The data shall be segregated and provided in the report format on the bases of Section-wise, direction-wise, class-wise, etc. as approved by the Independent Engineer.

5.3.1.2 Travel Time Measurement System (TTMS) Module

Travel Time Measurement System (TTMS) module shall be provided for measuring required travelling time between major section of the project. The ANPR cameras shall be installed at VSDS locations on the entire stretch. TTMS shall use these ANPR data to detect the current vehicle location. Using this location data, TTMS module shall calculate the actual travelling time per section for each vehicle and derive the average travelling time by the statistics process.

The ANPR cameras will capture the image of each vehicle crossing the VSDS location and shall extract the vehicle number. The image and vehicle number shall be stamped with time and location for the purpose of section speed calculation of each vehicle. The same data shall be used for travel time estimation.

TTMS module shall calculate the actual travel time and velocity (speed) of each vehicle between every checkpoint (VSDS location). Speed data from all vehicles shall be processed statistically by TTMS module to calculate the average travel time between two consecutive check points (VSDS location), to calculate the average speed and average travel time for each section and the entire project stretch in both the directions. Route Travel Time Estimation Models in IRC:SP:110-2017 shall be referred for estimation of travel time.

5.4 Integration with Vahan Database, NPCI FASTag Mapper, Police Control Rooms, Dial 112, Smart City ICCC

The ATMS Software shall be integrated with Vahan Database and NPCI FASTag Mapper for fetching the Vehicle owner contact details of errant commuters detected by the ATMS System (ANPR, VIDS, TMCS, etc.) or reported by the route patrolling team with an evidence under violation of any traffic and safety rule / law on the project stretch.

In case the incident/ violation is reported manually, the evidence received from the ground staff / enforcement agency shall be verified by the control room manager and upon authentication from manager, the operator shall create and event in the ATMS application.

The data fetched from the Vahan database or NPCI FASTag Mapper shall be done only at the backend through the ATMS software and only the relevant fetched result shall be displayed on the operator screen or in the reports. The ATMS software shall fetch the data for events generated and audited by the operator. The vehicle numbers shall be audited by the operator by matching the system generated vehicle number with the vehicle number on the image captured by the camera. The operator shall have the option to edit the vehicle number. The logs shall be maintained for each such correction done by the operator and shall be 100% audited by the manager for each operator to minimize human and system errors.

Following actions shall be taken automatically by the ATMS Software after the violation is detected and audited.

i) Generate e-challan
ii) Send SMS regarding violation on the registered mobile number of the vehicle fetched from Vahan database and NPCI FASTag mapper.
iii) Email the daily e-challan report to the concerned enforcement agency(ies) as applicable for each state, district, etc. the project crosses through, so the e-challans shall be sent accordingly

to the concerned enforcement agency under whose jurisdiction the incident / violation detection point / spot / section falls.

iv) To avoid any discrepancy in section based overspeed enforcement, the VSDS (ANPR camera) location shall be selected such that any one section is not falling in jurisdiction of two different agencies. In case if the same can't be avoided, the section based overspeed e-challan shall be sent to the agency under which the end point/2nd checkpoint of the section falls.

The formats of e-challan, warning/ information messages (SMS), emails, etc shall be finalised in consultation with Independent Engineer / NHAI and concerned enforcement agency.

ATMS Software shall be integrated with police control rooms of the state, district as applicable, as well as the ICCC of smart city projects (as applicable), and National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), the District Disaster Management Authority (DDMA), etc.

The police control room shall be provided with the limited access of the ATMS application through On-line Access Facility and shall be able to perform the functions are described in the On-line Access Facility section. The functions specified there are the minimum requirement and the application shall be designed to meet the actual requirement of the Police and Enforcement agencies in consultation with Independent Engineer and the concerned agency and any additional information shall be approved by the NHAI.

5.5 Outline of TMC Software

The Concessionaire shall describe in his Technical Proposal, application software to be provided to the servers and workstation in the Traffic Management Centre required hereunder.

1) Graphical presentation of module and components comprising application of servers and workstation.
2) Data processing flow in the form of class diagram, use case diagram, sequence diagram, or data flow diagram
3) GIS and Image Processing module
4) Scale or size of the module and components, and programming language used
5) Extent of the development required for the Project.

6. Advance Driver Advisory System (ADAS)

Advance Driver Advisory System (ADAS) shall be provided in each patrol, ambulance, and maintenance vehicle.

The ADAS system shall consist of following components fitted in each vehicle:

i. GPS tracker,
ii. Industrial grade rugged (Waterproof) dashboard mounted 10" Tablet,
iii. Dashcam (dual camera) with video calling and inbuilt recording feature,
iv. Body cam 1 nos. for each vehicle,
v. Front view varifocal cameras (mounted on vehicle),
vi. Rear view varifocal cameras (mounted on vehicle),
vii. LPU with Storage mounted in vehicle,
viii. UPS,
ix. High speed wireless connectivity
x. Buzzer for call / incident alert

The ADAS shall provide real time connectivity of TMC and sub-centres with the patrol and maintenance vehicles. Separate high speed multi operator embedded SIM shall be provided for GPS tracker, industrial grade rugged waterproof 10" tablet, Dashcam, body cam, and LPU.

The LUP and storage shall be compact in size and only fan-less industrial grade controller shall be provided.

The system shall provide live monitoring of all cameras installed in patrol and maintenance vehicles (including body cam) from TMC & sub-centres.

The ADAS shall aid the TMC/Sub-centre in disseminating the required information to the patrolling / maintenance team in real-time. The tablet shall have GPS map to assist the driver in identifying the incident location with estimated travel time, route, alternate route, etc.

The ADAS shall also provide the option to the driver of one vehicle to connect with other emergency / maintenance services vehicles of the stretch and also provide option to conduct video conference call among them and with TMC/Sub-centre.

The vehicle staff shall be able to log the incident/event details through the tablet.

The vehicle staff shall have the option to select any and all of the cameras simultaneously to view in the tablet.

The ADAS application on the tablet shall be locked and the users shall not be able to access other features/applications of the tablet.

The tablet shall go in sleep mode when not in use to save the battery and optimize the usage.

The LPU shall sound an alert / alarm in the TMC & Sub-centre in case any of the component is turned off / removed / disconnected / low battery / faulty / etc.

The Dashcam and other cameras shall be ON at all the time and recording shall be stored in local storage of the camera as well as the LPU for a minimum period of 30 days. The TMS & Sub-centre shall have the option to retrieve any video from the LPU wirelessly and the live feed of all the cameras of all the vehicles shall be available in realtime. There shall be option to record the live video of all the cameras in the TMC and Sub-Centres.

The cameras shall be integrated with Road Condition Monitoring module for collection of road condition data and statistics.

6.1 ADAS Camera Specifications

6.1.1 General

a. The IP camera shall be POE/POE+ powered bullet type with inbuilt IR of 60 meters.
b. The Camera shall have inbuilt SD card slot and shall be provided with at least 128 GB class 10 SD card.
c. The shutter speed of the camera shall be 1/4 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image.
d. The face detection function shall be activated as soon as the motion detection is triggered.
e. The camera shall detect any object addition, object removal, and line crossing.
f. Whenever any event is triggered, the camera shall record the event on SD card also.

6.1.2 Lens

2 MP Full HD motorized varifocal lens with minimum 5-45 mm motorized auto-focus function having optical defog feature and auto focus covering suitable range of focal length shall be provided and mounted on the camera. The range of the camera shall be minimum 60 meters. The resolution shall be full HD at 60 FPS.

6.1.3 Night vision capability

Cameras shall have inbuilt IR illuminator of 60 meters for night vision functionality. External IR illuminator shall be acceptable in case of box cameras, however inbuilt IR shall be preferred. The minimum illumination shall be of 0.01 lux for colour image with automatic gain control on in auto/ manual mode. The camera shall be capable of recording black and white video even in 0.001 lux with IR up to a distance of 60 meters.

6.1.4 Image enhancement capability

Camera shall have hue light compensation, back light compensation, and three-dimensional digital noise reduction features. The camera shall support true wide dynamic range of minimum 120 dB.

6.1.5 Camera Housing

The camera shall be housed in a suitable housing to protect them from solar radiation, UV, dust and rain. The field of view of the camera shall not be obstructed by the housing. Picture quality or optical performance shall not be degraded by the housing. The Housing shall have IP-67 or higher rating for Weather-proof, and NEMA 4X-rating or IK10 or higher rating for Vandal-proof.

6.2 ADAS LPU and Cabinet

a. ADAS LPU shall be a fan-less industrial grade rugged compact CPU housed in a compact cabinet together with power supply and network equipment. The cabinet shall be suitable for mounting in the vehicle.
b. The cabinet shall be electrically and mechanically isolated and shall have a degree of protection of IP 55 or higher specified in IEC 60529. If necessary, the cabinet may be provided with a ventilation fan for controlling internal temperature, but the protection code requirements shall be met.
c. A right hinged door shall be provided on the front to realize easy maintenance work.
d. The turning direction of the handle shall be counter-clockwise.
e. The power supply unit shall be provided with a circuit breaker.
f. The anti-lightning and surge protection complying with the IEC 61643-1 shall be provided.
g. The cabinet shall be finished with the anticorrosive treatment.
h. The Concessionaire shall state the details of the anticorrosive treatment and painting.
i. The Cabinet shall have door open alert feature and alarm to be sounded locally as well as the Central Control Centre.
j. The Cabinet shall have suitable built with appropriate locking arrangements to protection from theft, vandalism etc.
k. The cabinet shall be of suitable size to accommodate the equipment to be housed in the cabinet and shall be designed to meet the environmental conditions at the site and cooling, heating, ventilation requirement for the equipment, etc.

7. Incident Monitoring System (IMS)

Incident Monitoring System (IMS) shall be deployed at each PIU office and RO office (as applicable) of the project.

The IMS shall include following minimum components:

1. Workstation (1 nos. at each location),
2. All-in-one color A4 printer,
3. 100" 4K UHD LED display (commercial grade),
4. UPS as per site requirement,
5. Networking devices, switches,
6. Connectivity with TMC & Sub-centres,
7. CCTV camera,
8. DG of suitable ratting as per site requirement,
9. MPLS etc.

The Concessionaire shall establish seamless connectivity between IMS and TMC & sub-centres such that the PIU officials are able to monitor the TMC and ATMS system in whole. The IMS shall be customised as per the requirement raised by the PIU/NHAI/ Independent Engineer from time to time.

The IMS shall provide function to monitor any camera of the stretch. It shall provide access to the reporting modules, NMS, FMS, SLA monitoring, GIS, ADAS, etc.

The standard / default screen of the IMS display shall be the live view of the TMC / sub-centre (option to select / toggle automatically) Graphic display screen content being displayed at the TMC / Sub-centre and shall be configurable without any requirement of support from Concessionaire.

The incident / event pop-up and alerts shall be configurable as per the PIU requirement.

IMS system shall be manned by the Concessionaire's operator during the O&M period as per the working hours of PIU/RO office.

8. Video Analytics and Management System (VAMS)

a. 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.
b. The VAMS software shall have a client/server-based architecture that can be configured as a standalone VAMS system with the client software running on the server hardware and/or the client server running on any network-connected TCP/IP workstation. It shall support all major operating systems (windows, Linux, Mac). It shall support web client interface and shall operate without requirement of installation of any software.
c. The contractor shall obtain the license for the total number of cameras to be provided for the project based on the MAC address of each NIC. The VAMS shall have a single page that displays the status of all servers and cameras currently connected. This page shall display any alarms, events, MAC addresses, camera configuration, format and frame rate from each individual camera.
d. The VAMS system shall have the ability to record an audit trail of when users login, which futher shows what changes they have made, what video they have viewed and what they have exported.
e. The VAMS shall allow for the configuration of what drives to use for recording video. Those drives may be local drives, direct attached storage drives or iSCSI drives.
f. VAMS shall support the mobile application for both iOS and Android platform capable of viewing multiple simultaneous live video streams and playing a recorded video stream.
g. The VAMS software shall have an open architecture supporting IP cameras and encoders from multiple manufacturers providing high-resolution megapixel features.
h. Multiple control room consoles/workstations shall be able to simultaneously view live video and audio and/or recorded video and audio from the storage/video server. All storage / video servers shall also be able to simultaneously provide live and/or recorded video to one or more consoles. Its operator shall be able to push the video to another operator console seamlessly.
i. The VAMS software shall be able to send a predefined email based on an event trigger. The VAMS software shall also support SSL and TLS connections for transmissions of the mail.
j. The VAMS shall be capable of multi streaming on all connected workstations/ consoles in the entire network of the project stretch as well as minimum 20 remote users simultaneously. The remote users shall have full functionalities as are available for the control centre operators.
k. It shall be possible to configure multiple monitors on one workstation / console i.e. multiple VAMS application simultaneously on one workstation.
l. Recording of all video transmitted to the VAMS shall be continuous, uninterrupted and unattended.
m. The VAMS system shall have video motion detection recording, such that video is recorded when the VAMS detects motion within a region of camera's view.
n. VAMS shall have Suspect Tracking feature to configure camera links between cameras, to follow a suspect between different camera scenes.
o. Inactivity timeout feature shall be provided to save the bandwidth
p. Archive bookmarks feature shall be available to specifically archive bookmarked video and create a second copy of important video.
q. VAMS shall automatically generate alarm / alert in case of any video loss or failure and shall have failover/redundancy feature without any manual intervention.
r. The VAMS software shall be used to connect different types of events, such as input triggers, to a desired action such as recording video or triggering an alarm. The VAMS software shall recognize the following event types: video motion, video loss, input trigger, health monitoring, IP camera connection, software trigger and analytics, camera preview style, hovering, server disconnect, archive alarm - failure on archiving target, such as bad mount point. The VAMS shall provide the search and display analytic meta data when searching analytic event linkages etc.
s. The VAMS shall be integrated with Road Condition Monitoring module for collection of road condition data and statistics.

9. Emergency Telephone console

a. There shall be a Control System with a Control Software to receive all Emergency Communication from the NHAI 24X7 National Highways helpline and Route Patrol.
b. All the Calls coming on NHAI 24x7 helpline for this section shall be automatically routed to the TMC. The required integration with the telecom operator and 1033 helpline services shall be in the scope of the Concessionaire.
c. The Software shall be integrated with all the Telecom operators for obtaining live location of the caller and the same shall be plotted automatically on the GIS Map, so that the location of the caller can be identified automatically for providing required service. This will also enable the software to identify the fake callers and the caller calling outside the Highway ROW.
d. The software shall operate on open architecture and integrate with other subsystem software that are installed to manage Cameras, and Speed Display, apart from the Traffic Management module (where applicable) etc.
e. The software shall store configuration Emergency call ID, Location on the highway stretch etc. of each Emergency call received. There shall be options to generate reports of stored device configuration.
f. The system shall record all calls on to a dedicated server with adequate indexing to retrieve the same on a later date.
g. The help desk will be manned by call managers / operators. The administrator should be able to create, add, edit & delete users (call managers/ operators). He should be able to administer access rights of the entire highway or a section thereof.
h. The administrator should be able to place call managers in a hierarchy. The higher priority manager should inherit the rights of a lower priority manager automatically when he is taking overriding control of Emergency calls, which are already being controlled by a lower priority manager. There should be minimum 3 hierarchical levels of security for providing user level log in.
i. The system shall provide activity log (audit trail) with user id, time stamp, and action performed, etc.
j. The system shall perform communication health check (link quality check) on all the connected communication devices and report errors if any on the administrator console.
k. ATMS Control Centre will have dedicated workstations for Call management. For monitoring purposes, Video monitors shall be setup and should show the location of originating calls clearly on GIS map sections of the highway.
l. The user shall have the facility to request for control of any section of highway outside his rights for a reservation period. Control of the said section is released after the reservation period (Request enhanced control rights for a short duration).
m. ATMS Control Centre may have one or more Operators simultaneously logged in to the communication software to manage their respective sections of the highway.
n. Each workstation and the associated software should allow up to nine calls to be maintained on hold while the current call is being serviced.
o. Call manager/operator logoff shall be allowed only when no call is in progress or on hold.
p. System should ensure that once recorded, the audio cannot be altered; ensuring the audit trail is intact for evidential purposes.
q. System shall provide sufficient storage of all call recordings for the entire Contract period or more.
r. The call manager/operator shall have the facility to call back the caller.
s. The call manager/ operator shall also have the facility to patch any call on Emergency helpline to an external telephone line (fixed and mobile), local intercom at the ATMS Control Centre, sub-centre, and the local mobile radio network (if applicable).
t. The call manager/operator shall have the facility to initiate communication health check on any device within his section of the highway.
u. It shall be possible to switch calls. That is, if a call # 1 is in progress, the call manager can open any other call that is in hold status. Call # 1 shall go hold status.
v. The offered system shall have facility to retrieve/export/ backup (on CD, DVD or Blu-ray recorders) the desired portion of call record (from a desired date/time to another desired date/time) through the search functionality of the application software.

w. It shall be possible to archive old call records and logs on CD, DVD, Blu-ray recorders, or RAID backup devices. Log of any such activity should be maintained by the system for audit purposes.

x. Database Server shall keep track of all configurations, error data, configuration events, usage events and error events.

y. All the workstations shall be provided with software to play recordings, archive and manage calls. However, managers would require sufficient access rights to use play and archive modules.

10. Probe Data System

a. A probe car system is envisaged that receives and processes location data from the project vehicles equipped with GPS device and show the location of GPS devices attached to patrol vehicle or another management vehicle as one of the components of ATMS.

b. The system will use the vehicle location data of maintenance, patrol and emergency vehicles fitted with GPS device and deployed on the project.

c. The probe data system shall utilize the date from the GPS devices fitted on the vehicles by the vehicle operator as well the sub-components of ADAS system provided by the Concessionaire.

d. The supply and installation of GPS devices is not under the scope of this Contract except for the maintenance vehicles to be provided by the Concessionaire on the project during O&M period of this Contract. The Concessionaire shall only be required to establish the data communication system between vehicles and Probe Data System console in TMC under the scope of work of this Contract.

e. However, the Concessionaire shall provide the GPS devices for the vehicles provided by the Concessionaire.

f. It shall be the responsibility of the Concessionaire to furnish all necessary hardware, software and database, install equipment at the specified location, provide necessary cabling, integrate all system components, and deliver a complete operational system including such works as required for the transmission of the probe data on 24/7 basis.

g. The probe car system will be prepared for generating traffic condition information and utilising the cumulated data as statistics for the measures on transport such as traffic management etc.

h. It collects vehicle location information dynamically. A probe sensor installed in vehicle consists of Global Positioning System (GPS) unit, processor unit, communication unit and power supply unit.

i. The satellites send time signals. The time signals are received by the GPS unit on the earth. The GPS unit receives the signals from several satellites and identifies its location on the earth.

j. The accuracy of the location generally ranges 10 to 100 m, depending on such factors as quality of GPS unit, high-rise buildings around etc. The probe sensor periodically sends the recorded data such as vehicle location in terms of longitude/latitude and recording time to the TMC.

k. The vehicle locations shall be displayed on the GIS map in real-time in TMS and all sub-centres.

l. The probe data will be received periodically at the TMC and shall be analysed to show the location of maintenance vehicle on the road network of digital road map.

m. The analysed data is converted into traffic congestion information and provided to the road users. The cumulated probe data is processed as historical data for higher accuracy of congestion information.

n. **Data List -** The vehicle location data shall be generated at an interval of 10 seconds in each GPS device on board vehicle. The probe car system shall receive all vehicle location data as they are sent from vehicles. The data includes the following items:
   1) Device ID
   2) Vehicle type
   3) Location (Longitude and Latitude)
   4) Date & time of data
   5) More detailed structure of the GPS data will be provided to the Concessionaire.

o. Data validation: The system shall scrutinize the data received and any abnormal data such as data without time stamp, data value outside of the range, and data with longitude and latitude outside of the vehicle coverage area shall be removed from the data.

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p. Map matching: The system shall have map matching function to project the location of vehicle onto the nearest point along the vehicle route. If the distance between original point and projected point is longer than the pre-set threshold, the data shall be disregarded.

q. Data storage and retrieval function
   i. All data shall be recorded and stored in the probe car server for analysis and future usage. The raw vehicle location data sent from GPS device and processed location data after map matching shall be kept for three (3) months.
   ii. Data retrieval and presentation software shall be provided that shows the original location data, location data after map matching.

r. Screen Display Functions
   i. The information display shall be schematic map-based interface and as well in the form of a list. The schematic map-based display shall cover the entire Project and be able to enlarge individual locations on the map when selected. The enlarged view shall be able to display the details for each selected location.

s. Reporting functions
   i. Probe Data System Server shall publish/print as a minimum the reports listed below. The reports shall be produced as pre-scheduled or on-demand by system operator. It shall be possible to produce the reports in a portable file format.
   ii. Operation and error log List of roadside equipment, which are operational or malfunctioned
   iii. Error record

t. Communication Network
   i. The data transmission of vehicle tracking data shall be made through IP based network provided by communication provider. The network equipment of the system shall have highly reliable and secured connectivity.

u. All the third-party GPS on board Unit shall be subjected to test before Acceptance test, during installation work and upon completion depending on the test item.

v. Three types of test, i.e. function test, performance test and general test shall be conducted. They include (as a minimum):
   i. Communication and performance of GPS On Board Unit.
   ii. Probe Data System Server application and reports.
   iii. Locating function on map.
   iv. Data logging function.

11. Hardware for Central Processing System

The Central Processing System shall comprise of following minimum components:

1. TMC Central Processing Servers in hot standby configuration (Primary + Secondary)
2. Video Recording Servers with 360 TB inbuilt storage
3. Backup Video Recording (Only Incidents) Server with 240 TB inbuilt storage
4. Internet and SMS Server
5. Operations Laser Printer (Colour)
6. Operations Laser Printer (Black)
7. Operator Consoles each with 4 nos. 21" touchscreen monitors
8. Emergency Telephone Console 2 nos. 21" touchscreen monitors
9. ATSC Console 2 nos. 21" touchscreen monitors
10. RLVD Console 2 nos. 21" touchscreen monitors
11. Graphic Display with Graphics Display management software and Controller
12. Firewall, IDS, IPS and other network security components
13. Core Switch
14. Routers
15. Network Equipment – Layer 3 Switch, Layer 2 Switch etc.
16. Network Management System (NMS)

11.1 TMC Central Processing Servers and Sub-Centre Servers

The Traffic Management Centre (TMC) application server system shall consist of two servers with cluster configuration, one primary server and one stand-by server. Each of the two servers in the cluster shall meet or exceed the minimum requirements stated hereunder.

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The TMC server and workstation computer hardware shall be standard models manufactured by organizations of international repute. Custom built or non-standard equipment will not be acceptable. All the servers and computing shall be UL, CE, FCC, BIS certified.
Full maintenance support services and ready availability of consumables, spare parts or replacement units shall also be assured from a third party, based in India, who is not connected with the Concessionaire and his agent.
The specifications in this section are provided as reference. The workstations to be provided by the Concessionaire shall materially comply with these specifications and shall be subject to the approval by the Independent Engineer.

b. Each server shall have a minimum of two numbers of latest generation Intel/AMD 16-Core processor 2.8 Ghz CPU of 19.25 MB Cache, 105W.
c. The server shall have 256 GB RAM memory using 32GB Module scalable to at least up to 1.5TB, using DDR4 2666MHz DIMM (RDIMM) memory modules.
d. Server shall have 4* 1.6 TB SSD HDD bays with each SSD having minimum endurance of 3 DPWD
e. One optical drive DVD-RW shall be provided in each server.
f. Server should have RAID controller with 4GB Lithium-ion battery backed write cache (onboard or in a PCI Express slot).
g. Server should support 1Gb 4-port network adaptor supporting advanced features.
h. The power supply shall be Redundant 800W Platinum hot plug and redundant hot-plug system fans. The display controller should support VGA.
i. The server should be provided along with the out-of-band remote management and maintenance capability. Remote management should be possible by using API and Web based GUI.
j. The server should support all industry leading OS / Hypervisor like Windows, Linux, VMware, KVM etc.

11.2 Video Recording Server (VRS)

The Video Recording servers shall be provided at TMC and sub-centres for recording the live video feed from all the cameras (TMCS, VIDS, ANPR). The VMS (Video Analytics and Management System) software shall be installed on the VRS. The inbuilt storage prescribed for VRS herewith are estimated for 60 days @ 25 FPS, 2 MP at 80% load. The Concessionaire shall propose the storage capacity of VRS as per its own calculation and proposed solution to provide video recording of all the cameras for minimum of 60 days keeping 20% buffer. The specified storage here is the minimum requirement to be provided by the Concessionaire. Minimum 2 nos. VRS shall be provided at each location (TMC and sub-centres).

a. Each server shall have a minimum one latest generation Intel Xeon 4-Core processor 3.5 Ghz CPU of 8 MB Cache, 256 SSD in RAID 1 for operating system and video management software. Each server shall support at least 128 channels at full HD along with 2-way audio feature.
b. The server shall have 16 GB RAM memory DDR3 memory.
c. Server shall have 20* 12 TB SSD HDD bays such that minimum 240 TB useable internal storage space is available after applying RAID 6 configuration. Additional storage shall be added to achieve 360 TB useable storage.
d. One optical drive DVD-RW shall be provided in each server.
e. Server should support 1Gb 4-port network adaptor supporting advanced features
f. The power supply and fan shall be Redundant
g. The display controller should support VGA, HDMI, DVI.
h. The server shall support minimum 1200 Mbps bandwidth for read and write the video recording and shall support 8 input and 4 output alarm.

Note: Total number of servers required at each location / Sub-system shall be as per the solution design of the Concessionaire. The Quantity mentioned in the BOQ is the minimum requirement and shall be provided by the Concessionaire.
All the Servers shall come with 5 years OEM Warranty with 24X7 support and Next Business Day (NBD) resolution.

11.3 Graphic Display for TMC

a. The Concessionaire shall provide Graphic Display cubes with DLP based technology with Laser light source or Active LED based display of 0.9 mm or less pixel pitch. Graphic Display shall show large-scale presentation of central server monitor screen and live video streaming from the all the cameras (TMCS, VIDS, ANPR), ATMS Dashboard and GIS Map.

h It shall be able to show multiple screens at a time and the number of screens on the display shall be flexible.

c. It should have a life of atleast 7 years in 24x7 operations.

d. The Graphic Display shall be made up of several units. It should have automatic and continuous color calibration and uniform brightness amongst all cubes. Each cube should be able to take full HD signal. The Laser DLP based graphic display shall be provided in 3x4 or 2x6 matrix of 70" cube or bigger, suitable to display minimum 30 cameras along with GIS Map and ATMS dashboard in full high defination. The size of the Active LED based display shall be calculated such that it achieves the size equalvalent to laser DLP display of 70" cube in 3x4 or 2x6 configuration, such that at least 30 nos. TMCS cameras can be viewed in full high definition at same time along with GIS Map and ATMS dashboard.

e. The brightness of the cube shall be 400 nits and should be adjustable for lower or even higher brightness requirements with brightness uniformity of more than 95%. The dynamic contract ratio shall be 1000000:1 or more.

f. The ingress design of the projection unit shall confirm to IEC-60529 standard. Test certficiate shall be submitted by the Concessionaire in the Technical Proposal.

g. The depth of the cube/ Videowall for Laser DLP / active LED shall be as per OEM and shall be minimum possible to avoid wastage of space in the TMC and sub-centres. The control room layout shall be considered accordingly, such that minimum viewing distance is achieved..

h. Graphic Display Controller and management software shall be from the same OEM. The number of output shall be capable to drive number of cubes to achieve the resolution.

i. The Operator shall be able to see multiple source in one window and shall be able to specify time interval and sequence. The software shall provide the option to split the entire display in multiple sections and layouts. The operator shall be able to define multiple layouts that can be launched based on time schedule or sequence as defined by the operator or control room Manager. The layouts shall be finalised in consultation with the Independent Engineer and NHAI.

j. The software shall have self health diagnostics function and shall raise alert or popup in case of any error is diaganosed in the graphic display. The operator shall notify the maintenance engineer regarding such alerts through FMS.

k. At least following information (Road and Traffic condition) shall be provided on Graphic Display:

1) GIS Map of the Stretch with each lane
2) TMCS Camera live video streaming
3) VIDS live video streaming and Incident Pop-ups
4) ANPR and speed radar live data
5) Traffic Condition
6) Traffic count and classification
7) Travel time
8) Traffic Event using Image Icon (Type and Location)
9) Emergency call status
10) Status of each equipment plotted on the GIS Map
11) NMS
12) ADAS
13) Road condition
14) ATSC Status
15) FMS
16) Mobile App pop-ups

11.3.1 Graphic Display for Sub Centre

a. The information terminal to be installed at all the three sub-centres shall be a Laser DLP or Active LED based display of 0.7 mm or less pixel pitch Graphics Display made

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of 70" or bigger diagonal cubes in 2x3 matrix. The size of the Active LED based display shall be calculated such that it achieves the size equalvalent to laser DLP display of 70" cube in 2x3 configuration.

b. The Concessionaire shall supply and install the information terminal at the specified location in the sub centre and connect it with the central server system through the digital transmission system. Software required to operate the information terminal shall also be provided.

c. Information (Road and Traffic condition) as below shall be provided on Display as same as in main centre but **only of the stretch and equipment covered under that Sub-Centre**:

1) GIS Map of the Stretch with each lane
2) TMCS Camera live video streaming
3) VIDS live video streaming Incident Pop-ups
4) ANPR and speed radar live data
5) Traffic Condition
6) Traffic count and classification
7) Travel time
8) Traffic Event using Image Icon (Type and Location)
9) Emergency call status
10) Status of each equipment plotted on the GIS Map
11) NMS
12) ADAS
13) Road condition
14) ATSC Status
15) FMS
16) Mobile App pop-ups

Note: For the ergonomic design of the TMS and the Sub Cent,res ISO 11064 shall be followed.

11.4 Network Equipment

11.4.1 General

a. The Concessionaire shall supply and install network equipment at each location to connect each peripheral to the TMC systems. The Concessionaire shall supply and install all equipment, cables, connectors, terminals and other miscellaneous materials necessary to establish a working local area network connecting these systems.

b. The network between the TMC and sub-systems shall either use the optical fibre cable network or high-end Wireless Access Points along the stretch and a data communication network shall be established using layer 3 switch to be supplied by the Concessionaire. The Concessionaire shall supply and install the network equipment suitable for interfacing the layer 2 switch to the layer 3 switch.

c. The type and the number of the network equipment proposed by the Concessionaire as per the network design shall be mentioned by the Concessionaire in the BOQ. The network configuration shall be determined by the Concessionaire. The cost of the network devices and materials that is not explicitly listed in the BOQ of the Bid submitted by the Concessionaire or supplied by the Concessionaire during the installation works but deemed necessary for the system during any stage of this Contract shall be included in the cost of appropriate items and the Contract Price, and no separate payment shall be made.

11.4.2 Network design

a. The Concessionaire shall undertake the detailed design of the digital transmission system. The design work shall include but not be limited to transmission protocol, network and transmission equipment, type and size of cable, cable splicing, conduit and cable installation work, manhole, hand-hole and pull box at bridge and earth sections.

b. Digital transmission system shall adopt IP. Suitable media and transmission protocol at Layers 1 and 2 shall be decided, type of digital station equipment shall be selected. In developing the design, various factors such as amount and type of data, transmission distance, quality of service (QoS), reliability, latency, and changeover time to backup route shall be considered. Type of

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optical fibre cable shall also be considered in the design. Packet based transmission system will be preferred than circuit-based transmission system such as Gigabit Ethernet.

c. Loop topology based on resilient packet ring (RPR) shall be adopted for local line transmission system for redundant operation. A cut in the communication at a point in the loop shall not affect the normal operation of the communication system.

d. Physically separate optical fibre cables shall be used for a ring topology and for back up route in the future trunk line transmission system. Compressed image data and data from other devices must be separately allocated to the optical fibre core.

e. Layer 2 switch will be used at each node to connect local network or device to the local line network. Layer 2 switch will also be used to connect devices to the local network. The switches used at the field nodes shall only be of industrial grade for operations under extreme weather and outdoor conditions.

f. In addition to the equipment listed above, the system requires fibre distribution frame and main distribution frame for cable termination, surge arrester or similar surge protection device to protect the equipment from the lightening, and accessories necessary for cable installation. The Concessionaire shall supply and install these devices and accessories.

11.4.3 Reliability

Digital transmission system shall have high reliability to ensure continuous operation of the system. Bit error rate for the end to end data communication must be 1×10^{-6} or better.

11.4.4 Capacity and Quality of service

a. The digital transmission shall have a sufficient capacity in terms of speed and bandwidth to meet the demands to be decided based on the estimated amount of data including digitized voice data at each facility such as Traffic Management Centre, and service area. Video signal from the TMCS camera shall be transmitted in H.264/H.265 format and the digital transmission system shall provide sufficient capacity for it. The Concessionaire shall estimate the type, amount and location of data transmission need and design the system, equipment and cables that satisfy the demand.

b. Quality of service (QoS) capability shall be provided to the digital transmission system to ensure smooth and uninterrupted delivery of data for voice and video image transmission required for emergency telephone system and TMCS camera system.

11.4.5 System supervision

The digital transmission system shall be equipped with a supervisory function which continuously monitors the system operation and issues an alarm in case malfunction is found. The supervisory shall have the following functions:

1) Management of occurrence and recovery of malfunction
2) Registration and modification of system configuration
3) Registration and modification of network configuration
4) Testing of equipment and circuit
5) Logging of equipment operation and cable performance
6) Changeover between primary and backup routes

12. Closed Circuit Television (CCTV) and Access Control System (ACS) for TMC and Sub-Centre Building and Security

12.1 General

a. This part of the RFP covers the equipment and services to be supplied under this Contract for CCTV equipment and Access Control System (ACS) to be installed at the Traffic Management Centre and Sub-Centres. The CCTV and ACS equipment shall be categorized as two types, CCTV and ACS for Building and CCTV for Security.

b. All the cameras shall be IP based and shall be connected to the Video server. The cameras shall support ONVIF profile S/G and shall be FCC Class A, UL, CE, BIS certified. The NVMS installed on video server shall provide the facility to control the cameras at the Supervision workstation in the Control room Buildings. The video recording of each camera shall be stored

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at the Video server/storage for a period of minimum 60 days at 2MP (full HD), and 25 FPS and incident video clips shall be stored for the entire Contract period.

c. All Cameras shall have inbuilt IR illuminator for night vision functionality. External IR illuminator shall be acceptable for box type cameras, however inbuilt IR shall be preferred for these types of cameras also.

d. The Video Server of each location shall be interfaced to TMC system and NHAI HQ Command Centre to be able to watch and control the cameras for the PTZ activities from the TMC control. room, NHAI HQ Command Centre, and On-line access facility. The priority shall be given to the local control room staff.

e. The functionality of the CCTV cameras provided by the Concessionaire shall be described as follows:
   i. Building Surveillance CCTV cameras – These cameras installed on a sufficient height mast shall be intended for general surveillance of the building area and field activity outside the building and walkways. These cameras shall also be linked for remote monitoring. As both the traffic control room staff and sub-control room staff can control the pan, tilt and zoom function, the priority shall be given to the local control room staff.
   ii. Building Security CCTV cameras – These cameras shall be intended for monitoring of security areas such as the building compound, general parking area, Control Room, supervisor room, building lobby, walkway, server room, UPS room, and emergency vehicle parking area.
   iii. These cameras shall have voice recording and Class 10 SD memory card of minimum 128GB for local storage of videos and voice recordings.
   iv. These cameras shall be of two types
      1) Motorised Bullet/Box colour cameras.
      2) Motorised Dome colour cameras
   v. The box cameras installed outdoor shall be installed in the weatherproof enclosure.

f. The design of the CCTV system shall consider the following: -
   i. Provide effective supervision and control
   ii. Easy to use
   iii. Self-contained system
   iv. Increase span of management
   v. Reduce unnecessary travel
   vi. View / evaluate situations quickly
   vii. Motion detection
   viii. Savings on time and manpower
   ix. Easy access to video information and quick playback
   x. Minimize the use of security guards
   xi. Eliminate unnecessary responses to false alarms
   xii. Provision for future scalability

g. The camera and VAMS shall be capable of triggering alarms in case of Video motion detection, manual trigger, digital input, periodical trigger, system boot, recording notification, camera tampering detection and audio detection. The triggering alerts can be controlled by the control room operator.

h. The system should support intelligent video motion detection to track objects, learn the scene and adapt to a changing outdoor environment. Environmental changes such as rain, hail, wind, swaying trees and gradual light changes should have minimum effect on the settings.

i. The control software should provide for alarms and alarm log. Alarm settings need to be individually configurable for each alarm and each camera prerecord duration. The duration shall be selectable from a list of values ranging between 2 seconds or less to 5 minutes or more. There shall be provision to achieve, print and display the log using device filter, device group filter and/or a time window.

j. The administrator should be able to create, add, edit & delete users. He should be able to administer access rights to system resources and functionality as well as access permissions to a list of cameras, a user can view and control.

k. The system shall provide User activity log (audit trail) with user id, time stamp, health monitoring, etc.

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l. ATMS Control Centre will have workstations along with controllers for Camera operation.
m. The Workstation Frontend Software should also be working on a browser-based system and mobile application for remote users to allow any authorized user to display the video of any desired camera on the monitor with full PTZ and associated controls.

12.2 CCTV Specifications

12.2.1 Dome Camera

a. A surveillance camera of 2MP at 25 FPS shall be provided. The IP camera shall be POE powered dome type with inbuild IR of 30 meters with illumination at 0.005 lux for colour image and black& white at 0 lux with IR. The lens shall be of 2.8-12 mm motorised varifocal with true WDR, 3D DNR, BLC, AGC and triple streaming (i. live viewing, ii. analytics, & iii. recording). The Camera shall have inbuild SD card slot and shall be provided with at least 128 GB class 10 SD card. The shutter speed of the camera shall be 1/3 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image. The housing shall be IP 67 rated with IK10 protection against vandalism. The camera shall support one alarm I/O port and audio I/O.
b. The face detection function shall be activated as soon as the motion detection is triggered.
c. The camera shall also detect any object addition, object removal, and line crossing.
d. Whenever any event is triggered, the camera shall record the event on SD card.

12.2.2 Bullet Camera

a. A surveillance camera of 2MP at 25 FPS shall be provided. The IP camera shall be POE powered bullet type with inbuild IR of 50 meters with illumination at 0.005 lux for colour image and black & white at 0.001 lux with IR. The lens shall be of 2.8-12 mm motorised varifocal with true WDR, 3D DNR, BLC, AGC and triple streaming (i. live viewing, ii. analytics, & iii. recording). The Camera shall have inbuild SD card slot and shall be provided with at least 128 GB class 10 SD card. The shutter speed of the camera shall be 1/3 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image. The housing shall be IP 67 rated with IK10 protection against vandalism. The camera shall support one alarm I/O port and audio I/O.
b. The face detection function shall be activated as soon as the motion detection is triggered.
c. The camera shall also detect any object addition, object removal, and line crossing.
d. Whenever any event is triggered, the camera shall record the event on SD card.

12.2.3 Access Control System

a. Door / premises entry Access control system shall be provided in each TMC and sub-centre building and rooms including server room, UPS room, generator room, etc.
b. The system shall provide an integral software tool designed to reduce or eliminate tailgating.
c. Restricting or denying access to a card holder shall happen automatically if they have entered a zone without a valid card transaction.
d. The access control system should be modular in nature, with the below mentioned modules-
   i. Card Management and enrolment module
   ii. Alarm Management Module
   iii. Rolling Transaction Display Module
   iv. Web Dash Board
   v. Zone Management and Broadcast
   vi. Time & Attendance Module
   vii. Visitor Management System Module
   viii. Reporting module
e. The dashboard shall display data in multiple formats such as bar, line, and pie charts, and tabular formats and shall provide following information:
   i. Card Swipes & Zones Swipes
   ii. Cards Parked
   iii. Zone Occupancy & Muster zone swipes
   iv. Type of Cards Issued and their status
   v. Licensing
   vi. Diagnostics

vii. Users logged on
viii. Invalid Swipe Analysis
ix. Average Alarm Acknowledgement/Cancel Locked Out Accounts
x. Top current alarms
xi. System and capacity & software licensing information
xii. Alarm acknowledgment analysis
xiii. Locked out workstation user accounts
xiv. Users currently logged on
xv. System Time and Date
xvi. Last backup status and Backup history report

f. Reporting Module shall provide the following information:
   i. Access Level changes
   ii. Alarm Reports
   iii. Transaction Reports
   iv. First & Last transaction report
   v. Device Reports
   vi. Device Access Report
   vii. Device configuration reports
   viii. Personnel Reports
   ix. Card parking Reports
   x. Absentee Report

g. The ACS shall have following features:
   i. Record cardholder personal and access information.
   ii. Control card verification (i.e. the recording of cards on the system).
   iii. Control data flow to the Ethernet Reader Controllers - card and configuration information.
   iv. Provide automatic updates of Ethernet Reader Controllers and field device changes, so that the system is continually updated.
   v. Pass alarm and status information in real-time to client PC workstation computers being used for system monitoring.
   vi. Pass alarms to an integrated Short Message Service (SMS) for a text messaging service to user defined recipients.
   vii. Issue broadcast messages to the Ethernet Reader Controllers.

h. The ACS shall be integrated with following sub-systems of the building
   i. Video Analytics and Management System (VAMS)
   ii. Fire Systems (FS)
   iii. Intrusion Detection Systems (IDS)
   iv. Perimeter Intrusion Detection Systems (PIDS)
   v. Generic Lift or Elevator interface
   vi. Building Management Systems (BMS)
   vii. Time and Attendance (T&A) Module
   viii. Visitor Management System

i. The ACS system shall be CE certified and designed for UL294, with IP 20 rating. The readers shall be RS485 OSDP compliant, communicate through encrypted OSDP RS485 Wiegand, and encrypted host communications with TLS and AES encryption.
j. The single door and true four door ACS shall have touch screen terminals for easy access with 12 keys (10 numeric keys, 2 context sensitive function keys), capacitive, light touch and 10/100 Mbps ethernet port.
k. The system shall have sufficient offline data storage capacity of minimum 500,000 cardholders transactions and 75,000 offline events (transactions and alarms).
l. Shall have inbuilt battery and charging system. It shall automatically switch over on detection of power supply.
m. The system shall have tamper detection capabilities and shall raise alarm that shall be configurable as per site requirement.

Section 04 Traffic Monitoring Camera System (TMCS)

1. General

The Concessionaire shall provide and construct Traffic Monitor Camera System (TMCS) as a closed-circuit television system that meets the requirements stated herein for the surveillance of the traffic and vehicle on the project. Digital type system shall be used and video signal output from the camera shall be digitized and compressed to reduce the bandwidth requirement for digital transmission system. The system and its component devices shall be of rugged construction for outdoor industrial use capable of continuous operation.

2. System Configuration and Main Function

The system shall consist of camera at site, and control equipment and VMS at the Traffic Management Centre / Sub-centres, and digital transmission system shall transmit video signal from the camera to the TMC/Sub-centres.

The Traffic Monitoring Camera System shall be used for monitoring the project corridor, junctions and interchanges. The cameras with Pan/Tilt/ Zoom(PTZ) facility shall provide a 360-degree field-of-view to enable the operational objective of full coverage of the highway/expressway, at-grade roads, junctions, service road, entry/exit ramps and related spaces within the corridor/ ROW. Operationally, the main function of the camera is to provide surveillance of the transportation system and enhance situational awareness and enable operations staff to perform a number of valuable monitoring, detection, verification functions.

The camera shall also perform the automatic incident detection functions (defined in next section) in each pre-set position. Under normal condition of the Project, the TMCS cameras shall be set at home position and shall periodically to other pre-set positions to enable automatic incident detection.

The cameras shall be integrated with Road Condition Monitoring module for collection of road condition data and statistics.

3. Equipment Location and Type

a. TMCS camera shall be installed in the median or shoulder (as per the availability of space and OFC cable and chamber location) approximately at every 1 Km such that the monitoring of the entire route is ensured. The number of cameras shall be sufficient to monitor the key location, accident prone areas, junctions, major median openings, major structures, urban areas, major villages junctions etc. through entire journey of every vehicle on the road.

b. The Concessionaire shall propose the actual locations to satisfy the above requirement. The exact location will be determined based on the alignment, geometry, viewing area (based on site visit) and shall be approved by the Independent Engineer.

c. The TMCS camera shall be supplied power from the solar panel attached to Camera Pole. The UPS and Lithium-ion battery bank shall be able to provide the power backup for minimum of 72 hours.

4. System Function

4.1 Camera

Camera shall be for industrial use, capable of continuous operation under harsh environment on the highway. Camera shall be IP based full HD colour type with 1/1.9" image sensor (CMOS) or better. It shall have frame rate of up to 60 frames per second in all compression mode and shall have 3 simultaneous streams and live view for more than 5 users.

4.1.1 Lens

Motorized zoom lens with minimum 36x Optical zoom and minimum 16x digital zoom having optical defog feature and auto focus covering suitable range of focal length shall be provided and mounted on the camera. The lens size shall be approx. 5-200 mm suitable to achieve the required optical zoom.

4.1.2 Night vision capability

Cameras shall have inbuilt IR illuminator of 500 meters for night vision functionality. External IR illuminator shall be acceptable for PTZ cameras, however inbuilt IR shall be preferred. The minimum illumination shall be of 0.002 lux for colour and 0.0002 lux for black and white image with automatic gain control on in auto/ manual mode. The camera shall be capable of recording black and white video even in 0 lux with IR up to a distance of 500 meters.

4.1.3 Image enhancement capability

Camera shall have electronically image stabilisation, hue light compensation, back light compensation, and three-dimensional digital noise reduction features. The camera shall support true wide dynamic range of minimum 120 dB.

4.1.4 Camera Housing

The camera shall be housed in a suitable housing to protect them from solar radiation, UV, dust and rain. An inbuilt wiper shall be provided with the housing to permit cleaning of the camera gimble during a rainstorm/ dust etc. The field of view of the camera shall not be obstructed by the housing nor by the wiper, which shall automatically park out of view. Picture quality or optical performance shall not be degraded by the housing. The Housing shall have IP-66 or higher rating for Weather-proof, and NEMA 4X-rating or IK10 or higher rating for Vandal-proof. The housing shall have inbuilt heater and blower function.

4.1.5 Pan-tilt Head

Camera housing shall be mounted on a motorized pan-tilt head. The angles of the head and rotating and tilting speed shall be as follows:
Rotating angle: 360 degrees endless with pre-set pan and tilt speed of minimum 200° per second faster.

4.1.6 Camera Control

a. The following control functions shall be provided to the system to cover wider area and longer distance:
   1) Pan (right – left)
   2) Tilt (up – down)
   3) Zoom (wide – telescope)
   4) Focus (near – far)
   5) Wiper (on – off)
b. The Concessionaire shall state the angle range of pan and tilt movements and their speed.
c. The TMCS Camera shall support H.264, H.265 video compression and shall support latest ONVIF S&G protocol. The camera shall have auto motion detection and shall be capable of auto tracking the moving object, wrong direction detection, stationary object detection, face detection, 250 plus pre-set, patrolling mode, audio I/O ports, alarm I/O, multiple privacy masking features.
d. The Camera shall have applicable CE, UL, BIS and FCC.

4.2 Quality

a. TMCS camera system shall be designed to operate 24 hours a day and 7 days a week without shutdown. Thus, high reliability and availability shall be achieved.
b. Design target of MTBF shall be 3×10^4 hours or better except the mechanical part of pan-tilt head. Expected MTBF shall be calculated based on the announced reliability of parts and component, or operation record of similar products.
c. Availability of the system and each camera shall be 99% or better.

4.3 Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar streetlight

a. A surveillance camera of 2MP at 25 FPS shall be provided at each equipment location along with hooter alarm and beacon. The IP camera shall be POE powered bullet type with

inbuilt IR of 50 meters with illumination at 0.005 lux for colour image and black& white at 0.001 lux with IR. The lens shall be of 2.8-12 mm motorised varifocal with true WDR, 3D DNR, BLC, AGC and triple streaming. The Camera shall have inbuilt SD card slot and shall be provided with at least 128 GB class 10 SD card. The shutter speed of the camera shall be 1/3 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image. The housing shall be IP 67 rated with IK10 protection against vandalism. The camera shall support one alarm I/O port for activation of Hooter and beacon.

b. The function of this camera is to monitor the cabinet and pole surrounding for pilferage and vandalism attempts. The motion detection feature shall raise the alert in the control centre as soon as any movement is detected nearby the cabinet and camera pole to alert the control centre operators regarding any possibility of pilferage and vandalism attempt.
c. Hooter shall be controlled locally by the camera and shall sound when the motion detection period is greater than 5 seconds. The alert in the TMC/Sub-centre shall be raised by VMS/ATMS software as soon as hooter is activated.
d. The face detection function shall be activated as soon as the motion detection is triggered.
e. The camera shall also detect any object addition, object removal, and line crossing.
f. Whenever any event is triggered, the camera shall record the event on SD card also.
g. The camera and hooter beacon alarm shall be installed at height of 8 meters to prevent vandalism.
h. The camera shall be mounted on 1-meter cantilever arm attached to the pole.
i. All-in-one solar streetlight of 15W 2000 Lumens with inbuilt motion detection sensor and auto on-off and auto dimming function shall be installed at each location at a suitable height.

4.4 Power supply system

a. A solar power supply system consisting of a solar panel, a controller, a UPS and Lithium-ion battery bank shall be provided at each TMCS camera location that operates on solar power. Solar power equipment except solar panel shall be accommodated in the same cabinet as TMCS camera controller or in a separate cabinet. The solar panel shall have sufficient size to generate the power required. The Concessionaire shall provide the support for solar panel and connection between the panel and the controller, which shall not be exposed. A mechanism shall be provided to adjust the angle of solar panel to the solar panel support and prevent pilferage. The solar panel shall be installed at the minimum height of 8 meters.
b. The Lithium-ion battery shall be custom built so that it cannot be used for any other application / purpose. It shall be designed such that the terminals/ cells get damaged upon unauthorised removal of battery from the enclosure / cabinet to prevent pilferage.
c. The Lithium-ion battery shall provide power for Camera at least for 3 days even if solar power cannot be generated due to the weather condition. The Concessionaire shall present the calculation of power consumption and capacity of solar power supply system to be used for the TMCS system. The Concessionaire shall also consider the power requirement of network devices, wireless access points, PoE switch, SPD etc. suitably during the calculation.
d. Proper earthing shall be provided at each equipment location.

5. Installation

TMCS camera shall be mounted on a tilt pole installed beside the Highway/expressway on the shoulder as specified. Height of camera shall be 12 meters. Pole shall be rigid enough so as not to vibrate under strong wind and passage of heavy vehicle. Optical fibre cable and power cable shall be extended from the nearest hand-hole at the shoulder where branch connection of cable is possible. The TMCS camera shall be connected to the nearest Wireless Access-point through repeater / access point / transceiver appropriately.

6. Acceptance test

a. Camera, camera housing, pan-tilt head, TMCS camera station, Solar power system, and TMCS camera system central equipment shall be subjected to test at all stages of

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Acceptance tests i.e. Factory Acceptance Test, during installation work and upon completion depending on the test item. Three types of test i.e. function, performance test and general test shall be conducted.

b. Details of the test item, test procedure and criteria to judge test result shall be proposed by the Concessionaire subject to the approval by the Independent Engineer / NHAI.

c. In principle, function and performance requirement stated above shall be tested. More specifically, the following tests shall be conducted as minimum:
   1) Resolution
   2) Colour
   3) Wiper control
   4) Maximum pan and tilt angle and speed
   5) Control desk and remote control
   6) Video switching function
   7) Video recording
   8) Solar Power system charging and backup performance

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Section 05 Video Incident Detection System (VIDS)

1. General

Video Incident Detection System (VIDS) will be installed at the accident-prone and other essential areas identified by the enforcement agency and other vulnerable locations. The images taken by VIDS camera shall be transmitted to the Traffic Management Centre (TMC) / sub-centres through Optic Fibre cable in real time. In the TMC, images are selectively shown on the monitor display of VIDS workstation and VIDS monitor screen. If an incident occurs within the coverage area of camera, operator shall be able to control VIDS camera remotely and check the status visually. At the same time, images from all cameras shall be recorded on the storage device in specified period.

The cameras shall be integrated with Road Condition Monitoring module for collection of road condition data and statistics.

2. System Configuration

a. The VIDS system shall consist of the following components:
   1) VIDS image sensor cameras and LPU at roadside
   2) Cabinet
   3) Solar and UPS
   4) Network equipment, etc.

b. No periodical manual adjustment shall be required in camera and local processing unit.

c. The VIDS application shall be provided to the Traffic Management Centre and Sub-centres for receiving pre-processed data from VIDS LPU on the Project. The data collection interval shall not be more than 60 seconds.

3. Equipment Location

a. VIDS shall be installed at the location to identified by the Concessionaire and approved by the Independent Engineer. The VIDS shall be installed at a suitable location from the connecting / merging road to monitor the sectional traffic volume on the main carriageway.

b. The Concessionaire shall examine and select the VIDS location and obtain the approval from the Independent Engineer.

c. The VIDS shall be installed on a dedicated pole to be provided by the Concessionaire. The clearance of 8 meter shall be secured.

d. The VIDS shall be supplied power from the solar panel attached to Camera Pole. The UPS and Lithium-ion battery bank shall be able to provide the power backup for minimum of 72 hours.

4. System Function

VIDS system shall be provided with the functions described below.

4.1 Monitoring function

a. The road and traffic condition video and images taken by VIDS cameras on the project shall be transmitted as video signal to the Traffic Management Centre through the communication network. The ATMs Software shall be capable of selecting video signal from any VIDS camera to be displayed on the monitor and graphics display.

b. Sequential display function shall be provided to the ATMS Software. The sequential display function shall allow the video image from the multiple cameras to be sequentially displayed at a pre-set interval. It shall be possible to select the cameras for sequential display and to set the display time of the image from each camera.

c. The VIDS console and graphics display shall have multiple screen capability and shall display either one image or four images at a time. The image on the Graphics Display shall be controlled by the ATMS Software.

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4.2 Incident detection

a. The VIDS system shall have an incident detection function and automatically detect incident occurred within its viewing area when the camera is set at home position. Incident refers to those occurrences of slow-moving vehicle, stopped vehicle, reverse traffic, fallen object, poor visibility, vehicle running in opposite direction, etc.
b. If an incident is detected, ATMS Software shall issue an alarm and incident image shall be automatically displayed on the ViDS operator console monitor display and Graphics Display. The GIS Map shall show the location of the incident with a red dot and popup of the video.
c. The Concessionaire shall describe the incident detection mechanism in the Technical proposal that the Concessionaire proposes together with its limitation.

4.3 Image recording and retrieval

All images shall be automatically recorded in the VRS at TMC/Sub-centre with camera ID and time stamp. Frame rate of the video signal can be configured to one frame to 60 frames per second to optimise the storage capacity as per the site requirements. Images shall be stored for minimum 60 days.

4.4 Diagnosis

a. The VIDS system shall have a diagnosis function.
b. The ATMS Software shall check the connection with the VIDS camera and the status of VIDS camera by sending the diagnosis signal every minute. If VIDS camera fault signal is received or there is no response from the VIDS camera, the ATMS Software shall issue an alarm on the Graphics display and operator console.
c. The fault shall also be recorded in the log.
d. The Concessionaire shall state in his Technical Proposal, the types of error and malfunction of the VIDS System that can be diagnosed from the ATMS Software.

5. Camera

5.1 General

a. The IP camera shall be POE/POE+ powered bullet type with inbuilt IR of 60 meters.
b. The Camera shall have inbuild SD card slot and shall be provided with at least 128 GB class 10 SD card.
c. The shutter speed of the camera shall be 1/4 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image.
d. The face detection function shall be activated as soon as the motion detection is triggered.
e. The camera shall detect any object addition, object removal, and line crossing.
f. Whenever any event is triggered, the camera shall record the event on SD card also.

5.1.1 Lens

2 MP Full HD motorized varifocal lens with minimum 5-45 mm motorized auto-focus function having optical defog feature and auto focus covering suitable range of focal length shall be provided and mounted on the camera. The range of the camera shall be minimum 60 meters. The resolution shall be full HD at 60 FPS.

5.1.2 Night vision capability

Cameras shall have inbuilt IR illuminator of 60 meters for night vision functionality. External IR illuminator shall be acceptable in case of box cameras, however inbuilt IR shall be preferred. The minimum illumination shall be of 0.01 lux for colour image with automatic gain control on in auto/ manual mode. The camera shall be capable of recording black and white video even in 0.001 lux with IR up to a distance of 60 meters.

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5.1.3 Image enhancement capability

Camera shall have hue light compensation, back light compensation, and three-dimensional digital noise reduction features. The camera shall support true wide dynamic range of minimum 120 dB.

5.1.4 Camera Housing

The camera shall be housed in a suitable housing to protect them from solar radiation, UV, dust and rain. The field of view of the camera shall not be obstructed by the housing. Picture quality or optical performance shall not be degraded by the housing. The Housing shall have IP-67 or higher rating for Weather-proof, and NEMA 4X-rating or IK10 or higher rating for Vandal-proof.

5.2 VIDS LPU and Cabinet

l. LPU (Local Processing Unit) shall be a fan-less industrial grade rugged compact CPU housed in a cabinet together with power supply and network equipment.
m. The cabinet shall be electrically and mechanically isolated and shall have a degree of protection of IP 55 or higher specified in IEC 60529. If necessary, the cabinet may be provided with a ventilation fan for controlling internal temperature, but the protection code requirements shall be met.
n. A right hinged door shall be provided on the front to realize easy maintenance work.
o. The turning direction of the handle shall be counter-clockwise.
p. The power supply unit shall be provided with a circuit breaker.
q. The anti-lightning and surge protection complying with the IEC 61643-1 shall be provided.
r. The cabinet shall be finished with the anticorrosive treatment.
s. The Concessionaire shall state the details of the anticorrosive treatment and painting.
t. The Cabinet shall have door open alert feature and alarm to be sounded locally as well as the Central Control Centre.
u. The Cabinet shall have suitable built with appropriate locking arrangements to protection from theft, vandalism etc.
v. The cabinet shall be of suitable size to accommodate the equipment to be housed in the cabinet and shall be designed to meet the environmental conditions at the site and cooling, heating, ventilation requirement for the equipment, etc.

5.3 Local warning flashing lights and Alarm

The local VIDS controller shall be enabled to provide appropriate local warnings (in the interest of road safety) to vehicles on the main carriageway on detection of incidents like reverse traffic (along with warning to the Traffic Management Control Centre).

a. Pole mounted flashing lights of minimum 300mm diameter with a visibility of at least 500m shall be used for local warning.
b. There shall be at least five such warning lights each mounted typically at a distance of 100 meters and 200 meters before the incidence monitoring point when seen from the direction of travel. The above distances shall be suitably optimized during detailed engineering. Two warning lights shall be installed in the median and three on the shoulder side.
c. The lights shall be powered by a local solar PV based power supply withinbuilt Li-ion battery and shall be interconnected with the incident detection system either by cable or by wireless (GSM based).
d. During periods of poor visibility, as detected by the VIDS or TMC / Sub-centre operator, the lights shall go into a flashing mode until visibility improves to a level for adequate incident detection. The TMC / Sub-centre operator shall have the option to turn on/off the lights remotely.
e. The above lights shall stop flashing either on the event of the disappearance of the detected incident(s) or on the occurrence of a reset from the TMC / Sub-centre operator.
f. In case of failure of the VIDS LPU the above lights shall, by default, switch to the flashing mode.

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5.4 Solar powered Amber Flasher Light

Apart from the local warning flashing light mentioned above, a set of two standalone Solar powered Amber Flasher Lights (FL) / Solar Blinkers of 300 mm Dia with at least 96 hours power backup shall be provided at each location mentioned in the equipment location list. The FL shall be installed such that it is visible to the merging traffic as well as to the traffic plying on the main carriageway. The set of FL shall be installed at each median opening (also at the location even if the median opening has been closed, as these are the points where two-wheelers, pedestrians etc. frequently use for road crossing and may be potential accident prone areas even after the closure of the median opening), junctions, merging / diverging points near the flyovers, major bridges, railway over bridges, villages, accident prone areas, location identified as frequent animal crossing etc.

The Solar panel and Lithium-ion battery (in lockable and theft proof housing/ enclosure) shall be installed on the top of the FL pole, at a suitable height to prevent theft.

5.5 Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar streetlight

a. A surveillance camera of 2MP at 25 FPS shall be provided at each equipment location along with hooter alarm and beacon. The IP camera shall be POE powered bullet type with inbuild IR of 50 meters with illumination at 0.005 lux for colour image and black& white at 0.001 lux with IR. The lens shall be of 2.8-12 mm motorised varifocal with true WDR, 3D DNR, BLC, AGC and triple streaming. The Camera shall have inbuild SD card slot and shall be provided with at least 128 GB class 10 SD card. The shutter speed of the camera shall be 1/3 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image. The housing shall be IP 67 rated with IK10 protection against vandalism. The camera shall support one alarm I/O port for activation of Hooter and beacon.

b. The function of this camera is to monitor the cabinet and pole surrounding for pilferage and vandalism attempts. The motion detection feature shall raise the alert in the control centre as soon as any movement is detected nearby the cabinet and camera pole to alert the control centre operators regarding any possibility of pilferage and vandalism attempt.

c. Hooter shall be controlled locally by the camera and shall sound when the motion detection period is greater than 5 seconds. The alert in the TMC/Sub-centre shall be raised by VMS/ATMS software as soon as hooter is activated.

d. The face detection function shall be activated as soon as the motion detection is triggered.

e. The camera shall also detect any object addition, object removal, and line crossing.

f. Whenever any event is triggered, the camera shall record the event on SD card also.

g. The camera and hooter beacon alarm shall be installed at height of 8 meters to prevent vandalism.

h. The camera shall be mounted on 1-meter cantilever arm attached to the pole.

i. All-in-one solar streetlight of 15W 2000 Lumens with inbuilt motion detection sensor and auto on-off and auto dimming function shall be installed at each location at a suitable height.

6. Quality

a. The system shall operate on a 24x7 basis. The VIDS shall be capable of taking clear images of road and traffic conditions under any brightness conditions during the daytime and night-time.

b. It shall be the responsibility of the Concessionaire to furnish and install all necessary hardware, software, and database, integrate all system components and deliver a complete operational VID.

7. Power Supply

a. A solar power supply system consisting of a solar panel, a controller, a UPS and Lithium-ion battery bank shall be provided at each location that operates on solar power. Solar power equipment except solar panel shall be accommodated in the same stainless-steel cabinet as controller or in a separate stainless-steel cabinet. The solar panel shall have sufficient size

to generate the power required. The Concessionaire shall provide the support for solar panel and connection between the panel and the controller, which shall not be exposed. A mechanism shall be provided to adjust the angle of solar panel to the solar panel support and prevent pilferage. The solar panel shall be installed at the minimum height of 8 meters.

b. The Lithium-ion battery shall provide power for Camera at least for 3 days even if solar power cannot be generated due to the weather condition. The Concessionaire shall present the calculation of power consumption and capacity of solar power supply system to be used for the system. The Concessionaire shall also consider the power requirement of network devices, wireless access points, PoE switch, SPD etc. suitably during the calculation.
    a. Proper earthing shall be provided at each equipment location.
    b. Power consumption of all types of VIDS shall be 100VA or less regardless of the type of power supply.

8. Installation

a. VIDS Camera device shall be installed on the top of individual supporting pole. The supporting structure with enough length must be provided to keep good visibility.

b. VIDS camera station (local control electronics) shall be installed in VIDS cabinet on the supporting pole for VIDS camera.

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Section 06 Vehicle Speed Detection System (VSDS)

1. General

The Concessionaire shall install the ANPR camera-based solution for over speed detection and enforcement, and radar sensor-based speed detection system for speed display on LED panel. The ANPR system should correctly link the vehicle number plate with the vehicle speed.

The ANPR camera shall be mounted permanently to monitor a single lane of a highway. Multiple ANPR cameras shall be placed on an overhead gantry to get the complete picture of traffic flow for each lane including hard & earthen shoulder in the location.

The ANPR system shall be capable of detection both spot over speeding as well as section based over speeding.

The ATMS Software shall be capable of generating e-challan automatically and integrated with the Vahan database, NIC ITMS, and NPCI FASTag mapper for obtaining the vehicle registration and contact details for e-challan and cross-verification of the vehicle class. The Contractor shall be responsible for integration of AMTS software with the Vahan Database, NIC ITMS, and NPCI FASTag Mapper as part of this Contract.

In addition to ANPR based VSDS, radar triggered Vehicle Actuated Speed Display (VASD) shall be installed at each location to cover all the lanes per direction. The purpose of the VASD is to display the speed of the vehicle to the driver and alert about his/her speed and prevent him/her from over-speeding, hence shall act as speed calming device. The location of VASD and ANPR camera based VSDS may be same or vary as per the site requirement.

The Concessionaire shall be required to integrate with AFS (ANPR cum FASTag System) for exchange of ANPR data, as per the requirement raised by NHAI / Independent Engineer for the project/ NH stretch.

The cameras shall be integrated with Road Condition Monitoring module for collection of road condition data and statistics.

2. System Configuration

The Radar Speed Sensor shall be provided for traffic monitoring and give input to the VADS for display of vehicle speed in real-time. The ANPR camera shall be used to capture the vehicle speed and estimate of vehicle length to identify vehicle class, reverse vehicle movement detection, and wrong lane driving (on the bases of the vehicle classification, e.g. Bus/truck driving in the car/overtaking lane, car driving in over taking lane, etc.). both VSDS and VASD systems shall work independent to each other.

The radar shall be capable for monitoring three/four lanes plus the hard & earthen shoulder simultaneously and send the command to each VASD display for displaying the real-time speed of the vehicle in each lane. The speed of the vehicle in hard/earthen shoulder shall be displayed on the adjacent display. Precise tracking and video overlaying in difficult situations like

- Multiple car tailgating Parallel motion,
- High occlusion target scenarios – e.g. small car or bike next to a large truck

The system shall be capable of capturing all type and classes of vehicles, including but not limited to 2-wheelers, three wheelers, tractor, over-sized, non-standard vehicles, etc.

The Concessionaire shall be responsible for Integration of ATMS system and sub-systems with the NHAI Mobile App for the road users as per the requirement raised from time to time by the Electronics/ IT department of NHAI or its authorized agency.

3. Location

VSDS and VASD shall be installed at suitable locations as identified during the survey by the Concessionaire and approved by the Independent Engineer. The VSDS and VASD shall be installed in the section where the over speeding chances are higher, such that at least one set is installed at suitable location between two junctions / flyover/ interchange / entry- exit points and the distance between two locations shall not exceed 10 kms in each direction. The ideal distance between two locations is 5 kms in each direction.

Both the system shall be installed in both the directions (LHS & RHS) of the road at each location.

Minimum of 3 sets shall be installed in each direction on the project stretch for obtaining sufficient data for section-based speeding, ATCC, and TTMS functionalities, such that the shoulder is also covered, additional camera per direction shall be provided, if required to cover the shoulder.

VSDS and VADS systems shall be installed in both the directions (LHS & RHS) of the road at each location on the same gantry.

4. Roadside Equipment

a. ANPR Camera
b. LPU
c. Cabinet
d. Vehicle Actuated Speed Display integrated with Speed Radar
e. Speed Radar
f. Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar streetlight
g. Civil works and gantry structure
h. Solar and UPS

5. TMC Equipment

Speed Enforcement Application module (part of the ATMS software) and console.

6. System Function

6.1 Radar System

a) The radar Sensor must have high accuracy and detection range. The operational range should be 90 meters.
b) The Sensor shall be Capable for the tracking up to 32 vehicles simultaneously.
c) The accuracy of speed detection shall be more than 98% at a speed range of 0.5 to 200 km/hr.
d) Inbuilt radar in VASD shall also be acceptable if the accuracy level of more than 98% at a speed range of 0.5 to 200 km/hr can be achieved by the inbuilt radar and display on the VASD in real-time with read range of 100 meters.
e) The radar shall be calibrated and tested by the third-party for speed detection. Test and calibration certificates shall be submitted by the Concessionaire along with the Technical Proposal and commissioning. The commissioning certificate shall only be issued after authentication of the test reports and calibration certificates.

6.2 ANPR Camera

a) The ANPR camera shall be installed at site independent of the radar system.
b) Success rate of number plate recognition, reading and associating with transaction shall not be less than 90% during night-time at a speed of 180 kmph for standard number plates. The vehicle image capturing, and processing zone shall be within 40 meters for higher accuracy.
c) The night vision should not affect the accuracy.
d) The camera shall capture the image of each over speeding vehicle for spot speeding and each vehicle for section speeding and send to the control room. In case the ANPR/OCR is unable to read/recognize the number plate, the system shall create an incident and send an alert to the operator. The operator shall be able to zoom the vehicle image to read the registration number plate and manually enter the vehicle number in the system for further processing. The Concessionaire shall be responsible to propose the system capable of processing all over speeding vehicles, irrespective of the accuracy, read rate of the ANPR.
e) The video recording of each ANPR camera shall be stored for a period of 60 days in H.264, H.265 format and the video clip of over speeding vehicles shall be stored for the entire period of the Contract i.e. for minimum of 5 years. The length of the video clip shall be proposed by the Concessionaire such that the same can be produced to the enforcement agency as and when required as an evidence of speed violation. It shall be solely the responsibility of the Concessionaire to produce the evidence and provide required support to the Authority and enforcement agency for justifying the speed violation.

f) The software and cameras shall be calibrated on monthly basis and the certified test report shall be submitted to the Authority and Independent Engineer. In addition to the monthly testing and calibration, the Authority or Enforcement agency may instruct the Concessionaire to test the cameras and software at any time to ascertain the accuracy of the cameras, software and radars.

g) The ANPR Cameras and VSDS Software shall be calibrated and tested by the third-party for speed detection. Test and calibration certificates shall be submitted by the Concessionaire along with the Technical Proposal and commissioning. The commissioning certificate shall only be issued after authentication of the test reports and calibration certificates.

6.3 Specifications

a. The system shall perform during day and night as well as in adverse weather conditions.
b. It shall have built in diagnostic functions to quickly asses the validity of speed calibration.

6.3.1 General

a. The IP camera shall be POE powered box type with external IR of 100 meters or better.
b. The Camera shall have inbuilt SD card slot and shall be provided with at least 128 GB class 10 SD card.
c. The shutter speed of the camera shall be 1 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image.
d. The Camera shall have Ethernet port, 2 alarm input/2 Alarm output.

6.3.2 Lens

2 MP Full HD manual varifocal lens with minimum 5-50 mm C/CS mount DC drive. The range of the camera shall be up to 100 meters. The resolution shall be full HD at 60 FPS.

6.3.3 Night vision capability

Cameras shall have inbuilt IR illuminator of 100 meters for night vision functionality. External IR illuminator shall be acceptable, however inbuilt IR with housing shall be preferred. The minimum illumination shall be of 0.005 lux for colour image with automatic gain control on in auto/ manual mode. The camera shall be capable of recording black and white video even in 0.001 lux with IR up to a distance of 100 meters.

6.3.4 Image enhancement capability

Camera shall have hue light compensation, back light compensation, hue light compensation, defog, and three-dimensional digital noise reduction features. The camera shall support true wide dynamic range of minimum 120 dB.

6.3.5 Camera Housing

The camera shall be housed in a suitable housing to protect them from solar radiation, UV, dust and rain. The field of view of the camera shall not be obstructed by the housing. Picture quality or optical performance shall not be degraded by the housing. The Housing shall have IP-67/IP-68 rating for Weather-proof with better dust & dirt protection, and NEMA 4X-rating or IK10 or higher rating for Vandal-proof. The housing shall have built-in heater and blower.

6.4 VSDS LPU and Cabinet

a. LPU (Local Processing Unit) shall be a fanless industrial grade rugged compact CPU housed in a cabinet together with power supply and network equipment.
b. The cabinet shall be electrically and mechanically isolated and shall have a degree of protection of IP 55 or higher specified in IEC 60529. If necessary, the cabinet may be provided with a ventilation fan for controlling internal temperature, but the protection code requirements shall be met.
c. A right hinged door shall be provided on the front to realize easy maintenance work.

d. The turning direction of the handle shall be counter-clockwise.
e. The power supply unit shall be provided with a circuit breaker.
f. The anti-lightning and surge protection complying with the IEC 61643-1 shall be provided.
g. The cabinet shall be finished with the anticorrosive treatment.
h. The Concessionaire shall state the details of the anticorrosive treatment and painting.
i. The Cabinet shall have door open alert feature and alarm to be sounded locally as well as the Central Control Centre.
j. The Cabinet shall have suitable built with appropriate locking arrangements to protection from theft, vandalism etc.
k. The cabinet shall be of suitable size to accommodate the equipment to be housed in the cabinet and shall be designed to meet the environmental conditions at the site and cooling, heating, ventilation requirement for the equipment, etc.

6.5 Vehicle Actuated Speed Display (VASD)

6.5.1 Function

The speed display shall display the speed of the vehicle in real-time and provide textual or graphical warning to the vehicles exceeding the pre-set speed limit. The speed shall be displayed in green colour if the speed is within the permissible limit for the vehicle class, orange colour if the speed is matching the speed limit, and red if the vehicle is over-speeding. The display shall blink continuously if the speed of vehicle is more than 120% of the permissible speed limit, along with the message "Over-Speed – Slow down" in the first row of the display. One speed display shall be installed for each lane on both the sides of the road.

Time shall be displayed at the top section of the display in HH:MM:SS (24 hour) format at all the times, even if no speed is being displayed on the VASD. The font size shall be suitable and visible from 100 meters distance. The time on all the displays shall be synced with the central server.

6.5.2 Specifications

a. The system shall perform during day and night as well as in adverse weather conditions.
b. It shall have built in diagnostic functions to quickly asses the validity of speed calibration.
c. It shall adjust display intensity automatically to suit the ambient light conditions.
d. It shall be modular in construction for ease of maintenance.
e. It shall display numeric speed data as well as graphical (standard IRC road warning sign) (preferably) / textual warning.
f. Measurement:
    i. Speed range: 0.5 km/h to 200 km/h
    ii. Maximum Measuring errors: Up to 100 km/h ± 3 km/h, Above 100 km/ ± 5 km/h
    iii. Minimum Monitored section length: 100m
g. It shall have the facility to log vehicle speed of over- speeding vehicles and transfer them to the ATMS control centre.
h. The speed display shall be formed using individual modules.
i. Speed display must be constructed using corrosion resistant panel with LED pixels in row: column matrix.
j. The Display shall show the speed in green colour if the speed is within 80% of the limit for the vehicle class, orange if the speed in exceeding 80% of the speed limit and red (blinking) if speed of the vehicle exceeds the speed limit for the vehicle class.
k. Scanning/Multiplexing ratio shall be 1/8 or better.
l. The LED Cluster shall consist of individual LED`s rated for out-door use.
m. The board size shall be minimum 1,000 mm (W) x 2,000 mm (H) ±5%

n. The LED configuration shall be 3 in 1 SMD and the pixel pitch shall be 6mm outdoor or better. Lower pixel pitch shall be considered better. The pixel density shall be more than 2500 pixels per square meters.
o. The LED board shall have the capacity to display any content, graphics, videos, symbols, text in full matrix, with multiple font size and character height, and multiple languages.
p. Shall support an industry standard communication interface such as TCP/IP on copper, Wi-Fi, and/or fibre optic to help setting the pre-set speed and retrieve log data.
q. Shall maintain time stamped record (speed and vehicle image) of each case of over speeding in a log file that can be retrieved over the connected network or using a locally connected laptop.
r. It shall optionally be possible to configure the display to send real time violation event record (speed, and time stamp) over the connected network while recording the same
s. It shall be possible to control the brightness of displays automatically using built-in light sensors.
t. All PCB's shall be of FR4 material, 1.6mm thick and LED matrix PCB shall be 2.4mm thick. PCBs shall be of quality suitable for use in the environmental conditions as specified.
u. The equipment shall allow local diagnostics via laptop connected to its communication port.
v. Display size shall be suitable to display both the speed of the vehicle and warning message simultaneously in two rows.
w. Brightness intensity shall be 7500 cd per sq.m. with option to adjust the brightness manually as well as auto brightness adjustment feature.
x. Fault diagnostics shall be provided to include the following as a minimum:
    i. Radar Failure
    ii. LED Failure

7. Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar streetlight

a. A surveillance camera of 2MP at 25 FPS shall be provided at each equipment location along with hooter alarm and beacon. The IP camera shall be POE powered bullet type with inbuild IR of 50 meters with illumination at 0.005 lux for colour image and black& white at 0.001 lux with IR. The lens shall be of 2.8-12 mm motorised varifocal with true WDR, 3D DNR, BLC, AGC and triple streaming. The Camera shall have inbuilt SD card slot and shall be provided with at least 128 GB class 10 SD card. The shutter speed of the camera shall be 1/3 second to 1/100000 seconds for capturing the motion detection even during low light condition and provide proper image. The housing shall be IP 67 rated with IK10 protection against vandalism. The camera shall support one alarm I/O port for activation of Hooter and beacon.
b. The function of this camera is to monitor the cabinet and pole surrounding for pilferage and vandalism attempts. The motion detection feature shall raise the alert in the control centre as soon as any movement is detected nearby the cabinet and the Gantry to alert the control centre operators regarding any possibility of pilferage and vandalism attempt.
c. Hooter shall be controlled locally by the camera and shall sound when the motion detection period is greater than 5 seconds. The alert in the TMC/Sub-centre shall be raised by VMS/ATMS software as soon as hooter is activated.
d. The face detection function shall be activated as soon as the motion detection is triggered.
e. The camera shall also detect any object addition, object removal, and line crossing.
f. Whenever any event is triggered, the camera shall record the event on SD card also.
g. The camera and hooter beacon alarm shall be installed at the gantry to prevent vandalism.
h. The camera shall be mounted on at a suitable location on the Gantry such that it focuses on the enclosure / cabinet housing the LPU and Li-ion battery bank.
i. All-in-one solar streetlight of 15W 2000 Lumens with inbuilt motion detection sensor and auto on-off and auto dimming function shall be installed at each location at a suitable height.

8. Power Supply

a. The power supply shall be connected from communication rack using the POE or Adaptor.
b. A solar power supply system consisting of a solar panel, a controller, a UPS and Lithium-ion battery bank shall be provided at each location that operates on solar power. Solar power equipment except solar panel shall be accommodated in the same stainless-steel cabinet as controller or in a separate stainless-steel cabinet. The solar panel shall have sufficient size to generate the power required. The Concessionaire shall provide the support for solar panel and connection between the panel and the controller, which shall not be exposed. A mechanism shall be provided to adjust the angle of solar panel to the solar panel support and prevent pilferage.
c. The Lithium-ion battery shall provide power for at least for 3 days even if solar power cannot be generated due to the weather condition. The Concessionaire shall present the calculation of power consumption and capacity of solar power supply system to be used for the system. The Concessionaire shall also consider the power requirement of network devices, wireless access points, PoE switch, SPD etc. suitably during the calculation.
d. Proper earthing shall be provided at each equipment location.

9. Installation

The system will be installed on the gantry at specified locations.

10. Acceptance test

Acceptance test shall be conducted for speed system at the factory (before Site Acceptance test), during installation work and upon completion depending on the test item. Test will be classified into two types, functional and performance test, in addition, trial operation shall be conducted after the Acceptance test.

11. Design Principle of VSDS, TMCS, VIDS, and other Foundations

11.1 Design Strength

The foundation shall be of reinforced concrete with the concrete having the compressive strength of 2,500 N/cm^2 (250kg/cm^2) after 28 days (cylinder type), or when made with a high rapid strength Portland Cement, it shall acquire the same strength after 7 days.

11.2 Contractor's Detailed Survey and Design

Before commencing the actual work, Contractor shall carry out the field detailed survey/design of the facilities. The detailed drawings including the calculation data based on the survey/design shall be prepared and shall be submitted to NHAI for approval.

11.3 Construction of Foundation

11.3.1 VSDS, TMCS, VIDS, and other Foundations

a. Contractor shall comply with the following specifications for preparing and mixing concrete.
b. All foundations shall be constructed with a ready-mixed or site-mixed, M20 Grade Or if made manually then the concrete when made with a normal Portland Cement, shall attain a minimum compressive strength of 2,500N/cm2 (250kg/cm2) in 28 days (cylinder type) , or when made with a high rapid strength Portland Cement, it shall acquire the same strength in 7 days (Test to be performed on cylindrical type concrete specimen of size 150mm x 300mm).
c. The slump range for the concrete used in the construction of foundation shall be between 8 and 15cm.
d. NHAI may order three (3) test pieces (cylinder type) from any batch of the concrete to be taken and properly marked for the laboratory test as required.

e. The concrete shall be slowly poured around the moulds or forms, up to adequate level evenly and tamped into all parts of the moulds or forms, by using a vibrator until a densely solid mass without cavities is obtained.
f. The concrete, once mixed, shall be used within 60 minutes. After one hour, any remaining concrete shall be removed and shall not be used.
g. Cement mortar shall consist of one (1) measure of Portland Cement and two (2) measures of sand.
h. The concrete shall be covered with saturated sack-cloth or similar materials and shall be sprinkled with water to keep sufficient moisture, adequate times a day for 7 days.

11.3.2 Excavation for Foundation

a. The Contractor shall take all countermeasures necessary for safety of the public and for protecting and preserving any and all temporary or permanent utilities.
b. Contractor shall obtain all permissions, right-of-way and/or permits necessary for the execution. The permissions shall include property owners' approvals for necessary work on their properties.
c. Contractor shall obtain all permissions, right-of-way and/or permits necessary for the execution. The permissions shall include property owners' approvals for necessary work on their properties.
d. Contractor shall be directly responsible for all damages to existing utilities and shall restore these services immediately at his own expense.

11.3.3 Backfilling

a. Backfilling shall commence after notifying Independent Engineer.
b. Upon completion of the backfilling, all remaining soil shall be removed and the road surface, pavement and the area concerned shall be immediately cleaned.
c. Before backfilling, all foreign objects shall be removed from the excavation.

11.4 Material for Foundation

11.4.1 Cement

a. All cement used in underground construction shall be Portland Cement and in accordance with BS 12 or equivalent.
b. The cement shall be stockpiled in such a manner as to afford easy access for inspection. Cement shall be kept dry at all times prior to use in order to prevent deterioration. Open air storage of cement shall not be permitted.
c. Deteriorated cement, such as cement containing lumps that are too difficult to powder by hand, shall not be used.

11.4.2 Water

a. All water used for mixing and curing of concrete shall be supplied by the waterworks.
b. Water from other sources may be used only if authorized by NHAI after tests have shown the quality to be better than that supplied by the waterworks.
c. Water from any source which has been contaminated with dirt, oil, salt or other foreign substances shall not be used.

11.4.3 Fine Aggregate

a. The fine aggregate for concrete shall consist of natural river sand or equivalent material.
b. The fine aggregate shall be uniformly graded and shall meet the grading requirements as follows:

Sieve Designation	Percentage by Weight Passing square mesh sieve
(10.0mm)	100
No.4 (5.0mm)	95 to 100
No.16 (1.2mm)	45 to 80
No.50 (0.3mm)	10 to 30

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No.100 (0.15mm)	2 to 10

c. The fine aggregate shall be stored in such a manner as to prevent mixture with other aggregate prior to the use and also to prevent inclusion of foreign materials.

11.4.4 Coarse Aggregate

a. The coarse aggregate for concrete shall consist of crushed stones having hard, strong and durable pieces free from adherent coatings such as mud or other foreign materials. The coarse aggregate shall be graded between a maximum size of 25mm and a minimum size corresponding to No.4 sieve size. It must be free from dirt, floury stone dust, earth or any similar materials.

b. The coarse aggregate shall be stored in such a manner as to prevent mixture with other aggregate, prior to the use and also to prevent inclusion of foreign materials.

11.4.5 Reinforcing Bar

Reinforcing bars shall be deformed steel bars. The bars shall be free from dirt, oil, paint, grease, thick rust and other defects and shall confirm to the following requirements:

Item	Unit	Specific Value
Tensile Stress at Minimum	N/mm2	500 (49 kg/mm2)
Yield Point at Minimum	N/mm2	300 (30kg/mm2)
Elongation at Minimum	%	14
Design Stress	N/cm2	160(1,600kg/mm2)

12. Acceptance test

Details of the test item, test procedure and criteria to judge test result shall be proposed by the Contractor subject to the approval by the NHAI.

12.1 Function and performance test

In principle, function and performance requirement stated above shall be tested. More specifically, the following tests shall be conducted as minimum:

1) Message composition
2) Data exchange
3) Central control
4) Local control
5) Colour and brightness
6) Response time
7) Display off function
8) Error detection

12.2 General test

The following tests shall be conducted as minimum:

1) Appearance
2) Power supply fluctuation
3) Instantaneous power interruption
4) Insulation resista0nce
5) Dielectric strength
6) Temperature variation
7) Waterproof test (field equipment)
8) Amount of zinc coating (field equipment and support)

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Section 07 Adaptive Traffic Signal Control System

1. General

ATSC system shall be deployed at intersection/ crossing / junction locations along the Highway stretch, such as junctions formed under the flyover, VUP, and underpasses. The locations shall be identified during the site survey by the Concessionaire.

ATSC shall be provided at every junction under the VUP and Flyover where signalling system is not available and required by the Traffic Police. In case Traffic signals are available and doesn't require replacement, only RLVD and Automatic pedestrian Detection system shall be deployed.

The quantity provided in the BOQ/indicative list of equipment is tentative and the final quantity shall be derived as per the actual project requirement during the site survey and Detail Design phase and the quantity shall be reduced or increased accordingly.

The primary purpose of these signals will be to provide traffic and transit management services in support of improving congestion and reducing delays at the intersections.

The proposed system shall comply with the functional requirement stipulated in IRC:SP:110:2017.

Training shall be provided to all the concerned stakeholders such as traffic police, NHAI representatives, etc. as per the requirement. The training schedule and procedure shall be finalized in consultant with the Independent Engineer and Traffic Police.
The cameras shall be integrated with Road Condition Monitoring module for collection of road condition data and statistics.

2. ATSC Components

The ATSC to be provided as part of this contract encompass the following components:

1. Traffic Signaling System
2. Red light violation detection system (RLVD)
3. Automatic Pedestrian Detection system (APDS)
4. Traffic Signal System monitoring, control, analytics and management module at TMC integrated with ATMS Software
5. Traffic Signal Controller Cabinets to accommodate traffic signal hardware or red-light enforcement, surveillance cameras, switches, emergency preemption equipment, etc.
6. Vehicular and pedestrian signal heads at every signalized intersection.
7. Traffic Signal Poles – high poles, cantilever poles (mast arms) and gantries
8. Camera based Traffic Detectors
9. Digital Communication System
10. Solar based Power supply with 72-hour backup
11. SPD, Lighting protection, etc.
12. Foundation, conducting, etc.
13. Integration with NMS and FMS
14. Integrate with Smart City ITS Control Rooms/ ICCC, as applicable.
15. Automatic generation of e-challan and SMS service, same as in case of violation detection from VSDS and VIDS system.

Dismantling of existing equipment and installation of new ATSC system shall be in the scope of the Concessionaire and no additional cost shall be payable for any dismantling of existing equipment if required at any intersection / location.

3. Operations & Maintenance of ATSC

The Contractor shall perform following tasks during the O&M phase:

a. Finalize the Maintenance SOP developed as part of the proposal using stakeholders' inputs.
b. provide comprehensive maintenance of the System as mentioned in the Maintenance SOP including cleaning of the Solar panels regularly.
c. provide comprehensive maintenance of the System as mentioned in the Maintenance SOP including cleaning of the Solar panels regularly.
d. monitor & evaluate the efficiency of the adaptive control system on a regular basis and developing strategies for enhanced operation.
e. monitor the ATSC system performance with respect to the entire stretch and traffic management module targets.

4. System Design

The Concessionaire shall submit the detailed design of following components during the detail design phase for the approval of the Independent Engineer. The design of each component shall be on the bases of the system required for each type of junction / intersection.

a. Traffic signal design
b. Traffic signal poles, mast arms and gantries
c. Traffic signal Heads – vehicular and pedestrian
d. Traffic Signal Cabinet Assembly
e. Detection system
f. TMC Controlled Adaptive Software
g. Conduits and Junction Boxes

The system shall be designed and installed in accordance with relevant National (Indian) and International technical, safety and environmental standards, specifications and type approvals, including but not limited to current versions of the following documents:

1. Guidelines on Design and Installation of Road Traffic Signals – The Indian Roads Congress, (IRC: 93-1986).
2. Guidelines for Pedestrian Facilities – The Indian Roads Congress, (IRC: 103-2012)

The proposed system shall be fully compatible and seamlessly integrate with the current ATSC and RLVD system being deployed in the concerned smart city or city ITS project or traffic police project, as applicable.

4.1 Design Drawings

The traffic signal design drawings shall specify the location of the following component for every junction:

1. Traffic signal heads
2. Traffic signal cabinet
3. Traffic signal poles
4. Traffic signal conduits and pull boxes
5. Detection system (RLVD, APDS, etc.)
6. Other installed intersection technologies

Following minimum information shall be provided in the traffic signal design drawings:

1. Electrical circuit schedule/table
2. Pole schedule/table
3. Detector assignment schedule/table
4. Phasing Diagram
5. Pole foundation
6. Traffic controller foundation
7. Conduit and pull boxes installation

Traffic signal drawings shall be supplemented with any necessary documents to comply with requirements of the project and prevailing standards.

5. RLVD (Red Light Violation Detection) System

a. System should be totally digital

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b. The system shall detect and capture vehicle details when: i) It violates the stop line/zebra crossing, ii) It violates the red-light signal
c. System shall be Non-Intrusive. It shall have the option of working without integration with traffic controllers but Concessionaires should also provide undertaking that their system also works with integration of controllers.
d. Red light system shall be a completely fair system with all evidence captured before and after the red-light jumping infraction has happened.
e. Each camera system shall cover road width of 3.5 meter or 7 meter or 10.5 meter and above.
f. The Camera specifications shall be same as specified in the VIDS section for bullet/box camera and VSDS section for ANPR camera.
g. Red light system should detect vehicle presence to act as input to control the Traffic Controller.
h. System can be a composite unit with all components inside the IP66 box OR comprised of camera or other units mounted on poles or gantries with controller and processors at side poles to make sure all lanes of the road are covered.
i. System should be able to recognize the entire event by which the same can be justified automatically by fetching the number plate of cars in violation.
j. The system shall have alert generation feature as per the requirement of the Traffic Police, the same shall be finalized after discussion with the concerned enforcement agencies of the state in consultant with the Independent Engineer.
k. Certification: UL (Underwriters Laboratories), BIS (Bureau of Indian Standards) and RoHS compliant certificate.

6. ATSC and RLVD Module in TMC

a. The system should provide function to the Operator to manually check the entry in application and edit the numbers which may be wrongly OCR- read, before the numbers are fed to the e-Challan generating sub-system. An audit trail should be maintained to record such editing activities.
b. No deletion or addition of data without validation, proper password protection. Deleted data if any to be inserted automatically in a separate table.
c. The system should provide facilities to search for the cases of violations that occurred during any specific span of time and provide a statistical analysis of the number of such incidents occurring during various days of the month.
d. A customized web-based dashboard to be developed for all types of master data entry and for customized reports with graphical analysis.
e. System can be integrated with existing e-Challan generating systems as well as with fine generation/imposition for each infraction with multiple images clearly showing color of red-light signal and violation (i.e. color image of context camera), date, time, vehicle registration number, classification of offence etc. Image having water mark of Date & time, Place, Latitude & Longitude to be uploaded.
f. Integration with RTO database, Vaahan databased, and police control rooms etc. to be integrated by the Concessionaire.
g. It is desirable that the proposed solution should already be in use with enforcement authorities and is used for generating fines. End user certificates for proper working shall be submitted, if applicable.

Section 08 Power and Other Cables, Power conditioning equipment

1. Power Cable

1.1 Type of Power Cable

The types of cables shall be as follows:

No.	Item	Specifications
1.	Outdoor Power Cable	Minimum 1.5 square mm - 22 square mm, 3 cores

1.2 Specification of Outdoor Power Cable

Outdoor power cable shall meet the following specifications:

1) Bright annealed, 99.97% electrolytic grade
2) Copper conductor (solid/stranded),
3) Voltage grade 1100 V,
4) Single or multi core cable,
5) Flame retardant low smoke (FRLS),
6) PVC / XLPE insulated,
7) With high oxygen and temperature index
8) Armored,
9) IS 8130, IS 5831, IS 3975, IS 1554 (Part I) / IS 7098 (Part I) or BS 6346/ IEC 60502

2. Power Conditioning Equipment System

2.1.1 General

a. This specification lays down the general, functional and technical requirements of the power conditioning equipment.
b. Power supply rated at 440V, 3 phases will be made available at the Essential Supply Board of the TMC and Sub Centre Building. This supply will be backed up by standby generators to be provided by others; should there be an absence of electrical power.
c. A power distribution board (PDB) as detailed in the drawing shall be supplied and installed under this Contract. The Concessionaire shall provide power distribution board at other locations where necessary and the cost of such power distribution board shall be considered included in the Contract Price.
d. The Concessionaire shall supply and install UPS systems indicated below. All equipment except the equipment with solar power supply shall be provided power through this UPS to make sure that the power is continuously available to all equipment during the interruption of commercial power.

2.1.2 System Configuration

The UPS system shall consist of the following components:

1) UPS at TMC, Sub Centres and all Road-side equipment
2) Power distribution board at TMC centre, sub centres and all Road-side equipment

3. Type of UPS

a. Rating of UPS Type for TMC and Sub-Centres shall be 10KVA, 15KVA or 20KVA.
b. The suggested rating of the UPS at each location shall be submitted in the proposed design and BOQ. The Concessionaire shall make his own calculation of the rating based on the power requirement of the equipment he supplies and the sound engineering practice. The Concessionaire shall submit the calculation and the rating to the Independent Engineer for his approval before the supply of the UPS.

3.1 Installation Location

1. All the UPS to be provided shall be online type UPS only with minimum 4 hour back-up for TMC and sub-centres and 72 hours for roadside equipment. The minimum UPS rating for each system and sub-system shall be as shown in the table below:

No.	Position	For ATMS		Remarks
		UPS Rating (minimum)	Tentative Quantity*	
	For Server Rack	10 KVA	2	1 at TMC and 1 at each Sub-centre (4 hours backup each)
2	TMC	20 KVA	2	In Hot Standby configuration (4 hours backup combined)
3	Sub Centre	10 KVA	2	In Hot Standby configuration (4 hours backup combined)
4	Road-Side Equipment	Concessionaire to Propose	1 at each location	With solar panel
				Minimum 72 hours backup

*Actual quantity of UPS as per the project / site requirement, to be finalised by the Authority/ Independent Engineer.

2. The Concessionaire shall be responsible to calculate the UPS rating required for each location in the configuration as mentioned in the table above, based on the load of the equipment being proposed. The load calculation for each location shall be submitted in the Technical Proposal.

4. Cabinet

4.1 Fabrication

Panel or distribution board shall be wall mounted. It shall be fabricated or readymade with 14/16SWG CRCA Sheet, compartmentalized, double door hinged type. Gasket shall be provided to prevent the ingress of dust and vermin confirming to degree of protection IP-54 (panel) and IP-43 (distribution board), IP-65 (outdoor) with suitable space & direction for cable entry. Distribution board shall be cleaned with 7 Tank process, powder coated with primer and epoxy paint as per IS 2174/1962 as amended.

4.2 Switchgears & Meters

All switchgears (MCCB / MCB / fuses/ measuring instruments / meters/ indicating lamps / relays / switches) rating, capacity, make, kA rating, dimension shall be as per the type of DB with quick make & break type operating mechanism suitable for rotary operation with suitable extended operating handles with capacity and position marking on door, flush mounted, with suitable spreaders / links for cable connection as per IS 1248, 2208, 4237, 8623, 10118 (Parts I to IV).

4.3 Wiring

All power wiring within panel and distribution board shall be with suitable size flexible copper wire of 1.1kV grade, C.T. & control wiring with 2.5 square mm and 1.5 square mm, respectively with 1.1kV grade with proper lugging, ferruling, and connection with SS Nut - Bolt with adjustable and fixed washer.

4.4 Indication and Marking

All distribution board and panel shall have suitable main name plate, feeder name plate, danger board plate engraved or anodized aluminium type as per IS 2551. All panels and distribution boards shall have earthing node, point or strip similar to busbar as per IS 3043.

4.5 UPS Specification

The UPS system to be provided under the Contract shall comply with the specifications below.

Description	Specifications
Rated Power	10 KVA/20KVA
Technology	i) True online rack mountable IGBT based UPS with double conversion technology.
	ii)UPS should be capable of paralleling up to 2 units or better .
	iii) UPS should have IGBT based rectifier and inverter.
	iv) Advance battery management feature should be built in for prolonged battery life
	v) The UPS should be compatible for single phase input and single-phase output supply.
Input	i)Voltage range 110 -275 V, Load dependent ,1 Ph,380v AC3 Phase
	ii) 45-55Hz / 54-66Hz (extendable to 40~70HZ when load < 60%)
	iii)Power Factor 0.99 (With PF correction)
	iv) Capacity as per rating
Output	i)Voltage range 220 /230/240 VAC +/- 2%
	ii)Harmonic distortion <3% (Linear Load); <5%(Nonlinear load)
	iii) 45-55Hz / 54-66Hz (extendable to 40~70HZ when load < 60%)
	iv) Power Factor Unity
	v) CREST factor 3:1
Efficiency	95% @ 230V output with typical load (Line mode with battery full charged)
Battery	i) Type - Sealed lead , acid maintenance free (SMF)
	ii) Backup Time - 04 hours hours in parallel mode
	iii) Transfer Time – Zero
	iv)Audible Noise - <60 db
Display	Multi-language LCD + status LED
Interface slot	USB & Intelligent Slot (SNMP)
Protection Grade	IP 20
Auto shutdown Software	UPS should come with Auto shutdown and monitoring software in CD media
Credentials	i)Manufacturer should be ISO 9001: 2000 certified
	ii)Manufacturer should be ISO 14001 certified
	iii) UPS should meet ROHS standards
Warranty	UPS Should have 05 years Onsite warranty and Batteries should have at least 05 years Onsite warranty
Surge Regulations	IEC 61000-4-5 Level 4
Parallel Cable component	For running UPS in parallel

Description	Specifications
Rated Voltage	2KVA / 3KVA
Technology	True Online Double Conversion Microprocessor based 2 kVA/1.6 kW UPS as per Bureau of Indian Standards
	UPS should have IGBT based rectifier and inverter.
	Advance battery management feature should be built in for prolonged battery life.
	The UPS should be compatible for single phase input and single-phase output supply.
Input	i)Voltage range 110 -300 V, Load dependent

Description	Specifications
	ii) UPS Input Frequency should be 50Hz with frequency window 40 Hz to 70 Hz.
	iii)Power Factor 0.99 (With P.F correction)
	iv) Capacity as per ratting
Output	i)Voltage range 220 /230/240 VAC +/- 2%
	ii)Harmonic distortion <3% (Linear Load), <5%(Nonlinear load)
	iii) UPS output frequency should be 50 Hz +/-1%
	iv) Power Factor 0.8
	v) CREST factor 3:1
Efficiency	UPS should provide online double conversion efficiency >90% ,provide Economy mode efficiency >97.5% and provide Battery mode efficiency >86% and should be certified from Bureau of Indian standard lab
Battery	i) Type - Sealed lead acid maintenance free (SMF)
	ii) Backup Time- 04 hours in standalone mode & @ Full load
	iii) Transfer Time – Zero
	iv)Audible Noise - <51 db
Display	UPS LCD display should provide Input/output/Battery/Load details on single screen.
Interface slot	RS232 & Intelligent Slot (SNMP)
Output socket	UPS should have 3* IEC C13 Output Socket + 1 terminal block
Protection Grade	IP 20
Auto shutdown Software	UPS should come with Auto shutdown and monitoring software in CD media
PCB Coating	UPS should come with conformal coated boards for harsh environment
Surge Regulations	UPS should have inbuilt surge protection as per Criteria B, DM Level 3: 2KV, CM Level 4: 4KV Ref Std : IEC 61000-4-5:2014
Credentials	i)Manufacturer should be ISO 9001: 2000 certified
	ii)Manufacturer should be ISO 14001 certified
Warranty	UPS Should have 05 years Onsite warranty and inbuilt Batteries module /EBM should have at least 05 years Onsite warranty

5. Cable Installation Work

5.1 Cable Pulling

a. Sufficient care shall be taken, and measures shall be taken during the loading, transportation and unloading of cable drum so as to avoid shock and damage to the cable.
b. Appropriate surplus of cable shall be required at inside of handhole/ manhole.
c. Cable shall be connected only inside the handhole/ manhole.
d. Cable tag (plastic plate) describing the name of the cable (power cable or earthing cable) and the origin of cable (cable name, type of cable, interchange name & etc.) shall be attached to the cable.
e. During the installation of cable, the following constraints shall be observed:
f. The maximum tension allowed.
g. The minimum curvature radius allowed: When installing cable at the handhole/ manhole, curvature radius shall be more than 6 times of the diameter of the cable being laid at all times. After cable laying work, minimum radius of more than 20 time of the diameter shall be ensured.
h. Extension speed of laying:
i. Towing cable shall be made smoothly without any excessive tension intermittently at the time of laying, and calibration of appropriate apparatus for setting up allowable tension shall be required.

j. The extension of cable shall be carried out at a constant speed and it shall apply the suitable back tension for a drum to avoid hunching.
k. Cable in the point in a handhole/ manhole shall have at least 3 m margin complied with curvature radius at every handhole/ manhole and the point of handhole/ manhole terminal equipment shall have the 3 m margin at both sides of branch.
l. Winding up of Insulating tape for the connecting point of electric wire shall be required.
m. Connection between electric wire and terminal equipment shall be connected using terminal lug or a screw.

6. Inspection and Acceptance test

Acceptance test specified shall be performed by the Concessionaire under the supervision of Independent Engineer.
Necessary equipment and materials for the site inspection and the Acceptance tests shall be provided by the Concessionaire at his own expense. Written report including the test results shall be prepared by the Concessionaire and verified by the Independent Engineer.

6.1 Interim Inspection

a. During interim inspection, at least the following test and inspection items shall be performed:
b. Visual inspection of cable route, cable location, dimension, accessories, cable terminations and cable joints.

6.2 Acceptance test

During Acceptance test, at least the following test and inspection item shall be performed.
Acceptance test item for power cable on-site inspection are as follows:

No.	Item	Contents
1	Visual Check	Cable Installation/Workmanship/ Installation Practice Compliance to Drawings
2	Power Cable Performance Test	insulation resistance test, Inductance Capacitance
3	As-built Drawings	Verification

Details of the test item, test procedure and criteria to judge test results shall be proposed by the Concessionaire subject to the approval of the Engineer.

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Section 09 Digital Transmission System

1. Digital transmission system

The field / roadside equipment deployed under the scope of this Contract shall be connected with the central equipment at the Traffic Management Centre and sub-centres and data and voice are exchanged between them. Digital transmission system is required to perform the service of data and voice communication. IP based digital transmission system over optical fibre cable shall be provided for this purpose.
The Concessionaire shall design, supply, install and test a digital transmission system that satisfies the needs of the component systems in terms of speed, bandwidth and reliability.

2. System configuration

Digital transmission system shall consist of local line transmission system and access line transmission system. The former connects between nodes established along the Highway/ Expressway and uses optical fibre cable while the latter connects roadside facility to the node using optical or metallic cable.
It is specifically noted that when the Highway / Expressway is extended, trunk line transmission system will be introduced for long distance data transmission between the Traffic Management Centre and the offices on the highway / expressway. Digital transmission equipment for trunk line transmission system will not be installed under this project. The local line transmission system to be provided shall be compatible with the standard digital transmission system commonly used in trunk line transmission. The optical fibre cable to be installed along the Project shall have minimum 48 cores to accommodate trunk line system.
All transmission cables shall be optical fibre cable having suitable number of cores except the metallic cable to be used to connect roadside emergency telephones to the nearest exchange or line concentrators.

3. System design

The Concessionaire shall undertake the detailed design of the digital transmission system. The design work shall include but not be limited to transmission protocol, network and transmission equipment, type and size of cable, cable splicing, conduit and cable installation work, manhole, hand-hole and pull box at bridge and earth sections.
Digital transmission system shall adopt IP. Suitable media and transmission protocol at Layers 1 and 2 shall be decided and type of digital station equipment shall be selected. In developing the design, various factors such as amount and type of data, transmission distance, quality of service (QoS), reliability, latency, and changeover time to backup route shall be considered. Type of optical fibre cable shall also be considered in the design. Packet based transmission system will be preferred than circuit-based transmission system such as Gigabit Ethernet.
Layer 3 switch will be used at each node to connect local network or device to the local line network. Layer 2 switch will also be used to connect devices to the local network.
In addition to the equipment listed above, the system requires fibre distribution frame and main distribution frame for cable termination, surge arrester or similar surge protection device to protect the equipment from the lightening, and accessories necessary for cable installation. The Concessionaire shall supply and install these devices and accessories.

4. Reliability

Digital transmission system shall have high reliability to ensure continuous operation of the system. Bit error rate for the end to end data communication must be 1 x 10-6 or better.

5. Capacity and quality of service

The digital transmission shall have a sufficient capacity in terms of speed and bandwidth to meet the demands to be decided, based on the estimated amount of data including digitized voice data at each facility such as Traffic Management Centre, Toll Plazas, sub-centres and service area/wayside amenities. Video signal from the TMCS camera shall be transmitted in H.264/H.265 format and the digital transmission system shall provide sufficient capacity for it. The Concessionaire shall estimate the type, amount and location of data transmission need and design the system, equipment and cables that satisfy the demand.
Quality of service (QoS) capability shall be provided to the digital transmission system to ensure smooth and uninterrupted delivery of data for voice and video image transmission required for VIDS, VSDS, and TMCS camera system.

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6. System supervision

The digital transmission system shall be equipped with a supervisory function which continuously monitors the system operation and issues an alarm in case malfunction is found. The supervisory shall have the following functions:

- Management of occurrence and recovery of malfunction
- Registration and modification of system configuration
- Registration and modification of network configuration
- Testing of equipment and circuit
- Logging of equipment operation and cable
- Changeover between primary and backup routes

7. Communication Cable

7.1 General

The type of cable for digital transmission system shall be as per the design and site requirement. The cable having suitable number of cores for optical cable and pairs for metallic cable shall be selected.
Two types of cable, optical fibre cable and metallic cable shall be used for digital transmission system along the Highway/ Expressway. In addition, power cable of suitable size shall be installed to provide power to the roadside equipment, as applicable.

7.2 Specification

Optical fibre cable (OFC) to be installed along the Highway/ expressway (main duct route) shall have a minimum of 24 cores. Branching of optical fibre cable shall be made in such a way that only the cores connected to the facility are taken into the facility and other cores will be bypassed. Splicing of optical fibre cable shall be made with the method that allows re-opening of splicing housing and change of connection. The connection of core shall be made with fusion splicing.
Other materials not specified in this Part shall be based on the Concessionaire's own technical specifications, subject to the approval of Independent Engineer. In this connection, Concessionaire shall submit, together with Technical Proposal, the technical specifications of main and other materials.

7.2.1 OFC Specification

The optical fibre cable to be supplied and installed under the Concessionaire shall be single-mode fibre optic cable having characteristics meet ITU-T G.652B, or equivalent and specification as below.

No.	Item	Specifications
1.	Cable type	OF-SM 24C OF-SM 8C
2.	Number of cores	OF-SM 24C: 24 cores OF-SM 8C: 8 cores
3.	Mode	Single mode
4.	Cladding diameter	125.0 µm ± 1.0
5.	Coated fibre diameter	245 µm ±10
6.	Core/cladding concentricity error	≤ 0.8µm
7.	Coating/cladding concentricity error	≤ 12µm
8.	Cladding non-circularity	≤ 1.0 %
9.	Mode Field Diameter	9.3µm ± 0.5 at 1310nm
10.	Attenuation (cable)	0.36dB/Km at 1310nm 0.25dB/Km at 1550nm,
11.	Zero-Dispersion Wavelength	1300 to 1322 nm
12.	Zero-Dispersion Slope	≤0.092 ps/Sq. Nm .km
13.	Cut-off Wavelength	≤1260 nm
14.	Polarization Mode Dispersion Coefficient	≤0.2 at 1310nm

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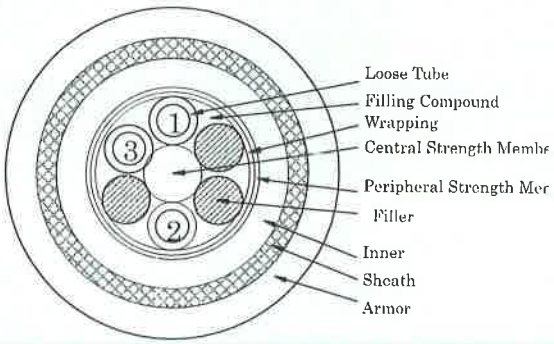
No.	Item	Specifications
15.	Fibre macro bend loss	≤0.05dB at 1550 nm with 75 mm dia, 100 turns
16.	Fibre macro bend loss	≤0.5dB at 1550 nm with 32 mm dia, 1 turn
17.	Coating Strip Force	$1.3 \leq F \leq 8.9$
18.	Minimum Proof Strength	0.70 (100kpsi) Gpa
19.	Strain	1 %



Specifications for Fiber Optic Armoured Cable

7.3 Packing and Delivery

a. Packing and delivery of fibre optic cables shall conform to the following:
b. Each length of cable shall be coiled on a substantial wooden or steel drum. Standard cable peace length shall be 1000 to 3000 meters.
c. After completion of the optical tests, both ends of the cable shall be sealed by a suitable method to prevent the entrance of moisture.
d. The starting end of the cable shall be secured on the inside of the drum flange.
e. Due care shall be taken during the transportation of the cable drum so as not to cause damage to the cable.

7.4 Metallic Cable

The size of CCP cable shall be 0.65 mm or larger. The number of pairs shall be decided taking the future demand after 10 year into consideration. Al least spare capacity of 100 % shall be reserved for future use. The minimum number of pairs shall be 50 pairs for the cable to be installed along the Highway/expressway and 10 pairs for the cable other than the above. In case of metallic cable, all pairs shall be connected to the MDF at each facility.

8. Conduit and Cable Work

8.1 General

a. Conduit work includes underground conduit, conduit attached to bridge and culvert, handhole, manhole, cable rack and associated accessories necessary for cable installation.
b. The Concessionaire shall undertake the detailed design of conduit and cable work including preparation of plain plan of conduit and cable route showing type and length of conduit, number of conduits, type and length of cable, and type of handhole, manhole. The detailed design shall be submitted to the Independent Engineer for his approval.
c. For the section where electromagnetic induction or electrostatic induction caused by high power transmission line is expected, countermeasures such as use of steel conduit or used of aluminium sheath shall be taken.

8.2 Conduit Works

Scope of work shall cover the following.

- Installation of conduit (HDPE PLB duct Φ40mm x 1),
- Excavation and back filling,
- Construction of cable trench,

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- Construction of manhole,
- Temporary reinstatement of road surface,
- Safety measures and warning signs during installation works,
- Power cable duct to be included (as required),
- Site clean-up and disposal of excess materials
- Compaction and backfill.

8.2.1 Installation of Cables

Scope of cable installation work shall cover the following.

- Installation of cable rack (vertical part of inside building) and ODF (Optical Distribution Frame).
- laying of cable into HDPE pipe,
- splicing of optical fibres and jointing of cables,
- splicing of metallic cables and jointing of cables,
- termination of optical fibre cable and metallic cable,
- testing of optical fibre cable and metallic cable,
- preparation of as-built documents,
- site clean-up and disposal of excess materials,
- safety precaution where necessary,
- preparation of as-built documents,
- Acceptance test.

8.3 Cable Works

Conduit works done under this Project shall have satisfied to conduit works acceptance tests before cable are pulling in, specially to cable test piece for conduit (ducts). Conduits shall be rodded by an acceptable method and cleaned before cables are pulled / blown in.

Duct assignment shall be always done carefully to avoid crossing of cables between the duct entrance and cable bearer, and blockage of future access to vacant duct. In general, placing shall start at the bottom row and handhole/ manhole wall side of the duct arrangement.

Splicing shall be carried out as soon as possible after placing of the cables.

The extension of fibre optic cable shall be carried out at a constant speed and suitable back tension shall be applied to the drum to prevent hunching.

While under tension, a minimum bend radius of 20 times the outside cable diameter shall be maintained through the use of pulleys and sheaves where required. After pulling, no bend may have a radius, at rest, of less than 10 times the outside cable diameter.

At the splicing point, slack of minimum 3 meter shall be kept on each side of splicing kit. The slack shall be neatly arranged and the requirement for the minimum radius shall be met.

8.3.1 Type and Size of Conduit

Main materials to be supplied by the Concessionaire for the implementation of the duct installation shall be in accordance with, or better in quality than, the specification stipulated hereinafter.

8.3.2 Application of Conduit

In general, HDPE (high density polyethylene) pipe having nominal inside diameter of 40mm shall be used. Galvanized steel pipe shall be used in the following cases and in accordance with Concessionaire's own specification subject to the approval of Independent Engineer.

Bridge Attachment, b) Culvert Crossing, c) Highway/Expressway road crossing and d) etc.

8.3.3 Warning Tape

"CAUTION: NHAI F.O CABLE BELLOW" caution marks in English and Hindi should be printed in every two meters of the yellow warning tape to be placed in the cable trench (100mm width and 0.15mm thickness).

Cable Tag

Cable tag (plastic plate) describing the name of the cable and the origin of cable (cable name, type of cable, interchange name & etc.) shall be attached to the cable

All other materials not specified in this ToR shall be in conformity with the Contractor's own technical specification, subject to the approval of the Independent Engineer.

8.3.4 Cable Tag

Cable tag (plastic plate) describing the name of the cable and the origin of cable (cable name, type of cable, interchange name & etc.) shall be attached to the cable
All other materials not specified in this Functional and Technical Specifications shall be in conformity with the Concessionaire's own technical specification, subject to the approval of the Independent Engineer.

8.3.5 Depth of Conduit

The covering depth from the top of HDPE pipes and GI pipes to the surface of ground shall be as follows:

Location	Depth
Side-shoulder	165cm
Carriageway	100cm or more
Highway road crossing, Main road crossing and Interchange area	120cm or more

However, in special case, the depth shall be determined in consultation with Independent Engineer, as per the site conditions and soil type.

8.4 Installation and Construction

Conduit installation works shall be performed in accordance with the specification stipulated hereinafter.
Other installation and/or construction works, the detail of which is not specified in this section, shall be based on the industry standard specification and/or the Concessionaire's own Technical Specifications, subject to the approval by Independent Engineer.
NHAI / Independent Engineer shall, at any time when deemed necessary during the construction period, carry out inspection and/or tests on the facility under construction and/or the portions of facilities completed by the Concessionaire.
Upon completion of conduit section, loose materials such as concrete, mud, dirt, sand, etc. shall be cleaned out from new ducts before testing. 6.0 m cable test piece may be used for main duct sections (cable test piece diameter 35mm) with sharp curve under the condition of the prior approval of the Independent Engineer.
The Concessionaire shall apply the Area Log Book in order to facilitate a full supervision on the construction work.

8.5 Handhole and Manhole

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

Type	Number of Ducts	Length (m)	Width (m)	Depth (m)	Cable Bracket
Handhole					
HH-1	1-8	1.20	0.60	0.85	One side
Manhole MH-1	1-9	1.80	1.00	1.50	One side

Handhole and Manhole shall be equipped with covers, duct plug, ladders, steps, cable bearers, cable brackets, name plates and pulling irons according to detailed drawings.

8.6 Excavation for Handhole, Manhole and/or Conduit

All excavation shall be done in a thorough and workmanlike manner in accordance with the detailed drawings and the Specifications.
The Concessionaire shall obtain all pertinent records from the Electric, Water Supply, and Sewage pipe and other organizations for underground utilities in order to proceed with his work and safeguard the other utilities. During the execution of the work, if existing underground facilities are damaged, or any part thereof is disturbed, the Concessionaire shall immediately notify of the facts to NHAI and owner of the utility and shall be responsible for the rectification of the damaged utility at its own cost. The Concessionaire shall indemnify the NHAI and its representatives from any loss or damaged caused by the Concessionaire during execution of the works. The Concessionaire shall cart away all excavated materials except that to be used for backfilling.

9. Inspection and Acceptance test

Site inspection specified herein shall be performed throughout installations and constructions of the various type of conduit facilities.

Should any errors in construction, faulty materials or other evidence of unsatisfactory construction and installation are found in the course of test, the Concessionaire shall immediately repair, replace and/or remedy such unsatisfactory items.

The Concessionaire shall perform the conduit facility inspection by himself every time to see if the work meets the requirement before the Acceptance test.

Acceptance test specified shall be performed by the Concessionaire under the supervision of the Independent Engineer. Necessary equipment and materials for the site inspection and the Acceptance tests shall be provided by the Concessionaire at his own expense. Written report including the test results shall be prepared by the Concessionaire and verified by the Independent Engineer.

During interim inspection, at least the following test and inspection items shall be performed:

Visual inspection of location, dimension, accessories and workmanship of handhole/manhole, Number and type of conduit, Cable test piece passage test, Check of new conduit, Backfilling and temporary reinstatement Acceptance test.

During Acceptance test, at least the following test and inspection item shall be performed:

Acceptance test item for handhole, manhole, conduit and optical fibre cable on-site inspection are as follows:

No.	Item	Contents
1	Visual Check	Handhole, Manhole & Conduit Construction/Cable Installation Workmanship/ Installation Practice Compliance to Drawings
2	Optical Line Performance Test	Optical Fibre Attenuation Test (Transmission Loss Measurement by Laser Source & Power meter)/ OTDR (Optical Time Domain Reflectometer) Test (OTDR Measurement both direction and Splice Loss)
3.	As-built Drawings	Verification

Section 10 Facility Monitoring System

1. Function

Facility monitoring system shall be provided to monitor the operation of facilities on the Highway/ Expressway. The system shall monitor the operation of the following component systems:

1) Traffic Monitor Camera System (TMCS)
2) Video Incident Detection System (VIDS)
3) Automatic Traffic Counter and Classifier (ATCC) module
4) Travel Time Measurement System (TTMS) module
5) Probe Data System
6) Central processing System
7) Vehicle Speed Detection System (VSDS)
8) Adaptive Traffic Signal Control System (ATSC)
9) ADAS
10) Incident Monitoring System (IMS)
11) Digital Transmission System
12) Power supply system (at building and field)

The functions of facility monitoring system may not be integrated in a single system. They may be achieved by the operation monitoring function of the component systems. The role of the facility monitoring system is to consolidate the monitoring function undertaken by component system, present the system status in a concise manner to the operator and keep the record of system operation. In case any abnormality or malfunction is detected, the system shall issue an alarm together with the information regarding type and location of the trouble so that remedial action can be taken swiftly.

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The Concessionaire shall design, procure, manufacture, install, test and commission the facility monitoring system that meets the concept and functions stated herein.

2. Operating Status

a. Items to be monitored and its content differ from one system to another system to be monitored. In general, the condition of the system and device such as 'Normal', 'Error' and 'No Reply' shall be classified in detail.
b. The system shall have a function to test itself without affecting normal operation of the system being monitored by the system.
c. Each error or malfunctioned status shall be assigned with severity level for each system. Depending on the severity level, different action shall be taken by the system. For minor errors such as abnormal data from vehicle detector for one interval, error is recorded in the log and no alarm will be issued. For severe errors such as interruption of communication circuit, alarm signal shall be automatically displayed on the system supervisory server overwriting the display being shown.

3. Monitoring

The manner of monitoring shall differ depending on the system and device to be monitored. In general, normal operation shall be confirmed periodically by the monitoring system by sending inquiry command. The time interval of inquiry shall be adjustable for each component system and its devices. But alarm signal shall be issued immediately by the component system and their devices comprising it to minimize delay.

4. Recording and logging

The facility monitoring system shall keep record of its operation and status of the various systems and devices in a unified manner in the database. All incident and events shall be recorded. Data retrieval software shall be provided to retrieve and display the operating history of the specified systems and devices. The database thus stored will be used to calculate the reliability indicators of the system and device including MTBF (mean time between failures) and MTTR (mean time to repair).

Availability calculation shall be reported in a quarter.
The Formula of calculation of availability is shown as follows.
Availability={1-{[(A)/(B-C)] *100}}
Where
A= Time for which system is down
B = Total Time
C= Scheduled downtime

5. Monitoring signal interface

a. The Concessionaire shall provide necessary number of monitoring signal interface units to receive operating condition and alarm signal from the system or device to be monitored. The interface shall be provided with sufficient number of analog, digital and pulse interfaces. It shall be capable of receiving operating condition signals through interface and sending them to the Traffic Management Centre using FTP, SNMP or DATEX-ASN protocol.
b. The interface shall be provided with an optical hub or switcher and can be connected to optical fibre cable directly.
c. The interface shall be equipped with a clock and the clock shall be adjusted using network time protocol (NTP) or simple network time protocol (SNTP).
d. Some of the monitoring signal interface shall be installed outdoor. The device to be used outdoor shall be capable of withstanding the environmental conditions for outdoor equipment.

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Annexure-I Indicative list of key Components

(Rough Estimation for 6-lane highway section of 100 kms considering 10 flyovers/Interchange)

The Concessionaire shall conduct the site survey in consultation with the Independent Engineer and shall propose the equipment location during the design phase of the Contract.

I. TMCS shall be provided at approx. every 1 Km in the median and 1 additional for each flyover / interchange.
II. VIDS shall be installed at each junction point of the ramps at each interchange such that one camera of the VIDS monitors the ramp and other two cameras monitor the main carriageway.
III. VSDS shall be installed at a suitable location on MCW between two interchanges or after every 10 kms, which every is lesser.

Note: This is Indicative list of key components. The Concessionaire shall provide item-wise rates and quantity for each component proposed as well as any additional item deemed necessary by the him to ensure completeness and compliance with the Scope of work. The Concessionaire shall also provide comprehensive list with unit price of proposed spares for each section as a separate enclosure. All values must be verified before submission, in case of any errors/ incompleteness, Concessionaire shall be responsible, and no additional items/ claims for the payments shall be entertained.
Only one make / model for each component along with Country of Origin, delivery lead time, etc. shall be specified in the BOQ submitted by the Concessionaire for the Approval of the Authority / Independent Engineer.

ATMS - Indicative list of key Components				
	Total Length (KM)	100	**Junction**	0
	Lanes	6	**Interchange / Flyover**	10
	Traffic Management Centre (TMC)	1	**Sub-Centre**	0
	Project vehciles (patrol, ambulance, crane, maintenance vehicle etc.)	20	**PIU**	1
Sr. No.	**ATMS Component**	**Unit**	**Qty**	**Remarks**
1	**Traffic Management Centre (TMC) (TMC 1 no. per project & Sub-Centre 1 no. per additional 80 kms)**			
1.1	Central Processing Server in hot standby configuration (Primary + Secondary) at TMC and 1 nos. at each sub-centre	Nos.	2	
1.2	Video Recording Server with storage (minimum 360 TB) 2 nos. at TMC and 1 nos. at each sub-centre	Nos.	2	
1.3	Backup Video Recording (Only Incidents) Server with 240 TB storage 1 nos. at TMC and 1 nos. at each sub-centre	Nos.	1	
1.4	Facility Monitoring System Controller (1 nos. at TMC and 1 nos. at each sub-centre)	Nos.	1	
1.5	Graphic Display 2x6 (FHD Laser DLP/ 0.9mm Pixel LED) for TMC incl. Controller, Software, Video Switches	Set	1	
1.6	Graphic Display 2x3 (FHD Laser DLP/ 0.9mm Pixel LED) for TMC incl. Controller, Software, Video Switches	Set	0	
1.7	Internet & SMS Server	Nos.	1	
1.8	Command Centre Operator Console with 4 nos. 21 inch touchscreen monitors	Nos.	4	
1.9	USB joystick to control PTZ cameras	Nos.	5	
1.10	Emergency Telephone (1033) console with 2 nos. 21 inch touchscreen monitors	Nos.	2	

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ATMS - Indicative list of key Components				
1.11	Facility Monitoring System Console with 2 nos. 21 inch touchscreen monitors	Nos.	1	
1.12	Operations Laser Printer (Colour)	Nos.	1	
1.13	Operations Laser Printer (Black)	Nos.	1	
1.14	Firewall, IDS, IPS, Core Switch, and Network Equipment (Bidder shall attach the breakup of Network equipment with unit price of each item)	LS	1	
1.15	Aadhar enabled Biometric Fingerprint machine	Nos.	2	
1.16	Power Distribution Board (PDB)	LS	1	
1.17	Server Rack	Nos.	2	
1.18	Maintenance Equipment as per ToR and site requirement	LS	1	
1.19	Surge Protection Device (SPD)	LS	5	
1.20	Lighting protection	LS	5	
1.21	Advance Driver Advisory System (ADAS), GPS tracker, industrial grade rugged (Waterproof) dashboard mounted 10" Tablet, Dashcam with video calling feature, body cam, rear & front view varifocal cameras with vandalproof housing (mounted on vehicle), LPU, storage, UPS, live monitoring provision of cameras from TMC & sub-centres, etc. for patrol, ambulance, and maintenance vehicles. (Note: Quantity shall be as per the project requirement)	Set	20	
1.22	**Incident Monitoring System (IMS) for PIU office:** Workstation (1 nos. at each location), All-in-one color A4 printer, 100"(±2%) 4K UHD LED display (commercial grade), UPS as per site requirement, Networking devices, switches, CCTV camera, DG of suitable ratting as per site requirement, Connectivity with TMC & Sub-centres, etc.	Set	1	
1.23	**ATMS Software package at TMC for entire expressway stretch**	LS	1	
1.24	Uninterruptible Power Supply (UPS) For Server Rack (10KVA Online Double Conversion UPS -IGBT based -Warranty 5 years) (1 at TMC and 1 at each Sub-centre)	Set	1	
	Battery backup -24000 VAH for Each UPS -Warranty 5 years-100AH X 20nos.	Nos.	25	
	Racks Links DC cable	Nos.	1	
1.25	Uninterruptible Power Supply (UPS) For TMC & Sub centre operator consoles (20KVA Online Double Conversion UPS - IGBT based arranged in parallel configuration -Warranty 5 years)	Set	2	
	Battery backup -34560 VAH for Each UPS -Warranty 5 years-100AH X 20nos.	Nos.	40	
	Racks Links DC cable	Nos.	2	
1.26	Power Distribution Board (Essential & Critical Supply)	Set	3	
1.27	Civil construction of TMC including Operation room, Server Room, UPS room, Incharge cabin, NHAI cabin, Independent Engineer cabin, pantry, toilet, etc. with interior works, complete technical furniture, raised floor, false celling, indoor and outdoor lighting, Audio/Mic system, Public Announcement / addressing system, CCTV system including PTZ cameras outside the buildings, Access Control system with smart card and biometrics, MEP works, HVAC system, power backup system including sufficient DG, Firefighting, alarm, extinguishers, etc.	LS	1	

ATMS - Indicative list of key Components				
1.28	Any other item(s) considered necessary to comply with the Scope of Works			
2	**Traffic Monitoring Camera System Equipment (TMCS) (1 no. at every 1km)**			
2.1	PTZ Camera 36x with 500m IR	Nos.	100	
2.2	Cabinet & 12m Pole with 1m arm at 8m	Nos.	100	
2.3	Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar street light	Nos.	100	
2.4	Chamber / Manhole and Pole Foundation, PCC, backfilling with sand	Nos.	100	
2.5	Solar System with UPS, Li-on battery & Pole with SPD, and lighting protection	Nos	100	
2.6	Industrial 5-port managed Gigabit Ethernet switch with 3x10/100/1000Base-T(X) and 2xGigabit combo ports, SFP socket	Nos.	100	
2.7	Any other item(s) considered necessary to comply with the Scope of Works			
3	**Video Incident Detection System Equipment (VIDS) (at every junction, merging / demerging / accident prone area / black spot)**		40	
3.1	VIDS Camera (4 nos. at each Junction + 3 nos. at each interchange/flyover ramp)	Set	120	
3.2	Warning amber lights with hooters and solar with at least 96 hours backup, pole and foundation (10 nos. at each junction/ location/interchange)	Set	40	
3.3	Local Processing unit (LPU)	Nos.	40	
3.4	Cabinet & 12m Pole with 1m arm at 8m	Nos.	40	
3.5	Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar street light	Set	40	
3.6	Chamber / Manhole and Pole Foundation, PCC, backfilling with sand	Set	40	
3.7	Solar System with UPS, Li-on battery & Pole with SPD, and lighting protection	Nos.	40	
3.8	Standalone Solar powered Amber Flasher Light of 500 mm Dia with at least 96 hours backup, Pole & Foundation (2 at each median opening)	Set	0	
3.9	Industrial 8-port managed Gigabit Ethernet switch with 3x10/100/1000Base-T(X) and 2xGigabit combo ports, SFP socket	Nos.	40	
3.10	Any other item(s) considered necessary to comply with the Scope of Works			
4	**Vehicle Speed Detection System Equipment (VSDS) (1 nos. each at LHS & RHS at every 10kms / between 2 interchanges)**		10	
4.1	ANPR camera with IR flasher for 6 lanes (8 Cameras - one each for all lanes in each direction + shoulder)	Nos.	80	
4.2	Local Processing Unit (LPU)	Nos.	10	
4.3	Speed Detection Radar (upto 90m range) for 4 lanes (one in each direction for all lanes + shoulder)	Nos.	20	
4.4	Vehicle Actuated Speed Display (VASD) System (one each for all lanes in each direction + shoulder)	Nos.	80	
4.5	Motion Detection surveillance camera, hooter alarm with beacon, and all-in-one solar street light	Set	10	
4.6	Gantry (including manufacturing, galvanizing, pile foundation) (1 no. for LHS and 1 No. for RHS at each location)	Nos.	20	

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ATMS - Indicative list of key Components				
4.7	Cabinet	Nos.	10	
4.8	Industrial 12-port managed Gigabit Ethernet switch with 3x10/100/1000Base-T(X) and 2xGigabit combo ports, SFP socket	Nos.	10	
4.9	Solar System with UPS, Li-on battery, Pole, cabinet for VSDS, with SPD, and lighting protection	Set	10	
4.10	Any other item(s) considered necessary to comply with the Scope of Works			
5	**Digital Transmission System**			
5.1	Supply of 24 core single mode armoured OFC Multitube (TEC G-652) (Loop 10-15m every MH/HH) + all accessories	Mtr	105000	
5.2	40 mm PLB HDPE duct as per latest TSEC specifications + all accessories	Mtr	105000	
5.3	Trenching of 1.5 meters, Laying & Backfilling for PLB HDPE duct, cable pulling, chambers lowering, etc.	Mtr	105000	
5.4	1m x 1m x 1.8m (depth) chambers (with concrete cover) with proper reinforcement and minimum M25 grade at every 500m	Nos.	200	
5.5	24 core OFC LIU - Bamboo Type	Nos	200	
5.6	Fiber Patch Cord Single Mode – 2m Length LC to LC	Nos	152	
5.7	SFP - 20 km Transmission range	Nos	5	
5.8	Any other item(s) considered necessary to comply with the Scope of Works			
6	**Adaptive Traffic Signal Control System (ATSC)**			
6.1	Traffic Signalling System (Discrete LED aspect) for entire junction / interchange	Set	10	
6.2	Vehicle Detector (Non-intrusive)	Set	10	
6.3	Red light violation detection system (RLVD) for entire junction / interchange	Set	10	
6.4	Automatic Pedestrian Detection system (APDS) for entire junction / interchange	Set	10	
6.5	ATSC Controller with cabinet	Set	10	
6.6	Pedestrian signal system (Discrete LED aspect, pole, etc.) for entire junction / interchange	Set	10	
6.7	Traffic Signal Poles – high poles, cantilever poles (mast arms) and gantries with civil works - foundations, manholes, etc.	Set	10	
6.8	Solar System with UPS, Li-on battery, Pole, cabinet, SPD, and lighting protection	Set	10	
6.9	Cabling, installation, trenching, IIDD, ducting, chamber, etc.	LS	10	
6.10	Any other item(s) considered necessary to comply with the Scope of Works			
7	**Services**			
7.1	Installation, testing & Commissioning	LS	1	
7.2	ATMS System Technical support staff (5 years)	Years	5	
7.3	ATMS Control Room Operations staff (5 years)	Years	5	
7.4	Spares for 5 years	Years	5	

ATMS O&M Staff			
S.No.	**Description**	**Nos.**	**Remarks**
A	**Technical Staff**		

1	System Maintenance Engineer/ Manager	1	I at TMC & 1 at each sub-centre
2	System IT Engineer	1	I at TMC & 1 at each sub-centre
3	System Maintenance Technicians	4	1 for each at TMC & sub-centre in each shift + Relievers
4	Maintenance Vehicle with Driver and helper	1	I at TMC & 1 at each sub-centre
5	Manhoist vehicle with Driver and helper	1	I at TMC / Sub-centre
6	Overhead Cost		Including tools
B. Control Room Operations Staff			
1	Traffic Management Manager	1	1 at TMC
2	Traffic Management Engineer	0	1 at each sub-centre
3	Asst Manager - Operations	4	1 for each at TMC & sub-centre in each shift + Relievers
4	Control Room operators	13	3 at TMC & 3 at each sub-centre in each shift + Relievers
5	Support Staff	1	In General Shift at TMC and Sub-centres
6	Office Assistant	4	1 at TMC & 1 at each sub-centre in each shift + relievers
7	Security Guard	4	1 at TMC & 1 at each sub-centre in each shift + relievers
8	Overhead Cost		Incl. office maintenance, recurring charges, DG and electricity bill

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PART-II Forms to be submitted by Concessionaire

Form TECH: Format for Submission of Detailed methodology and technical work plan supported with broad system architecture and design in Technical Proposal.

Sub.: Advance Traffic Management System (ATMS) for *(Project Name)* section of National Highway

Ref: Functional and Technical Specifications of above subject.

NOTE:
i. The Concessionaire shall submit elaborately the following items with Technical proposal and Detail Design for evaluation of the Independent Engineer, while giving information, the Concessionaires are advised to strictly focus and address the topic/sub-topic as asked for, in a structured manner. Any superfluous submission shall be at Concessionaires' risk
ii. Concessionaire shall provide comprehensive list of proposed spares for each section.

Dated: ..... /...../2021

(i) Detailed Methodology:

.....
.....

(ii) Technical Work Plan:

.....
.....

(iii) Broad system architecture and design proposed:

.....
.....

(iv) Equipment Delivery Schedule and Time schedule to complete the entire work under Functional and Technical Specifications, supported with Bar Chart, including the interior and allied works for TMC:

.....
.....

(v) Limitations on part of Concessionaire to address requirements under Functional and Technical Specifications, and SLA:

.....
.....

(vi) Design Concept of Central Processing System

(Design Concept including approach of concept and methodology for Central Processing System.)

.....
.....

Event Generation Method and Event List

(The Event Generation Method and Event list for design of Central Processing System.)

.....
.....

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.)

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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.)

.....

.....

Layout of Operation Room in Traffic Management Centre and sub-centres
(Layout of Operation room in effective technology and suitable for operation.)

.....

.....

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

.....

.....

GIS Map layout, process, and features
(Showing GIS Map Image of important items meeting Functional and Technical Specification features with feasible technology for effective operation.)

.....

.....

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

.....

.....

On-line Access during the Operations & Maintenance phase

.....

.....

(vii) Mobilization Schedule

.....

.....

(viii) Safety Plan

.....

.....

(ix) Schedule of Guarantee

.....

.....

(x) Concessionaire's Equipment

.....

.....

(xi) Spare Parts

.....

.....

(xii) Proposed Sub Contractors for Major Items of Plant Design, Supply and Installation Services

The Details of proposed Manpower for implementation and O&M phase shall be submitted in the format provided below (Form SUB and Form MAN)

.....

.....

(xiii) Arrangements by Concessionaire to address O&M Requirements, including complete manpower details proposed during implementation and O&M period.

NOTE: 1) The Manpower proposed here shall be dedicated for this project and shall not be proposed for any other project or assigned any other similar project of NHAI. The resource cannot be change for at least two years. In case of any variation or change in the manpower / person proposed in the Technical Proposal and manpower / person deployed upon successful award of the works, minimum 20% remuneration of the proposed role for the total contract period shall be deducted.

2) The Details of proposed Manpower for implementation and O&M phase shall be submitted in the format provided below (Form PER-1 and Form PER-2)

3) The substitute proposed by the Concessionaire 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.):

.....

.....

(xiv) Comments on Accuracy of information/data expected in RFP with justification:

.....

.....

(xv) Any other aspects the Concessionaire may wish to add:

.....

.....

(xvi) Catalogue, brochure, or other supporting document

(Catalogue, brochure, or other supporting document for each equipment proposing for this project.)

.....

.....

(xvii) Applied standards

(Applied standards for each works and equipment s are clearly identified and those satisfy India standards or international defect standards)

.....

.....

Note: Following documents shall be enclosed along with this form

(a) In case of any Non-Compliance in the Functional and Technical Specifications, Matrix thereof shall be submitted in the following format:

S. No.	RFP Clause & Page no.	RFP Provision	Non-compliance (details)	Remarks with alternate solution details

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(b) Technical details of each component, clearly mentioning the make, model, country of origin, and end of life of each component/ equipment as per the format given below, brief technical datasheet shall also be enclosed along with the material approval certificate*.
(c) Please include all items mentioned under the indicative list of key components.

(d) Quality Certificate and Undertaking for Country of Origin: The Concessionaire shall submit Quality Certificate from each OEM confirming that everything to be supplied by the OEM 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. The Concessionaire shall ensure that none of the key component or its sub-component such as PTZ / TMCS Cameras, VIDS system, Vehicle Speed Detection System, Control Centre / Command Centre / TMC equipment including servers, storage, network devices, security devices are procured / sourced from any of the region and / or company barred / banned / blacklisted / restricted by any of the Government Department / Authority / PSU / Ministries / Defense etc. in India. The proposal may be considered as non-compliance / non-responsive in case this requirement is not fully met by the Concessionaire. The Concessionaire shall submit the certificate from each OEM in the format given below, fully complying to this requirement.

***Material Approval Certificate (MAC) –** *To be filled for every key component and all its sub-component proposed. The technical datasheet of the OEM relevant and specific to the proposed make & model must only be enclosed along with the MAC.*

Signature of Authorized Signatory of Concessionaire
Name
Seal
Date

Project:	Service Provider:	Client:
		National Highways Authority of India
Location:		

Material Approval Certificate

Discipline	
Date	

Document No.

Service Provider	Contract No.
	Date

We request the approval to the following for use on the above contract

Document Title	
Works / Building	
Sub-Location	
Contractor / Sub-Contractor / OEM	
Contract Specifications Clause	
Technical Details Make, model, country of origin, MTBF, MTBF, OEM warranty and life and other such details as applicable for each	
Construction Drawing No. / Reference	
Estimated Date Required On Site	
Enclosures (samples, data, data sheets, test results, technical documentation, etc.)	
Meets / Doesn't Meets Requirement	☐ Yes ☐ No — In case of non-compliance please submit comparison statement

We certify that the above submitted item has been reviewed in detail and is correct and in strict conformance with the contract, drawings and specifications except as otherwise stated above.

Date		
Name		Authorized Representative of Service Provider

Client

Date received

Name	Post Number	Acronym	1st	2nd	Signature	Signature	MIP	Contract Signing Date

☐ Approved ☐ Approved with comments ☐ Rejected

Comments:

Date Approved/Rejected		Date Authorized	
Name		Name	

Authorized Representative of NHAI

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Form PER - 1: Proposed Personnel

Sub.: Advance Traffic Management System (ATMS) for (*Project Name)* section of National Highway

Ref: Functional and Technical Specification of above subject.

Dated: ….. /…../2020

[*The Concessionaire shall provide the names of suitably qualified personnel to meet the specified requirements stated in Functional and Technical Specifications.*]

1.	Title of position*
	Name
2.	Title of position*
	Name
3.	Title of position*
	Name
4.	Title of position*
	Name

*As listed in Functional and Technical Specifications.

Signature of Authorized Signatory of Concessionaire
Name
Seal
Date

Form PER - 2: Resume of Proposed Personnel

Sub.: Advance Traffic Management System (ATMS) for (*Project Name)* section of National Highway

Ref: Functional and Technical Specification of above subject.

Dated: ..... /...../2020

[*The Concessionaire shall provide the data on the experience of the personnel indicated in Form PER-1, in the form below.*]

Name of Concessionaire	Passport size recent color photograph of the candidate

1. Proposed Position : .....

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

3. Father's/Husband's Name : .....

4. **(a) Date of Birth** in Christian era (in dd/mm/yyyy format) (Please furnish proof of age) : .....

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

5. Permanent Address : .....
.....
.....

6. Address for Correspondence : .....
.....
.....

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

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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 DD/MM/YYYY	To DD/MM/YYYY	1 2 3 4
	Technical details of project experience				

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

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

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

Note - In case of more than 4 employments, the relevant details in prescribed format be added.

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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 NHAI discovers anything contrary to above, NHAI would be at liberty to remove the personnel from the present assignment and debar him for an appropriate period to be decided by NHAI.

iii) I have not left any assignment with the consultants/ agencies/ Concessionaires engaged by NHAI/ contracting firm for any continuing works of NHAI 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 NHAI. I have also no objection if my services are extended by NHAI for this work in future.

Signature of the Candidate
Place:
Date:

Undertaking from Concessionaire

The undersigned on behalf of ..... (name of Concessionaire) 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 NHAI / contracting firm for the ongoing projects and he is currently not engaged with any other firm engaged by NHAI / contracting firm for the ongoing projects. We understand that if the information about leaving the past assignment with MORT&H/NHAI without completing his assignment is known to NHAI, NHAI would be at liberty to remove the personnel from the present assignment and debar him for an appropriate period to be decided by NHAI.

Signature of Authorized Signatory of Concessionaire
Name
Seal
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 SUB: Proposed Sub-Contractors for Major Items of Equipment and Installation Services

Sub.: Advance Traffic Management System (ATMS) for (*Project Name*) section of National Highway

Ref: Functional and Technical Specification of above subject.

Dated: ..... /...../2020

A list of major items of ATMS is provided below.

The following Sub-Contractors and/or manufacturers are proposed for carrying out the item of the facilities indicated. Concessionaires shall propose only one sub-Contractor and / or manufacturer for each item.

Major Items of Equipment and Installation Services	Proposed Sub Contractors/Manufacturers	Nationality	Reference Project*

*Attach proof of relevant experience of minimum two projects.

Signature of Authorized Signatory of Concessionaire
Name
Seal
Date

Form MAN: Manufacturer's Authorization

(to be printed on the Letter head of the Manufacturer)

[*The Concessionaire 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.*]

Sub.: Advance Traffic Management System (ATMS) for (*Project Name*) section of National Highway

Ref: Functional and Technical Specification of above subject.

To:

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*] 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 the on-site warranty and training support stated above shall be extended to the Authority directly or its representative or any other Contractor appointed by the Authority, upon the request from the Authority.

Name: [*insert complete name Authorised Signatory*]

In the capacity of [*insert legal capacity of Authorised Signatory*]

Signature: [*Authorised Signatory*]

Duly authorized to sign the document for and on behalf of: [*insert complete name of Manufacturer*]

Dated on _____ day of _____, 2020 [*insert date of signing*]

Quality Certificate from OEM
(To be enclosed with MAC of each Component / Sub-Component)

Sub.: Advance Traffic Management System (ATMS) for *(Project Name)* section of National Highway

Ref: Functional and Technical Specification of above subject.

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
Name
Seal
Date

Signature of Witness
Name
Seal
Date

Signature of Authorized Signatory of Concessionaire
Name
Seal
Date

SCHEDULE - E

(See Clause 4.1.3)

APPLICABLE PERMITS

1 Applicable Permits

1.1 The Concessionaire shall obtain, as required under Applicable Laws, the following Applicable Permits on or before the Appointed Date.

Part-I

(a) Permission of the State Government for extraction of boulders from quarries for and in respect of at least 20% (twenty per cent) of the total length of the Project; and

Part-II

(a) Permission of Village Panchayat and the Pollution Control Board for installation of crushers;

(b) License for use of explosives;

(c) Permission of the State Government for drawing water from river/reservoir; and

(d) Any other permits or clearances required under Applicable Laws.

1.2 Unless otherwise specified in this Agreement, Applicable Permits, as required, relating to environmental protection and conservation shall have been procured by the Authority as a Condition Precedent.

SCHEDULE - F
(See Clause 9.1)
PERFORMANCE SECURITY/ ADDITIONAL PERFORMANCE SECURITY

The Chairman,
National Highways Authority of India
New Delhi

WHEREAS:

(A) **M/s Ambala Kala Ama Highway Private Limited** (the "**Concessionaire**") and the Chairman, National Highways Authority of India (the "**Authority**") have entered into a Concession Agreement dated ..... (the "**Agreement**") whereby the Authority has agreed to the Concessionaire undertaking 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) on design, build, operate and transfer ("**DBOT Annuity or Hybrid Annuity**") basis, subject to and in accordance with the provisions of the Agreement.

(B) The Agreement requires the Concessionaire to furnish a Performance Security to the Authority in a sum of Rs. ***** cr. (Rupees ***** crore) (the "**Guarantee Amount**") as security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period (as defined in the Agreement).

(C) We, ... through our Branch at ..... (the "**Bank**") have agreed to furnish this Bank Guarantee by way of Performance Security.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Concessionaire's obligations during the Construction Period, under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Concessionaire, such sum or sums upto an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an Officer not below the rank of General Manager in the National Highways Authority of India, that the Concessionaire has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Concessionaire is in default in due and faithful performance of its obligations during the Construction Period under the Agreement and its decision that the Concessionaire is in default shall be final, and binding on the Bank, notwithstanding any differences between the Authority and the Concessionaire, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Concessionaire for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Concessionaire and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Concessionaire before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfilment and/ or performance of all or any of the obligations of the Concessionaire contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Concessionaire, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Concessionaire or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfilment, compliance and/or performance of all or any of the obligations of the Concessionaire under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force until the earlier of the 1st (first) anniversary of the Appointed Date or compliance of the conditions specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee, no later than 6 (six) months from the date of expiry of this Guarantee, all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Performance Security shall cease to be in force and effect when the Concessionaire shall have expended on Project construction an aggregate sum not less than 30% (thirty per cent) of the Bid Project cost which is deemed to be Rs.*** cr. (Rupees ***** crore) for the purposes of this Guarantee, and provided the Concessionaire is not in breach of this Agreement. Upon request made by the Concessionaire for release of the Performance Security alongwith the particulars required hereunder, duly certified by a statutory auditor of the Concessionaire, the Authority shall release the Performance Security forthwith.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

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

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for a period of one year and six months or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operatable at our _____branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension/ renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

13. The guarantor/ bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of NHAI which are as follows:

S. No.	Particulars	Details
1.	Name of Beneficiary	National Highway Authority of India
2.	Name of Bank	Canara Bank
3.	Account No.	8598201005819
4.	IFSC Code	CNRB0008598

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of

the BANK by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the Head Office of the Bank as well as of issuing Branch should be mentioned on the covering letter of issuing Branch.

Enclosure-1

Annexure 1 of Schedule F
(See Clause 23.8)
Format for Guarantee for Mobilization Advance

The Chairman,
National Highways Authority of India
New Delhi

WHEREAS:

(A) **M/s Ambala Kala Ama Highway Private Limited (the "Concessionaire")** and the Chairman, National Highways Authority of India **(the "Authority")** have entered into a Concession Agreement dated …….. **(the "Agreement")** whereby the Authority has agreed to the Concessionaire undertaking 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) on design, build, operate and transfer **("DBOT Annuity or Hybrid Annuity")** basis, subject to and in accordance with the provisions of the Agreement.

(B) In accordance with Clause 23.8 of the Agreement, the Authority shall make to the Concessionaire an interest bearing (@average of one year MCLR of top 5 Scheduled Commercial Banks[8] plus 1.25%, compounded annually) advance payment (herein after called "Mobilization Advance") not exceeding 10% (ten per cent) of the Bid Project Cost; and that the Mobilization Advance shall be made in [one/two][9] installment(s) subject to the concessionaire furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such installment to remain effective till the complete and full payment of the installment of the Mobilization Advance as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second}[10] installment of the Mobilization Advance is Rs.--------- Cr. (Rupees------ Crore) and the amount of this Guarantee is Rs. ---- Cr. (Rupees---- crore) (the "Guarantee Amount")[11].

(C) We, ……..through our branch at …… (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "Guarantee") for the Guarantee Amount.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid installment of Mobilization Advance under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon

[8] The Authority shall declare the list of top 5 Scheduled Commercial Banks on 1st September every calendar year based on the balance sheet size as declared in their annual reports. The 1 year MCLR of top 5 Scheduled Commercial Banks shall be taken at the start of every quarter.
[9] Please strike out whichever is not applicable as per Clause 23.8 of the Agreement.
[10] Please delete in case of mobilization advance is to be made in one/single installment.
[11] The Guarantee amount should be equivalent to 110% of the value of the applicable installment.

its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Concessionaire, such sum or sums upto an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an Officer not below the rank of General Manager in the National Highways Authority of India, that the Concessionaire has committed default in the due and faithful performance of all or any of its obligations for the repayment of the installment of the Mobilization Advance under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Concessionaire is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Concessionaire is in default shall be final, and binding on the Bank, notwithstanding any differences between the Authority and the Concessionaire, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Concessionaire for any reason whatsoever.

3. The Bank further also agrees that the Authority at its option shall be entitled to in enforce this Guarantee against the Bank as principal debtor, in the first instance without proceeding against the Concessionaire and notwithstanding any security or other guarantee that the Authority may have in relation to the Concessionaire's liability.

4. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Concessionaire and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

5. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Concessionaire before presenting to the Bank its demand under this Guarantee.

6. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Mobilization Advance or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Concessionaire, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Concessionaire or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

7. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Mobilization Advance.

8. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force

for the period specified in paragraph 9 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

9. The Guarantee shall cease to be in force and effect on _____[12] unless a demand or claim under this Guarantee is made in writing on or before the aforesaid date, the Bank shall be discharged from its liabilities hereunder.

10. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

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

12. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 9 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

13. This guarantee shall 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. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of NHAI, the details of which are as follows:

S. No.	Particulars	Details
1.	Name of Beneficiary	National Highways Authority of India
2.	Name of Bank	Canara Bank
3.	Account No.	8598201005819
4.	IFSC Code	CNRB0008598

Signed and sealed this ..... day of ....., 20..... at .....

SIGNED, SEALED AND DELIVERED

[12] Initially the validity shall be 60 days after the expected date for **tenth** payment milestone mentioned in clause 23.4 of the Agreement. If the Concessionaire submits the Guarantee which has validity period which is less than that specified herein, then the Concessionaire shall also provide an undertaking to the Authority which states that the Concessionaire shall get the validity of the Guarantee extended so that the Guarantee is valid in accordance with the footnote.

For and on behalf of

the BANK by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(iii) The address, telephone number and other details of the Head Office of the Bank as well as of issuing Branch should be mentioned on the covering letter of issuing Branch.

SCHEDULE - G

(See Clause 12.1)

PROJECT COMPLETION SCHEDULE

1 Project Completion Schedule

During Construction Period, the Concessionaire shall comply with the requirements set forth in this Schedule-G for each of the Project Milestones and the Scheduled Completion Date (the "Project Completion Schedule"). Within 15 (fifteen) days of the date of each Project Milestone, the Concessionaire shall notify the Authority of such compliance along with necessary particulars thereof.

2 Project Milestone-I

2.1 Project Milestone-I shall occur on the date falling on the 180th (one hundred and eightieth) day from the Appointed Date (the "Project Milestone-I").

2.2 Prior to the occurrence of Project Milestone-I, the Concessionaire shall have expended not less than 20% (twenty per cent) of the total capital cost set forth in the Financial Package.

2.3 Prior to the occurrence of Project Milestone –I, the Concessionaire shall have commenced construction of the Project and achieved 20% Physical Progress.

3 Project Milestone-II

3.1 Project Milestone-II shall occur on the date falling on the 360th (three hundred and sixtieth day from the Appointed Date (the "Project Milestone-II").

3.2 Prior to the occurrence of Project Milestone-II, the Concessionaire shall have expended not less than 35% (thirty five per cent)] of the total capital cost set forth in the Financial Package. Provided, however, that at least 70% (seventy percent) of the expenditure referred to hereinabove shall have been incurred on physical works which shall not include advances of any kind to any person or expenditure of any kind on plant and machinery.

3.3 Prior to the occurrence of Project Milestone –II, the Concessionaire shall have commenced construction of the Project and achieved 35% Physical Progress

4 Project Milestone-Ill

4.1 Project Milestone-Ill shall occur on the date falling on the 540th (five hundred and fortieth) day from the Appointed Date (the "Project Milestone-Ill").

4.2 Prior to the occurrence of Project Milestone-Ill, the Concessionaire shall have commenced construction of all Project Facilities and expended not less than 75% (seventy five per cent) of the total capital cost set forth in the Financial Package.

4.3 Prior to the occurrence of Project Milestone –III, the Concessionaire shall have commenced construction of the Project and achieved 75% Physical Progress

5 Scheduled Completion Date

5.1 The Scheduled Completion Date shall be the 730th (seven hundred and thirtieth) day from the Appointed Date.

5.2 On or before the Scheduled Completion Date, the Concessionaire shall have completed the Project in accordance with this Agreement.

6 Extension of period

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly.

Annexure-I of Schedule G

Format for Contract Price Weightages for Highway Projects with Flexible Pavements

Contract Price Weightages

1.1 The Contract Price for this Agreement is **Rs. 6,29,16,00,000/-**
1.2 Proportions of the Contract Price for different stages of Construction of the Project Highway shall be as specified below:

Item	Stage for measurement of Physical Progress	Unit	Qty.	Weightage in percentage to the Contract Price
1	2	3	4	5
Road works including culverts, minor bridges, underpasses, overpasses, approaches to ROB/RUB/ Major Bridges/ Structures (but excluding service roads)	**A- Widening and strengthening of existing road**			
	(1) Earthwork up to top of the sub-grade	Km	[***]	[***]
	(2) Granular work (sub- base, base, shoulders)			
	(a) GSB	Km	[***]	[***]
	(b) WMM	Km	[***]	[***]
	(3) Shoulders	Km	[***]	[***]
	(4) Bituminous work			
	(a) DBM	Km	[***]	[***]
	(b) BC	Km	[***]	[***]
	(5) Rigid Pavement			
	Concrete work	Km	[***]	[***]
	(6) Widening and repair of culverts	No.	[***]	[***]
	(7) Widening and repair of minor bridges	No.	[***]	[***]
	B- New realignment/bypass			
	(1) Earthwork up to top of the sub-grade	Km	[***]	[***]
	(2) Granular work (sub- base, base, shoulders)			
	(a) GSB	Km	[***]	[***]
	(b) WMM	Km	[***]	[***]
	(3) Shoulders	Km	[***]	[***]
	(4) Bituminous work			
	(a) DBM	Km	[***]	[***]
	(b) BC	Km	[***]	[***]

(5) Rigid Pavement			
Concrete work	Km	[***]	[***]
C- New culverts, minor bridges, underpasses, overpasses on existing road, realignments, bypasses:			
(1) Culverts	No.	[***]	[***]
(2) Minor bridges			
(a) Foundation	No.	[***]	[***]
(b) Sub-structure	No.	[***]	[***]
(c) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(3) Cattle/Pedestrian underpasses			
(a) Foundation	No.	[***]	[***]
(b) Sub-structure	No.	[***]	[***]
(c) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(4) Pedestrian overpasses			
(a) Foundation	No.	[***]	[***]
(b) Sub-structure	No.	[***]	[***]
(c) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(5) Grade separated structures			
(a) Underpasses			
(i) Foundation	No.	[***]	[***]
(ii) Sub-structure	No.	[***]	[***]
(iii) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(b) Overpass			
(i) Foundation	No.	[***]	[***]
(ii) Sub-structure	No.	[***]	[***]
(iii) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(c) Flyover			
(i) Foundation	No.	[***]	[***]
(ii) Sub-structure	No.	[***]	[***]
(iii) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(d) Foot over Bridge	No.	[***]	[***]

Major Bridge works and ROB/RUB	**A- Widening and repairs of Major Bridges**			
	(1) Foundation			
	(a) Open Foundation	No.	[***]	[***]
	(b) Pile Foundation/Well Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	B- Widening and repair of			
	(a) ROB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	(b) RUB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	C- New Major Bridges			
	(1) Foundation	No.	[***]	[***]
	(a) Open Foundation	No.	[***]	[***]
	(b) Pile Foundation/Well Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	D- New rail-road bridges			
	(a) ROB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	(b) RUB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]

Structures (elevated sections, reinforced earth)	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	(4) Reinforced Earth Wall (includes Approaches of ROB, Underpasses, Overpasses, Flyover etc.	Sqm	[***]	[***]
Electrical and public Health Utilities	EHT line	Km	[***]	[***]
	EHT crossing	No.	[***]	[***]
	HT/LT lines (including Transformers if any)	Km	[***]	[***]
	HT/LT crossings	No.	[***]	[***]
	Water pipeline	Km	[***]	[***]
	Water pipeline crossings	No.	[***]	[***]
	Sewage line	Km	[***]	[***]
	Sewage line crossings	No.	[***]	[***]
Other Works	**(i) Service roads/ Slip Roads**	Km	[***]	[***]
	(ii) Toll Plaza	No.	[***]	[***]
	(iii) Road side drains	Km	[***]	[***]
	(iv) Road signs, markings, km stones, safety devices, ...			
	(a)Road signs, markings, km stones, ...	Km	[***]	[***]
	(b) Concrete Crash Barrier/ W-Beam Crash Barrier in Road work	Km	[***]	[***]
	(v) Project facilities			
	(a) Bus bays	No.	[***]	[***]
	(b) Truck lay-byes	No.	[***]	[***]
	(c) Rest areas	No.	[***]	[***]
	(vi) Repairs to bridges/structures	No.	[***]	[***]
	(vii) Road side plantation	Km	[***]	[***]
	(viii) Protection works			
	(a) Boulder Pitching on slopes	Km	[***]	[***]
	(b) Toe/Retaining wall	Km	[***]	[***]
	(ix) Tunnel			
	(a) Excavation	Metre	[***]	[***]
	(b) Construction of support system including rock bolting, lining etc.	Metre	[***]	[***]
	(c) On complete completion of tunnel	Metre	[***]	[***]
	(x) Miscellaneous	Lump sum	[***]	[***]
			Total	**100.00%**

* The above list is illustrative and may require modification as per the scope of the work.

** Measurement of Progress

For example, if the total length of bituminous work to be done is 100 km, the physical progress of bituminous work shall be determined as follows:

Physical progress of bituminous work
=Weightage for bituminous work x (L'/L)

L = Total length of bituminous work in km
L' = Executed length of bituminous work in km

Similarly, the physical progress for other stages shall be worked out and addition of all will give the total progress achieved.

Annexure-I of Schedule G

Format for Contract Price Weightages for Highway Projects with Rigid Pavements

Contract Price Weightages

1.1 The Contract Price for this Agreement is **Rs. 6,29,16,00,000/-**
1.2 Proportions of the Contract Price for different stages of Construction of the Project Highway shall be as specified below:

Item	Stage for measurement of Physical Progress	Unit	Qty.	Weightage in percentage to the Contract Price
1	2	3	4	5
Road works including culverts, minor bridges, underpasses, overpasses, approaches to ROB/RUB/ Major Bridges/ Structures (but excluding service roads)	**A- Widening and strengthening of existing road**			
	(1) Earthwork up to top of the sub-grade	Km	[***]	[***]
	(2) Granular work (sub- base, shoulders)			
	GSB	Km	[***]	[***]
	(3) Shoulders	Km	[***]	[***]
	(4) Bituminous work	Km	[***]	[***]
	(5) Rigid Pavement			
	(a) DLC	Km	[***]	[***]
	(b) PQC	Km	[***]	[***]
	(6) Widening and repair of culverts	No.	[***]	[***]
	(7) Widening and repair of minor bridges	No.	[***]	[***]
	B- New realignment/bypass			
	(1) Earthwork up to top of the sub-grade	Km	[***]	[***]
	(2) Granular work (sub- base, shoulders)			
	GSB	Km	[***]	[***]
	(3) Shoulders	Km	[***]	[***]
	(4) Bituminous work	Km	[***]	[***]
	(5) Rigid Pavement			
	(a) DLC	Km	[***]	[***]
	(b) PQC	Km	[***]	[***]

C- New culverts, minor bridges, underpasses, overpasses on existing road, realignments, bypasses:			
(1) Culverts	No.	[***]	[***]
(2) Minor bridges			
(a) Foundation	No.	[***]	[***]
(b) Sub-structure	No.	[***]	[***]
(c) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(3) Cattle/Pedestrian underpasses			
(a) Foundation	No.	[***]	[***]
(b) Sub-structure	No.	[***]	[***]
(c) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(4) Pedestrian overpasses			
(a) Foundation	No.	[***]	[***]
(b) Sub-structure	No.	[***]	[***]
(c) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(5) Grade separated structures			
(a) Underpasses			
(i) Foundation	No.	[***]	[***]
(ii) Sub-structure	No.	[***]	[***]
(iii) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(b) Overpass			
(i) Foundation	No.	[***]	[***]
(ii) Sub-structure	No.	[***]	[***]
(iii) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(c) Flyover			
(i) Foundation	No.	[***]	[***]
(ii) Sub-structure	No.	[***]	[***]
(iii) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
(d) Foot over Bridge	No.	[***]	[***]
A- Widening and repairs of Major Bridges			

	(1) Foundation			
	(a) Open Foundation	No.	[***]	[***]
	(b) Pile Foundation/Well Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	B- Widening and repair of			
	(a) ROB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	(b) RUB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
Major Bridge works and ROB/RUB	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	C- New Major Bridges			
	(1) Foundation	No.	[***]	[***]
	(a) Open Foundation	No.	[***]	[***]
	(b) Pile Foundation/Well Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	D- New rail-road bridges			
	(a) ROB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
	(b) RUB			
	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]
Structures (elevated sections, reinforced earth)	(1) Foundation	No.	[***]	[***]
	(2) Sub-structure	No.	[***]	[***]
	(3) Super-structure (including crash barriers etc. complete)	No.	[***]	[***]

	(4) Reinforced Earth Wall (includes Approaches of ROB, Underpasses, Overpasses, Flyover etc.	Sqm	[***]	[***]
Electrical and public Health Utilities	EHT line	Km	[***]	[***]
	EHT crossing	No.	[***]	[***]
	HT/LT lines (including Transformers if any)	Km	[***]	[***]
	HT/LT crossings	No.	[***]	[***]
	Water pipeline	Km	[***]	[***]
	Water pipeline crossings	No.	[***]	[***]
	Sewage line	Km	[***]	[***]
	Sewage line crossings	No.	[***]	[***]
Other Works	**(i) Service roads/ Slip Roads**	Km	[***]	[***]
	(ii) Toll Plaza	No.	[***]	[***]
	(iii) Road side drains	Km	[***]	[***]
	(iv) Road signs, markings, km stones, safety devices, ...			
	(a)Road signs, markings, km stones, ...	Km	[***]	[***]
	(b) Concrete Crash Barrier/ W-Beam Crash Barrier in Road work	Km	[***]	[***]
	(v) Project facilities			
	(a) Bus bays	No.	[***]	[***]
	(b) Truck lay-byes	No.	[***]	[***]
	(c) Rest areas	No.	[***]	[***]
	(vi) Repairs to bridges/structures	No.	[***]	[***]
	(vii) Road side plantation	Km	[***]	[***]
	(viii) Protection works			
	(a) Boulder Pitching on slopes	Km	[***]	[***]
	(b) Toe/Retaining wall	Km	[***]	[***]
	(ix) Tunnel			
	(a) Excavation	Metre	[***]	[***]
	(b) Construction of support system including rock bolting, lining etc.	Metre	[***]	[***]
	(c) On complete completion of tunnel	Metre	[***]	[***]
	(x) Miscellaneous	Lump sum	[***]	[***]
			Total	**100.00%**

* The above list is illustrative and may require modification as per the scope of the work.

** Measurement of Progress

For example, if the total length of bituminous work to be done is 100 km, the physical progress of bituminous work shall be determined as follows:

Physical progress of bituminous work
=Weightage for bituminous work x (L'/L)

L = Total length of bituminous work in km
L' = Executed length of bituminous work in km

Similarly, the physical progress for other stages shall be worked out and addition of all will give the total progress achieved.

SCHEDULE - H

(See Clause 12.2)

DRAWINGS

1 Drawings

In compliance of the obligations set forth in Clause 12.2 of this Agreement, the Concessionaire shall furnish to the Independent Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-H.

2 Additional drawings

If the Independent Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Annex-I, it may by notice require the Concessionaire to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Concessionaire shall promptly prepare and furnish such drawings to the Independent Engineer, as if such drawings formed part of Annex-I of this Schedule-H.

Annex - I (Schedule-H)

List of Drawings

- Plan & Profile
- Drawings of horizontal alignment, vertical profile and cross sections
- Drawings of interchanges, major intersections, grade separators, underpasses, ROBs and Major Bridges
- Drawings of toll plaza layout, toll collection systems and roadway near toll plaza
- Drawings of Control Centre
- Drawings of traffic diversion plans and traffic control measures
- Detail of Mandatory Regulatory Signs
- Detail of Compulsory Direction Control and Other Signs
- Detail of Informatory Signs
- Detail of Cautionary Signs
- Details of route marking (chevron marking)
- Details of road marking safety barriers etc.
- Details of directional signs
- Drawings of road drainage measures
- Drawings of drainage system
- Drawings of cross drainage works
- Details of Drainage Arrangement on Superelevated stretches
- Drawings of typical details slope protection measures
- Drawings of landscaping and horticulture
- Drawings of a truck parking lay bye and bus bays with furniture and drainage system
- Drawings of road furniture items including traffic signage, markings, safety barriers etc.
- Drawings of pedestrian crossings
- Drawings of street lighting
- Layout/Configuration of ATMS
- General arrangement of Base camp and Administrative Block
- Drawing of service area

SCHEDULE - I

(See Clause 14.1.2)

TESTS

1 Schedule for Tests

1.1 The Concessionaire shall, no later than 30 (thirty) days prior to the likely completion of the Project, notify the Independent Engineer and the Authority of its intent to subject the Project to Tests, and no later than 7 (seven) days prior to the actual date of Tests, furnish to the Independent Engineer and the Authority detailed inventory and particulars of all works and equipment forming part of the Project.

1.2 The Concessionaire shall notify the Independent Engineer of its readiness to subject the Project to Tests at any time after 7 (seven) days from the date of such notice, and upon receipt of such notice, the Independent Engineer shall, in consultation with the Concessionaire, determine the date and time for each Test and notify the same to the Authority who may designate its representative to witness the Tests. The Independent Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 14 and this Schedule-I.

2 Tests

2.1 In pursuance of the provisions of Clause 14.1.2 of this Agreement, the Independent Engineer shall conduct, or cause to be conducted, the Tests specified in this Paragraph 2.

2.2 Visual and physical Test: The Independent Engineer shall conduct a visual and physical check of the Project to determine that all works and equipment forming part thereof conform to the provisions of this Agreement.

2.3 Test drive: The Independent Engineer shall undertake a test drive of the Project by a Car and by a fully loaded Truck to determine that the quality of service conforms to the provisions of the Agreement.

2.4 Riding quality Test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [1,800 (one thousand and eight hundred)] mm for each kilometer.

2.5 Pavement Composition Test: The thickness and composition of the pavement structure shall be checked on a sample basis by digging pits to determine conformity of such pavement structure with Specifications and Standards. The sample shall consist of one pit in each direction of travel to be chosen at random in each stretch of 5 (five) kilometers of the Project. The first pit for the sample shall be selected by the Independent Engineer through an open draw of lots and every fifth kilometer from such first pit shall form part of the sample for this pavement quality Test.

2.6 Cross-section Test: The cross-sections of the Project shall be checked on a sample basis through physical measurement of their dimensions for determining the conformity thereof with Specifications and Standards. For the road portion, the sample shall consist of one spot to be selected at random in each stretch of 1(one) kilometer of the Project. The first spot for the sample shall be selected by the Independent Engineer through an open draw of lots and the spots located at every one kilometer from such first spot shall form part of the

sample. For the bridge portion, one spot shall be selected at random by the Independent Engineer in each span of the bridge.

2.7 Structural Test for bridges: All major and minor bridges, including over bridges, underpasses and flyovers, constructed by the Concessionaire shall be subjected to the Rebound Hammer and Ultrasonic Pulse Velocity tests, to be conducted in accordance with the procedure described in Special Report No. 17: 1996 of the IRC Highway Research Board on Non-destructive Testing Techniques, at two spots in every span, to be chosen at random by the Independent Engineer. Bridges with a span of 15 (fifteen) meters or more shall also be subjected to load testing.

2.8 Other Tests: The Independent Engineer may require the Concessionaire to carry out or cause to be carried additional Tests, in accordance with Good Industry Practice, for determining the compliance of the Project with Specifications and Standards.

2.9 Environmental audit: The Independent Engineer shall carry out a check to determine conformity of the Project with the environmental requirements set forth in Applicable Laws and Applicable Permits.

2.10 Safety review: Safety audit of the Project shall have been undertaken by the Safety Consultant as set forth in Schedule-L, and on the basis of such audit, the Independent Engineer shall determine conformity of the Project with the provisions of this Agreement.

3 Agency for conducting Tests

All Tests set forth in this Schedule-I shall be conducted by the Independent Engineer or such other agency or person as it may specify in consultation with the Authority.

4 Completion/Provisional Certificate

Upon successful completion of Tests, the Independent Engineer shall issue the Completion Certificate or the Provisional Certificate, as the case may be, in accordance with the provisions of Article 14.

5 Tests during construction

Without prejudice to the provisions of this Schedule-I, tests during construction shall be conducted In accordance with the provisions of Clause 13.3.1.

SCHEDULE - J

(See Clause 14.2 & 14.3)

COMPLETION CERTIFICATE

1 I/We,..... (Name of the Independent Engineer), acting as Independent Engineer, under and in accordance with the Concession Agreement dated .....(the "Agreement"), for development and operation of the 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) (the "Project") on design, build, operate and transfer (the "DBOT Annuity or Hybrid Annuity") basis, through.....(Name of Concessionaire), hereby certify that the Tests specified in Article 14 and Schedule-I of the Agreement have been successfully undertaken to determine compliance of the Project with the provisions of the Agreement, and I/We am/are satisfied that the Project can be safely and reliably placed in commercial service of the Users thereof.

2 It is certified that Rain Water Harvesting and Artificial Recharging arrangements have been provided by the Concessionaire as per Schedule C of the Concession Agreement, and are functional. Details (with location chainage) are as given in Annex- _____.

3 It is certified that, in terms of the aforesaid Agreement, all works forming part of the Project have been completed, and the Project is hereby declared fit for entry into commercial operation on this the day of 20

SIGNED, SEALED AND DELIVERED

For and on behalf of

INDEPENDENT ENGINEER by:

(Signature)

(Name)

(Designation)

(Address)

PROVISIONAL CERTIFICATE

1 I/We,..... (Name of the Independent Engineer), acting as Independent Engineer, under and in accordance with the Concession Agreement Dated..... (the "Agreement"), for 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) (the "Project") on design, build, operate and transfer (the "DBOT Annuity or Hybrid Annuity") basis through.....(Name of Concessionaire), hereby certify that the Tests specified in Article 14 and Schedule-I of the Agreement have been undertaken for the Project/section..... of the Project to determine compliance thereof with the provisions of the Agreement.

2 Construction Works forming part of the Project/section of the Project that were found to be incomplete and/or deficient have been specified in the Punch List appended hereto, and the Concessionaire has agreed and accepted that it shall complete and/or rectify all such works in the time and manner set forth in the Agreement. [Some of the incomplete works have been delayed as a result of reasons attributable to the Authority or due to Force Majeure and the Provisional Certificate cannot be withheld on this account. Though the remaining incomplete works have been delayed as a result of reasons attributable to the Concessionaire,][8] I/We am/are satisfied that having regard to the nature and extent of such incomplete works, it would not be prudent to withhold commercial operation of the Project/section..... of the Project, pending completion thereof.

3 In view of the foregoing, I/We am/are satisfied that the Project/section of the Project can be safely and reliably placed in commercial service of the Users thereof, and in terms of the Agreement, the Project/section of the Project is hereby provisionally declared fit for entry into commercial operation on this the ..... day of..... 20

ACCEPTED, SIGNED, SEALED AND DELIVERED	**SIGHNED, SEALED AND DELIVERED**
FOR AND ON BEHALF OF	FOR AND ON BEHALF OF
CONCESSIONAIRE by:	**INDEPENDENT ENGINEER bY:**
(Signature)	(Signature)
(Name and Designation)	(Name and Signature)
(Address)	(Address)

[8] May be struck out if not applicable. Also strike out other parts which are not applicable.

SCHEDULE - K

(See Clause 17.2)

MAINTENANCE REQUIREMENTS

1 Maintenance Requirements

1.1 The Concessionaire shall, at all times, operate and maintain the Project in accordance with the provisions of the Agreement, Applicable Laws and Applicable Permits. In particular, the Concessionaire shall, at all times during the Operation Period, conform to the maintenance requirements set forth in this Schedule-K (the "Maintenance Requirements").

1.2 The Concessionaire shall repair or rectify any defect or deficiency set forth in Paragraph 2 of this Schedule-K within the time limit specified therein and any failure in this behalf shall constitute a breach of the Agreement. Upon occurrence of any breach hereunder, the Authority shall be entitled to recover Damages as set forth in Clause 17.8 of the Agreement, without prejudice to the rights of the Authority under the Agreement, including Termination thereof.

2. Repair/rectification of defects and deficiencies

2.1 The obligations of the Concessionaire in respect of Maintenance Requirements shall include repair and rectification of the defects and deficiencies specified in Annex - I of this Schedule - K within the time limit set forth therein.

2.2 The Concessionaire shall at all times maintain an adequate inventory of spares and consumables to meet the Maintenance Requirements.

3 Other defects and deficiencies

3.1 In respect of any defect or deficiency not specified in Annex - I of this Schedule-K, the Concessionaire shall undertake repair or rectification in accordance with Good Industry Practice and within the time limit specified by the Independent Engineer.

3.2 In respect of any defect or deficiency not specified in Annex - I of this Schedule-K, the Independent Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Concessionaire in accordance with Good Industry Practice and within the time limit specified by the Independent Engineer.

4 Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule-K, if the nature and extent of any defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Concessionaire shall be entitled to additional time in conformity the Good Industry Practice. Such additional time shall be determined by the Independent Engineer and conveyed to the Concessionaire and the Authority with reasons thereof.

5 Emergency repairs/restoration

Notwithstanding anything to the contrary contained in this Schedule-K, if any defect, deficiency or deterioration in the Project poses a hazard to safety or risk of damage to property, the Concessionaire shall promptly take all reasonable measures for eliminating or minimizing such danger.

6 Daily Inspection by the Concessionaire

The Concessionaire shall, through its engineer, undertake a daily visual inspection of the Project and maintain a record thereof in a register to be kept in such form and manner as the Independent Engineer may specify. Such record shall be kept in safe custody of the Concessionaire and shall be open to inspection by the Authority and the Independent Engineer at any time during office hours.

7 Divestment Requirements

All defects and deficiencies specified in this Schedule-K shall be repaired and rectified by the Concessionaire so that the Project conforms to the Maintenance Requirements on the Transfer Date.

8 Display of Schedule - K

The Concessionaire shall display copy of this Schedule –K at the site along with the complaint register stipulated in article 40.

ANNEX – I

(Schedule-K)

Repair/Rectification of Defects and Deficiencies

The Concessionaire shall repair and rectify the defects and deficiencies specified in this Annex-I of Schedule-K within the time limit set forth herein[13].

ROADS

(a)

S. No.	Nature of defect or deficiency	Time limit for Repair/ rectification
Carriageway and paved shoulders		
(i)	Breach or blockade	Temporary restoration of traffic within 24 hours; permanent restoration within 15 days
(ii)	Roughness value exceeding 2,750 mm in a stretch of 1 km (as measured by a standardized rough meter/bump integrator)	180 days
(iii)	Pot holes	48 hours
(iv)	Cracking in more than 5% of road surface in a stretch of 1 km	30 days
(v)	Rutting exceeding 10 mm in more than 2% of road surface in a stretch of 1 km (measured with 3 m straight edge)	30 days
(vi)	Bleeding/skidding	7 days
(vii	Raveling/Stripping of bitumen surface exceeding 10 Sq m	15 days
(vii	Damage to pavement edges exceeding 100 mm	15 days
(ix)	Removal of debris	6 hours
Hard/earth shoulders, side slopes, drains and culverts		
(i)	Variation by more than 2% in the prescribed slope of camber/cross fall	30 days
(ii)	Edge drop at shoulders exceeding 40 mm	7 days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 days
(iv)	Rain cuts/gullies in slope	7 days
(v)	Damage to or silting of culverts and side drains during and immediately preceding the rainy season	7 days
(vi)	Desalting of drains in urban/semi-urban areas	48 hours
Road side furniture including road signs and pavement marking		
(i)	Damage to shape or position; Poor visibility or loss of retro-reflectivity	48 hours
Street lighting and telecom (ATMS)		
(i)	Any major failure of the system	24 hours
(ii)	Faults and minor failures	8 hours

[13] IS Authority may, in consultation with IRC, by order modify the values and periods specified herein, but such modification shall take effect only if it is included in the respective bidding documents.

Trees and plantation		
(i)	Obstruction in a minimum head-room of 5 m above carriageway or obstruction in visibility of road signs	24 hours
(ii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iii)	Replacement of trees and bushes	90 days
(iv)	Removal of vegetation affecting sight line and road structures	15 days
Rest areas		
(i)	Cleaning of toilets	Every 4 hours
(ii)	Defects in electrical, water and sanitary installations	24 hours
Other Project Facilities and Approach roads		
(i)	Damage or deterioration in Approach Roads, [pedestrian facilities, truck lay-bys, bus-bays, bus- shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts, Rain Water Harvesting/Artificial Recharge Unit and other works]	15 days

BRIDGES

Superstructure of bridges		
(i)	Cracks Temporary measures Permanent measures	 Within 48 hours Within 45 days
(ii)	Spalling/scaling	15 days
Foundations of bridges		
(i)	Scouring and/or cavitation	15 days
Piers, abutments, return walls and wing walls		
(i)	Cracks and damages including settlement and tilting	30 days
Bearings (metallic) of bridges		
(i)	Deformation	15 days
Joints in bridges		
(i)	Loosening and malfunctioning of joints	15 days
Other items relating to bridges		
(i)	Deforming of pads in elastomeric bearings	7 days
(ii)	Gathering of dirt in bearings and joints or clogging of spouts, weep holes and vent-holes	3 days
(iii	Damage or deterioration in parapets and handrails	3 days
(iv	Rain-cuts or erosion of banks of the side slopes of approaches	15 days
(v)	Damage to wearing coat	15days
(vi	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	30 days
(vii	Growth of vegetation affecting the structure or obstructing the waterway	15 days

Annex - II
(Schedule-K)

ATMS Operation & Maintenance Requirement

1. General

1.1 General Requirements

Operation and Maintenance of Advance Traffic Management System (ATMS) shall be executed in the manner originally intended, that is to collect road, traffic and weather condition data, process and analyse the data into useful information, disseminate the information to road users in accordance with the procedures as set forth herein and instructions given by the Engineer. The system shall be in operation for 24 hours a day and 7 days a week without interruption. The Concessionaire shall not divert and modify the procedure without written approval by the NHAI.

The purpose of Operation and Maintenance of ATMS is to keep the traffic management system and related facilities in operation in the manner originally intended, that is to collect road, traffic and weather condition data, process and analyse the data into useful information, disseminate the information to road users and to prolong the life of the system and the equipment. Therefore, time is of essence. Repair must be done in a timely manner.

The specifications described herein shall be considered the minimum standards to be followed for the maintenance and repair of all equipment and software covered under the Contract. Unless otherwise specified, the standards for equipment and equipment performance shall be in accordance with the Technical Specification.

1.2 Scope of Work

Apart from installation of ATMS system, the scope of contract also includes Operation and Maintenance of ATMS for entire O&M period from the date of Completion of works. Except otherwise specified in the Operation & Maintenance Specifications of NHAI's Requirements, it is the Concessionaire's responsibility to provide sufficient manpower to implement flawless execution of ATMS in operation in the manner originally intended, that is to collect road, traffic and weather condition data, process and analyse the data into useful information, disseminate the information to road users and undertake the Services that are not specifically mentioned in these requirements but essential for the safe and efficient traffic operation on the Project. The Concessionaire shall maintain qualified staff at the Traffic Management Centre (TMC), Sub Centre and other places wherever required necessary, tools, shop facilities, equipment, consumables, transportation and materials and perform all works necessary to maintain in good working manner all Advanced traffic management system and associated equipment.

The scope shall also include the following:

1. Accident / incident management from the ATMS Control Centre.
2. Performing periodic mock trials of rescue and incident management (at least once in a month) to maintain the efficiency and effectiveness of the operations team.
3. Routine monitoring of the project stretch from the ATMS Control Centre.
4. Manning the Emergency Telephone console to receive and respond to emergency calls without fail.
5. Monitoring of system status including the status of individual equipment and sub-systems and alerting the maintenance team in case of any failure(s).
6. Communication with the Patrolling/ Police/Emergency response Team / hospitals/ medical aid post, etc. whenever necessary,

7. Monitoring of movement of vehicles mandated for incident management on the project Expressway (Ambulance, route patrol, tow-away cranes) via GPS vehicle tracking and CCTV/ TMCS,
8. Efficient performance of incident management actions and monitoring based on the automatic system related checklist –based tool provided in the TMC.
9. Submit monthly reports of the system performance to the Authority / Independent Engineer by 5th day of the following month.
10. Respond to incidents (e.g. Emergency calls received at the ATMS Control Center) within stipulated time and enabling of all actions for optimal rescue and traffic normalization, including the rapid deployment of vehicles (ambulances, breakdown cranes and Patrol vehicles).
11. Detection of Vehicles not permitted to use project stretch, animal, vehicles damaging, spilling of hazardous material, etc. on the project stretch.
12. Detection of vandalism/ damage / malfunctioning of project property/assets (road signs, lighting, crash barrier, median plantation, etc.)
13. House Keeping of Traffic Management Centre and Sub Centre by a house keeping supervisor, housekeeper, security guard, cleaner, gardener and miscellaneous workers.
14. Administrative work such as purchases, account, human resource, public relation
15. ATMS Building maintenance and recurring charges such as electricity bills, water bill, etc.

Operation & Maintenance services are required to cover the system of Traffic Management Centre, Sub Centre system and following sub system.

1) Traffic Monitor Camera System (TMCS)
2) Video Incident Detection System (VIDS)
3) Automatic Traffic Counter and Classifier (ATCC) module
4) Travel Time Measurement System (TTMS) module
5) Central Processing System
6) Vehicle Speed Detection System (VSD)
7) Adaptive Traffic Signal Control System (ATSC)
8) Digital Transmission System and Communication Cable
9) Power and Other Cables
10) Facility Monitoring System
11) ADAS
12) IMS

Apart from above scope of operation and maintenance of ATMS, following works are out of scope from Operation and Maintenance of ATMS, but scope of NHAI and/or their Contractor.

1) Operation and Maintenance of TMS (Toll Management System)

2. *Operation & Maintenance Service Requirement*

The Concessionaire shall describe the methodology and outline, to execute proposed Services both Operation & Maintenance in sufficient detail in his Services Proposal to enable the NHAI to evaluate the technical capability and qualification of the Concessionaire and to judge whether the proposal is adequately responsive or not.

The Concessionaire shall update and furnish the Service Proposal two (2) months before expected starting date of Operation period for approval by NHAI.

The Services Proposal shall describe the operation and maintenance activities taking Manufacturer or OEM recommendations for all hardware and software into consideration and shall be written in the same sequence as the NHAI's Requirement. Where the supporting

documents such as brochure, article, report, or paper are provided, they shall be attached at the end of the proposal or in a separate volume and a cross reference shall be prepared. The Services Proposal shall be written in English.

The Concessionaire shall prepare a list of equipment to be covered by the maintenance based on the actual configuration and quantity of the equipment. If the Concessionaire provides any additional equipment not specifically mentioned in the NHAI's Requirements to complete the Advance traffic management system required under the Contract, they shall be included in the scope of maintenance work and the Concessionaire shall prepare and submit to the Engineer the revised list for his approval.

This plan shall be updated as necessary during the O&M period so as to reflect the actual conditions of O&M.

2.1 Operation Service Requirement

The contents of the Services Proposal shall include but not limited to the following:

1. Scope of services to be rendered
2. Standard Operating Procedures (SOP)
3. Checklist for operations tasks for each sub-system
4. System coverage area and list of equipment
5. ATMS Contractor's general obligation
6. Organization of operation team
7. Standard Operation Procedure (SOP) of sub-systems
8. Records and reports to be prepared by the Concessionaire
9. ATMS Contractor's personnel and personnel management
10. Operation manual
11. Training of Concessionaire's personnel
12. Safety, security and protection of environment
13. Ability to track performance and operation activities
14. Inspection and evaluation

No cost information of the services and operation shall be included in the Services Proposal.

2.2 Maintenance Service Requirement

The contents of the Maintenance Services Proposal shall include but not limited to the following:

1 Scope of services to be rendered
2 System coverage area and list of equipment
3 ATMS Contractor's general obligation
4 Organization of maintenance team
5 Maintenance manual
6 Checklist for Preventive Maintenance tasks on each device
7 Inventory of devices
8 Work order management capabilities
9 Level of Service and device inventory
10 Ability to track performance and maintenance activities
11 Establishing criteria for devices, equipment and systems regarding mean time failure
12 Equipment needed for performing diagnosis on ITS field devices
13 Schedule cross training activities to improve the overall skill level of ATMS technicians

3. *Requirements for ATMS Operation Services*

The various type of operation related services to be performed by the Concessionaire shall include the following:

3.1 ATMS Operation

The ATMS Operation shall be executed in accordance with the procedures as set forth herein and instructions given by the NHAI. The system shall be in operation for 24 hours a day and 7 days a week without interruption. The Concessionaire shall not divert and modify the procedure without written approval by the NHAI.

3.2 Briefing at shift change

Shift time of operators shall be arranged in such a way that there will be an overlapping period of at least 15 minutes. During the overlapped period, new operation team shall be briefed by the previous operation team as to the following:

1) General traffic condition
2) Weather condition
3) Existing incidents and accident being disposed of
4) On-going and scheduled work on the Project
5) On-going and scheduled event on the Project and radial roads connected with the Project interchange
6) Equipment malfunctioned and the status of maintenance work
7) Other matters that need attention of the operation team

3.2.1 Confirmation of equipment condition

At the start of a shift, operators shall confirm the condition of all equipment through operation or through the consoles. If there is a new failure that was not reported by the previous shift team, the operator shall record it and report it to the maintenance team for proper maintenance action.

During the operation of the system, if the operator detects any abnormality of the equipment, software, or database, he shall report it to the maintenance team for proper maintenance action. The operator shall refrain from manipulating equipment, modifying operating parameters, reloading software or other action without instruction by the maintenance staff when abnormal or defective behaviour of the equipment or software is found.

If the fault signal or no diagnosis signal response from roadside equipment is received at Traffic Management Centre, operator shall contact the maintenance team and report the location and status of equipment with failure.

3.3 Operation of Emergency Telephone ("1033")

3.3.1 System Setup

The system shall be set to automatic recording mode and all calls shall be recorded automatically. No recorded conversation shall be deleted without the written consent of the NHAI.

3.3.2 Operation

3.3.2.1 Call reception

When operator receives a call from "1033", he shall confirm the following information from the caller:

1. Caller's ID
2. Type of incident (accident, break-down, puncture, out of fuel, fallen object, etc.)
3. Location (kilo post and direction)
4. Request for action

In the case of accident, the followings shall be confirmed in addition to items (1) through (4) above.

1. Type and severity of accident
2. Number of persons injured
3. Necessity of ambulance, wrecker and/or fire brigade
4. Possibility of drivability of vehicle involved in the accident

In the case of breakdown, the followings shall be confirmed in addition to items (1) through (4) above.

1. The lane where that broken-down vehicle is stopping
2. Vehicle type
3. Reason of breakdown
4. Necessity of wrecker or crane

The operator shall inform the caller to implement temporary safety measures such as placing safety triangle or waving flag to prevent secondary incident and advise the caller to stay at a safe place.

In the case of simple inquiry such as location of exit for specific destination, the operator shall provide necessary information to the caller.

3.3.2.2 Countermeasure

The operator shall inform the patrol team of the incident so that they can take proper actions at site. If a call involves request for assistance such as dispatching wrecker, the operator shall inform the relevant agencies and request appropriate action to be taken.

3.3.2.3 Message

If the incident reported is the type that affects traffic flow or traffic safety on the Project, the operator shall provide incident information and display the incident information to the Mobile App.

3.3.2.4 Reporting

The operator shall fill up the prescribed incident form for every incident that requires actions to be taken by the NHAI, operator or other agencies.

When operator receive a call from patrol team or other related agencies regarding completion or clearing of incident, operator shall remove the incident message.

3.3.2.5 Mobile communication

The operating procedure from the mobile communication shall be same as that for "1033" emergency call system. If operator receives a call from a road user or patrol team through mobile phone, the operator shall act in a same manner as a call from "1033".

3.4 Operation of Traffic Monitor Camera System (TMCS)

3.4.1 System Setup

Under normal condition of the Project, the TMCS system shall be set to sequential display mode in which video image from all TMCS cameras is sequentially displayed on the multiple video monitors. The number of monitors used and scanning interval of each video camera is user selectable.

The TMCS camera shall also perform the automatic incident detection functions in each pre-set position. Under normal condition of the Project, the TMCS cameras shall be set at home position and shall periodically to other pre-set positions to enable automatic incident detection.

Image recording function shall be set to ON and image from all TMCS cameras shall be recorded automatically.

3.4.2 Operation

3.4.2.1 Monitoring

The operator shall from time to time watch the TMCS monitor which sequentially displays video image from all cameras at pre-set interval to monitor and confirm normal traffic flow.

If any abnormality is found in the video image, the operator shall discontinue sequential changeover mode and select and fix the camera that captures the scene of incident and observe the incident. If the incident is the type that requires assistance, the operator shall inform relevant agencies of the incident and request appropriate action to be taken.

If a report of incident is received and incident location is within the coverage area of a TMCS camera, the operator shall select the TMCS camera of incident location, operate the camera and focus on the incident to monitor to get first-hand information of the incident.

3.4.2.2 Incident detection

If the Video Incident Detection System (VIDS) detects an incident such as a vehicle moving in reverse direction, VIDS console issues an alarm and incident image will be displayed on the VIDS console monitor and Graphics Display.

The operator shall request Mobile operator to contact the relevant agencies such as patrol team, traffic police, fire brigades, ambulance or wrecker service, explain briefly the incident, and request them to take necessary action immediately.

3.4.2.3 Message

If the incident detected and reported is the type that affects traffic flow or traffic safety on the Project, the operator shall disseminate the incident information to the Mobile app as per the operating procedures.

3.5 Operation of Automatic Traffic Counter-cum-Classifier (ATCC) System and Travel Time Measuring System (TTMS)

3.5.1 System Setup

No specific system setup is required for ATCC and TTMS once its normal operation is confirmed at the time of system commissioning, as no additional hardware or filed equipment has been installed on the Project for ATCC and TTMS functionalities. The ATMS Software processes the data from ANPR and VIDS cameras for traffic counting and classification, and travel time estimation. However, threshold values that are used to detect abnormal traffic conditions shall be reviewed from time to time to confirm that the values are appropriate.

3.5.2 Operation

3.5.2.1 Monitoring

Operator shall from time to time but at least once an hour check the ATCC and TTMS data for any abnormality. If any abnormal data is found, the operator shall confirm whether the actual traffic flow is different from the normal, or the data is erroneous. If the data is found erroneous, the operator shall inform the maintenance team for further investigation.

3.5.2.2 Abnormal traffic condition

If the ATCC and TTMS module detects a traffic flow parameter at a lane or section is lower or higher than the predetermined threshold, the ITS console issues an alarm to the monitor display as abnormal traffic condition.

If an alarm is issued, the operator shall capture the image of traffic by TMCS at the sensing area and confirm whether the abnormal data is caused by the abnormal traffic condition or by ANPR equipment failure.

If any incident is identified by the TMCS system and requires attention or help, the Traffic operator shall contact the relevant agencies such as patrol team, traffic police, fire brigades, ambulance etc. for their action.

After the contact with the relevant agencies, operator shall disseminate adequate messages to the Mobile App.

When Traffic operator confirms that the traffic condition has become normal, operator to remove the messages or change the message with second priority. Operator shall also inform the relevant agencies of the termination of the incident.

3.5.2.3 Monthly review

At the end of every month, the operator shall go through the data collected by the ATCC and TTMS for any abnormality that could have been overlooked during daily operation. If an abnormal data is found, the operation shall further examine the data and determine whether the traffic condition became abnormal due to an incident or the ANPR equipment was defective. If any abnormality that is attributable to erroneous system operation is found, the operator shall inform the maintenance team for further investigation.

3.6 Operation of Messages on Mobile App

3.6.1 Type of information provided

Different types of message shall be sent to the Mobile App. These types are summarized below. With regard to the message format, the same shall be finalised in consultation with the Independent Engineer.

Social messages shall not be sent at any time. Only the messages useful for the user to provide them the information / alert / warning for any incident, road closure, traffic jam, over-speeding alerts etc. or travel time shall be sent. Travel advisory or travel time may be sent when there is no alert / warning is required to be disseminated to the commuters.

3.6.2 Advance warning message

Advance warning message gives the road users running at upstream section an advance notice of the incident at downstream section. The incident includes traffic congestion, slow traffic, accident, stalled vehicle, lane closure, fallen object, work zone and weather conditions. The message is effective in reducing possibility of secondary incidents.

3.6.3 Advisory message

Advisory message provides the road users with useful information about a specific problem along their route. This information allows the road users to change their speed or lane in advance of the problem area, or the road users may elect to voluntarily take an alternative route to their destination.

3.6.4 Early notice

Early notice informs the road users of a planned event such as road work on the Project or the closure of an interchange. This type of message has lower priority than other types of message and will be displayed only when there is no real-time message to be shown.

3.6.5 Language used

Three languages, English, Hindi, and another one local language will be used for messages. Thus, the operator shall be fluent in these languages. Except short message, messages will be displayed in one of the three languages. Message shall carry the same meaning regardless of the language used. For short message that can be expressed in one line, the same message may be displayed simultaneously in three lines.

3.6.6 Message Layout

Standard layout shall be followed consistently to express information for easier understanding by the road users.

3.6.7 Message Composition Method

TCC operator can choose message creation from three (3) methods as indicated below.

1) Combination of pre-defined message
The word which are frequently used such as "accident", "congestion", "construction work", "slow down" and so on are used to compose a message combination. They contain words indicating location, event and instruction.

2) Ready-made message
Operator may select one of the ready-made messages stored in the console.

3) Manual composition
Any message which operator cannot select from console; operator can create any message through keyboard.

4) Graphic symbols
Operator may provide a graphic symbol that graphically represent an incident and help Project road users to understand instantly without reading messages.

3.6.8 Message display

Upon reception of incident information from other operators or directly from other agencies, the operator shall send proper message with adequate location and direction without undue delay.

The operator shall evaluate the priority of the current and new incidents and decide whether the message being displayed is replaced with the new message or not.

The incident that exists at immediate downstream section shall have higher priority than the incident that is located more than one section away in general. If there are two incidents in a same section between two interchanges, incident of higher severity will take precedence over the incident with lower severity. If there are two incidents of same severity, incident nearer to the GPS location of the mobile app shall be displayed first.

3.6.9 Message removal

Upon reception of the notice that an incident for which a message is displayed has been resolved, the operator shall remove the message or replace with another message immediately. The message of the incident that has been resolved shall not be displayed unnecessarily.

The operator shall check the effectiveness of all the messages being displayed at every 15 minutes and confirm the message needs to be continued or removed. The operator shall remove the message or replace with another message if the message being displayed is no longer applicable.

3.7 Security & related Incident Management Service

The ATMS Project shall be designed for an end-to-end multi-layer security blanket to protect applications, services, data and the infrastructure from malicious attacks or theft from external (through internet) and internal (through intranet) hackers. Using Firewalls and Intrusion detection systems such attacks and theft should be controlled and well supported (and implemented) with the security policy. The virus and worms attacks should be well defended with Gateway level Anti-virus system, along with console level Anti-virus mechanism. ATMS should be designed to make use of the Secure Socket Layer (SSL)/Virtual Private Network (VPN) technologies to have secured communication between Applications and its end users.

Furthermore, all the system logs should be properly stored & archived for future analysis and forensics whenever desired.

These Service Levels would be calculated for each of the following types of incidences:

a) Virus Attack

Any virus infection and passing of malicious code shall be monitored at the gateway level or user complains of virus infection shall be logged at the help desk system and collated every quarter.

b) Denial of Service (DoS) Attack

Non-availability of any services shall be analysed and forensic evidence shall be examined to check whether it was due to external DoS attack.

c) Intrusion

Intrusion is an illegal act of entering, seizing, or taking possession of data hosted by ATMS. Compromise of any kind of data hosted by ATMS.

d) SPAM

SPAM is an unsolicited bulk message, especially advertising, indiscriminately. SPAM statistics on monthly basis shall be monitored through reports generated by Anti-SPAM software.

3.8 Records and Reports

The Concessionaire shall prepare and submit the various reports as stipulated herein in a form mutually agreed. Each report shall contain as a minimum the information listed.

For every incident reported, the operator in the TMC shall gather the information about the details of incident and site condition. List of Incident summarized the information to be collected for different type of incident shall be prepared by Concessionaire.

Operator shall prepare the following reports:

a) Daily report
   1) List of incidents responded by incident category
   2) Contact summary (numbers by category) with Emergency caller, patrol team, traffic police and other relevant agencies

b) Monthly report
   1) Number of contacts with Emergency caller, patrol, police, NHAI and others for each day.
   2) Number of incidents occurred by category for each day
   3) Number of road closure each day by reason for closure
   4) Number of emergency contact call
   5) Number of other contacts

Operators who responded to a call (such as emergency call) shall prepare the reports listed below. The report shall be compiled immediately after responding to the call and shall not be left unrecorded.

c) Emergency Response Report
   1) Incident location
   2) Weather
   3) Road condition
   4) Vehicle condition
   5) Contact record
   6) Dispatch record
   7) Traffic regulation implemented

d) Call Record
   1) Time
   2) Party contacted
   3) Incoming or outgoing
   4) Call content

e) Clearing/Recovering Record of Object on Road
   1) Time when information is received
   2) Receiver
   3) Contact source
   4) Caller
   5) Type or kind and name of object
   6) Location and direction (clockwise/counter clockwise)
   7) Lane number
   8) Time cleaning is ordered
   9) Name of person instructed
   10) ATMS Contractor to which clearing is requested
   11) Time of arrival at site
   12) Time of clearing work completion

f) Record of Traffic Regulation
   1) Time when information is received
   2) Location and direction (clockwise/counter clockwise)
   3) Lane number
   4) Regulation applied
   5) Time started and time restored
   6) Other information

g) Ambulance Dispatching Report
   1) Date and time
   2) Reason for dispatch
   3) Location and direction (clockwise/counter clockwise)
   4) ID of ambulance dispatched
   5) Service rendered
   6) Entry and exit interchange

h) Fire Engine Dispatching Report
   1) Date and time
   2) Reason for dispatch
   3) Location and direction (clockwise/counter clockwise)
   4) ID of fire engine dispatched
   5) Service rendered
   6) Entry and exit interchange

Operator at day shift shall hand over all reports to the night shift except daily report. When night shift finishes the duty, all reports shall be filed, and their copy shall be submitted to the NHAI.

The Concessionaire shall also prepare and submit to the NHAI as minimum the following deployment reports:

a) Duty plan of the operation team with the name of traffic management chief and operators on a weekly basis.
b) Daily attendance record with In-time and Out-Time for all Concessionaire's staff working at Traffic Control Centre.
c) Daily report of operation as stipulated in the operation manual and as agreed with between NHAI and Concessionaire.

The reports mentioned above are a minimum requirement. The NHAI reserves the right to reasonably demand more reports other than those listed above after the commencement of Services by the Concessionaire.

3.9 Customer Assistance and Close coordination with other organizations

ATMS operator shall provide such information as to the road condition, traffic condition, expected travel time, and route guidance to the Project user through Emergency call or mobile phone if requested by the Project user as part of customer service.

ATMS management (operation and maintenance) must be conducted with close coordination and cooperation with other agencies concerned. Liaison and coordination among related agencies such as traffic police, ambulance and fire brigades must be maintained all the time.

4, ATMS Contractor's Personnel

4.1 ATMS Contractor's Key Personnel

For the purpose of discharging its obligations under the Contract, the Concessionaire shall recruit and deploy the specified number of key personnel of suitable qualification and experience. The Concessionaire shall ensure that the key personnel deployed are of good health, of highest integrity, punctual, well dressed, well behaved and of qualification and experience prescribed hereunder.

The frequent replacement of key personnel is not desirable unless they are found involved in malpractices or non-compliances. However, a permission of replacement of key personnel shall be obtained from the Independent Engineer / NHAI in advance together with the request for approval of replacement. The Independent Engineer / NHAI, if satisfied with the reasons submitted to him, may allow such replacement after verifying the CVs strictly in accordance with the requirements.

4.2 Deployment of Personnel

The Concessionaire shall recruit and deploy the suitable number of traffic management chief and operator. The minimum number of the staff that the Concessionaire shall deploy is presented in the preceding section of these NHAI's Requirements.

The Concessionaire shall furnish to the NHAI, in addition to the list of key personnel provided with the Technical Proposal, a list of persons deployed for the purpose of discharging its obligations under the Contract, containing all the details like their educational qualifications, experience, training undergone, health condition, personal residential addresses and recent photograph.

The personnel to be appointed shall not have any previous criminal record. A certificate to this effect from concerned State Police Authorities shall be made obligatory for verification prior to appointment at Traffic Control Centre.

The NHAI reserves its right to object to the deployment of any personnel for any reason. In such case, the person or persons being objected to by the NHAI shall be removed by the Concessionaire forthwith and replaced within a day from such removal.

The NHAI shall not be liable for any misconduct or misdeeds or any act or incident involving the Concessionaire or any of its personnel in any criminal or civil case. The Concessionaire shall be responsible for consequences and if any such incident takes place, the Concessionaire shall forthwith intimate the said incident to the NHAI.

4.3 Relationship between Concessionaire's staff and NHAI

The Concessionaire specifically agrees that the personnel deployed by it, will not in any way claim employment with the NHAI. The Concessionaire shall be solely responsible for any dispute raised by the personnel deployed by him either during the term of the Concessionaire or thereafter.

In all circumstances it is clearly understood by the parties that the personnel deployed by the Concessionaire shall have no connection whatsoever with the NHAI and the relationship of NHAI and Employee shall be only between the Concessionaire and the personnel deployed by it.

4.4 Welfare of Concessionaire's Employee

The Concessionaire shall be solely responsible and liable for complying with statutory liability for welfare of the employees such as ESI, EPF, workmen's compensation, wages, bonus medical leave, etc.

However, if considered necessary, the NHAI shall have every right to enquire and seek documentary evidence from the Concessionaire to confirm, whether all the statutory dues like ESI, EPF, minimum wages, weekly offs, bonus, medical leave, workman compensation and any other entitlements, in accordance with the statutory dues applicable in the area are being paid.

4.5 Uniform and Name-plate/badges

The Concessionaire shall provide uniforms to the persons engaged in ATMS Operation Services at Traffic Control Centre as approved by NHAI. All staff personnel of the Concessionaire shall wear the uniform and nameplate/name-badges, when on duty without exception. The nameplate/name-badge shall bear the name and designation along with the name of toll collecting Concessionaire.

4.6 Operation Manual

The Concessionaire shall prepare and submit to the Independent Engineer / NHAI for approval, the following operation manuals for their staff two (2) months before the expected starting date of O/M period:

1) Emergency call /mobile, ADAS operating manual
2) TMCS, VIDS operating manual
3) Traffic/System, ATSC, etc. operating manual
4) Control Room (TMC) and Sub-centre operating manual

The manual shall describe the organizational setup of the Concessionaire, the authority and responsibility of each position, person to report, operation procedure of equipment comprising ATMS, report to be prepared and other details that staff at each position must follow.

4.7 Training

The Concessionaire shall conduct training of the staff as specified herein at the time of new recruitment and also from time to time to ensure high quality ATMS Operation Services. The training shall consist of classroom lecture using manual and hands-on training using the Advanced Traffic Management System equipment.

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

a) Basic of traffic engineering
b) Standard incident disposal procedure
c) System log-in, log-out procedure of ATMS
d) Each console and console operation
e) Printer operation
f) Access Control System operations and maintenance
g) Storage device operation
h) Network equipment operation
i) Power supply equipment operation

The Concessionaire shall describe the contents and the expected duration (number of hours) of the training in his Service Proposal.

4.8 Safety, Security and Protection of Environment

4.8.1 Safety of Staff Deployed

Throughout the period of Contract, the Concessionaire shall have full regard for safety of all persons entitled to be upon the Traffic Control Centre area and for the avoidance of danger to such persons specially from moving traffic.

All staff employed by the Concessionaire shall receive the training on the work area safety before assigned to the position. The Concessionaire shall provide all necessary safety equipment such as reflective vests, hardhats to the persons.

5. ***NHAI's Equipment and Property***

5.1 Provision of Equipment and Property

In order to enable the Contractor to discharge its duties of ATMS Operation Services efficiently and uninterruptedly, the NHAI shall provide its existing infrastructural facilities including Advanced Traffic Management System hardware and software, if available as may be considered appropriate by the NHAI.

5.2 Care of Equipment

The Concessionaire shall use the NHAI's equipment and property that the Concessionaire is allowed to use with utmost care and attention. If the equipment or property under custody of the Concessionaire becomes inoperative or defective due to the inappropriate operation or use of them by the Concessionaire's staff, the Concessionaire shall repair or replace them at his own cost after obtaining the instruction from the NHAI as to the remedial measure to be taken.

If any liability or obligation with regard to the repair or replacement of NHAI's equipment and property is remained unfulfilled by the Concessionaire at the time of return upon termination of the Contract, the amount necessary for the repair or replacement shall be detected to the payment due to the Concessionaire.

All consumables including but not limited to the printer paper and printer toner shall be arranged and purchased by the Concessionaire at his own cost.

6. ***Inspection and Evaluation***

6.1 Inspection

The NHAI / Independent Engineer reserves the right to conduct inspection of the Concessionaire's work at any time without prior notice, to check, observe, and witness the activities of the Concessionaire at Traffic Control Centre.

The Concessionaire shall permit the NHAI's Representative at any time or times during the execution of the Contract to enter upon any place where the Concessionaire is allowed to access within the NHAI's premises for the purpose of inspection or for any other legitimate purpose. The Concessionaire shall give all required information and inspection of records to the Engineer regarding the operation of the Advanced Traffic Management System, if asked for.

The purpose of the inspection is to monitor the Concessionaire's activities and to ensure that all the activities required under the Contract are being carried out properly by the personnel deployed by the Concessionaire.

The NHAI may exercise any check control to ensure discharge of various obligations by the Concessionaire under the Contract including but not limited to following:

a) Adherence to operation procedure stipulated in the operation manuals;
b) Promptness and responsiveness to Emergency call;
c) Promptness and adequateness to communicate with other organizations;

d) Handling of the system and equipment;
e) Adequateness and promptness of message;
f) Adequateness of record keeping;
g) Cleanness and tidiness of the Traffic Management Centre and the rooms that are used by the Concessionaire's staff;
h) Manner and politeness of Concessionaire's operator toward Emergency callers and Project users;
i) Traffic safety awareness; and
j) Any other check or control as considered appropriate by the NHAI.

6.2 Evaluation by NHAI

The NHAI will conduct from time to time the evaluation of the ATMS Operation Service provided by the Concessionaire under the Contract based on the performance of service level parameters specified in Service level Table.

7. *Requirements for ATMS Maintenance Services*

The various type of maintenance and repair works and related services to be performed by the Concessionaire shall include the following:

7.1 Preventive Maintenance

The Concessionaire shall perform the preventive maintenance of all equipment and software supplied under the Contract in accordance with the preventive maintenance schedule to be developed by the Concessionaire and approved by the Engineer.

7.1.1 Inspection Item for Preventive Maintenance

The Concessionaire shall prepare and submit to the Engineer a list of inspection items for all preventive maintenance work under the Contract two (2) months before the expected starting date of O&M period. The inspection item list shall indicate the type of inspection to be performed daily/weekly, monthly, bi-annually and annually. The inspection item shall cover all the equipment to be supplied under the Contract.

7.1.2 Schedule for Preventive Maintenance

The Concessionaire shall prepare and submit to the NHAI a schedule for all preventive maintenance work under the Contract two (2) months before the expected starting date of O&M period.

The schedule shall be in sufficient detail to indicate which part of the monthly inspection is to be performed in each week and which part of the bi-annual and annual inspections is to be performed in each month and the number of maintenance engineers and technicians to be assigned to the work.

The Concessionaire will be required to revise the schedule if the workload and the manpower assignment are unbalanced or unrealistic. Failure to submit an acceptable schedule within the specified time shall be a sufficient cause for suspension of the Contract and / or withholding of payments due the Concessionaire.

7.1.3 Check List

The Concessionaire shall develop and prepare check lists to be used for preventive maintenance for each type of equipment and software and submit them for the Engineer for his approval. The checklists shall include the type of equipment, equipment ID, location, date of inspection, name of inspector, check item, and remarks.

The check list shall be used every time a periodical inspection of the equipment is made, and results of the inspection shall be recorded together with other details.

The Concessionaire is required to submit a copy of all recorded check lists every month and as requested by the Engineer at any time. Failure to maintain or submit the check

lists shall be a sufficient cause for suspension of the Contract and / or withholding of payments due to be payable to the Concessionaire.

7.1.4 Software Preventive Maintenance

The Concessionaire shall perform preventive maintenance of the software to be provided under the Contract as part of the maintenance work. The Contract shall exert the utmost care not to inadvertently damage the software and database and cause erroneous or abnormal operation of the Advanced traffic management system.

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

1) Monitoring of CPU, memory and disk space utilization
2) Monitoring of system availability over TCP/IP
3) Monitoring of anti-virus and system security software operation
4) Backup of the system and restoration of the system when necessary.
5) Monitoring and review of system and event logs.
6) System modification

The work to be done consists of modifying the system, system parameter and other operating conditions and to improve the operation or to conform to new operational requirements. The work shall be done as directed by the Engineer.

7.2 Corrective Maintenance and Accident Repair

The Concessionaire shall provide corrective maintenance and accident repair on a 24-hour a day, 7-day a week basis. Upon reception of a failure notice by the contact person, the Concessionaire shall log the notice and determine the nature and severity of the failure, prepare the repair plan and dispatch the maintenance crew to the site. Immediate action shall be taken to safeguard the public at any time if the failure is of nature that causes hazardous condition.

If the fault cannot be permanently repaired immediately, a temporary repair or remedial measure sufficient to safeguard the operation of the Advanced traffic management system shall be affected by the Concessionaire and the NHAI shall be so notified.

The cost of corrective maintenance of the failure that is not attributable to the Concessionaire will be determined by mutual negotiation. The Concessionaire shall assess the extent of the damage, prepare the remedial plan and estimate the cost.

7.2.1 Response Time and Resolution Time

For all cases, the failure shall be classified into three severity levels, critical, major and minor. The Concessionaire shall satisfy the response time and resolution time specified for each type of failure as presented hereunder.

Severity	Response time	Resolution time
Critical failure	30 minutes	2 hours
Major failure	60 minutes	6 hours
Minor failure	2 hours	48 hours

Critical failure is defined as follows:

1) Halt of both active and backup server systems at TMC or sub-Centre.
2) Failure of Internet server.
3) Interruption of active or backup route of communication link to TMC system.
4) Failure of two or more console at TMC.
5) System failure of a server system of each sub-system
6) Failure of uninterruptible power supply.

Major problem is defined as follows:

1) Failure of a console at TMC.
2) Failure of large display at TMC.
3) Failure of two or more units of TMCS display monitor.

Minor failure is defined as those failures other than critical and major failures listed above.

7.2.2 *Inspection of Faulty Parts*

The Concessionaire shall inspect the faulty part retrieved from the equipment repaired and prepare and submit a report describing the nature of the failure to the Engineer together with his opinion whether the failure is caused by defect, inadequate operation, act by the third party, normal wear and tear or other reasons.

7.2.3 *Fault Report and Work Order*

Each and every corrective maintenance and accident repair work shall be documented on the fault report form and work order form by the Concessionaire. The Concessionaire shall prepare and submit the form together with the list of inspection items for the approval of the Engineer. A copy of completed work order forms shall be submitted with the monthly invoice. No payment shall be made without submitting the completed work order forms. The Fault Reports shall be kept in a logbook and shall be made available to the Engineer upon request at any time.

7.2.4 *Maintenance and repair records*

The Concessionaire shall maintain a comprehensive record of all maintenance and repair activities and spare parts consumptions and inventory. The records shall include as a minimum maintenance check lists, fault reports, spare parts receiving and consumption records, and work orders. These records shall be kept in a database and various operations including but not limited to search and retrieval of fault record by specified key, statistical processing of records into performance index, and calculation of MTBF, MTTR and other parameters shall be possible.

8. *Reporting*

The Concessionaire shall prepare and submit a monthly report in the form and contents as specified herein and as agreed with the Engineer

9. *Operation & Maintenance Personnel*

The Concessionaire shall employ traffic management chief and the suitable number of operators. It shall be noted that the number indicated in the table is the minimum requirements by NHAI and it is the Concessionaire's responsibility to provide high quality service seamlessly and effective staff arrangement shall be recruited if necessary. International Staff shall carry out the technology transfer as an important aspect including Advance traffic management technology through operation and maintenance works to NHAI officers and Concessionaire's local staffs.

The staff member shown in the table is the persons directly engaged in the ATMS Operation and Maintenance Services and the Concessionaire shall recruit and deploy the necessary number of managers, operators and technicians.

The Concessionaire shall provide all personnel necessary for performing the ATMS operation and maintenance by the personnel listed in Table. The Concessionaire shall submit curriculum vitae of the candidate key person for the Engineer's approval two (2) months in advance of the start of operation and maintenance work. These engineers shall be involved in the installation, adjustment, test on completion and training of the NHAI's staff of the Advanced traffic management system to be supplied under the Contract.

The Concessionaire shall submit the list of all ATMS Operation and maintenance staff with name, birth date and address together with copy of ID every month to the Independent Engineer. If there is any change in the composition of the operation and maintenance staff,

it shall be reported immediately to the NHAI. The NHAI will issue an ID to each staff member. The Concessionaire shall be responsible for the proper use of the ID to gain the access to the access-controlled places and system facilities and return it immediately if a staff member no longer works for the ATMS Operation and maintenance.

Three-shift (+1 backup) system shall be adopted for ATMS operation. The candidate shift is as shown below.

First shift: 05:45 -14:00 hours

Second shift: 13:45 - 22:00 hours

Third shift: 21:45 - 06:00 hours

9.1 Position and responsibility for position

1) The position, responsibility, and number are estimated by NHAI as follows;

S. No.	Position	Number	Responsibility
1	* Traffic Management Manager	1	Supervising and managing of highway traffic management with Traffic Management Chief
2	*Traffic Management Engineer	1 at TMC & 1 at each sub-centre	Technical aspect of Advanced traffic Management system
3	*Asst Manager – Operations	1 at TMC & 1 at each sub-centre	Management of Control room
4	Control Room / IMS Operator	5 at TMC & 3 at each sub-centre in each shift 1 at each IMS location	Operating activity of the system (Three Shift)
5	*System Maintenance Engineer / Manager	1 for every 50 kms	Management of System maintenance
6	System IT Engineer	1 for every 50 kms	Management of IT System
7	System Maintenance Technicians	1 for every 50 kms in each shift	Actual Maintenance activity (Three Shift)
8	Support Staff	1 at TMC & 1 at each sub-centre	
9	Office Assistant	1 at TMC & 1 at each sub-centre in each shift	
10	Security Guard	1 at TMC & 1 at each sub-centre in each shift	

11	Maintenance Vehicle with Driver and helper	1 for every TMC / subcentre	
12	Man-hoist vehicle with Driver and helper	1 for each project of up to 100 kms	Add 1 for every 2nd sub-centre

Note; Position with asterisk (*) is identified as Key Staff

2) The minimum experience of each position is shown as follows;

Position	Minimum Experience
* Traffic Management Manager	Total Professional experience; 12 years Similar works#; 10 years Manager of similar works; 5 years
*Traffic Management Engineer (BE/B tech Only)	Total Professional experience; 10 years Similar works#; 5years
*Asst Manager	Total Professional experience; 7 years Similar works#; 4 years
Control Room Operator	Similar works#; 2 years
*System Maintenance Engineer (BE/B tech Only)	Total Professional experience; 10 years Similar works#; 7 years
*System IT Engineer (BE/B tech Only)	Similar works#; 5 years
System Maintenance Technicians	Similar works#; 2 years

Note; The position with asterisk (*) shall be at least a BE/BTECH/M.Sc. in electronics, information technology, systems engineering, computer science, civil engineering, highway engineering or traffic engineering.

#Similar works shall mean that the candidate shall have working experience in ATMS/ ITS/ HTMS/ Traffic Management on a 4 lane/6 lane expressway/ highway project/ urban ITS project.

10. ***Maintenance Facilities***

10.1 Maintenance Equipment and Tools

The Concessionaire shall maintain required set of maintenance equipment and tool, and monitoring and testing software normally required for the maintenance of the electrical and server system. The maintenance equipment and tools shall be maintained in good workable condition so that they shall be available all the time. If periodical calibration is required, it shall be calibrated at the regular interval as specified by the supplier of the maintenance equipment. The maintenance staff shall be trained as to the use of the maintenance equipment and tools. The purchase or depreciation cost of the maintenance equipment and tools shall be deemed to be included in the appropriate cost item in the Tender and no separate payment shall be made.

10.2 Maintenance Office

The Concessionaire will be allowed to occupy and use the maintenance room in the TMC/Sub centre free of charge for operation & maintenance purpose. The Concessionaire shall observe the regulations regarding use of the maintenance office. Only persons authorized by the Engineer shall be allowed to use the office and the office shall be used solely for the operation & maintenance of the ATMS. The Concessionaire shall prepare at

his cost desks, chairs, shelves, cabinets, telephone, Internet access and other furniture and facilities necessary for the efficient maintenance operation.

10.3 Maintenance Vehicle

The Concessionaire shall provide the suitable number of vehicles for their operation & maintenance use. The vehicle shall be of the type suitable for maintenance work in terms of the number of passengers and load carrying capacity. The vehicle shall meet the relevant government regulations and registered under the name of the Concessionaire. The vehicles shall be maintained in good condition to run on the Project. The vehicle shall clearly indicate as maintenance vehicle on the side of the vehicle and a yellow flashing light shall be provided on the roof of the vehicle. A set of traffic safety devices consisting of safety cones, stand-alone flashing light, and reflective guide and warning signs shall be provided to the maintenance vehicle. The cost of obtaining, operating and maintaining the maintenance vehicle shall be included in the contract and no separate payment shall be made.

11. ***Service Level Requirements (SLR)***

Service level means the service delivery criteria established for the services specified in Service Level Table. The purpose of Service Levels specified in the Service Levels Tables is to clearly define the levels of service which shall be provided by the Concessionaire to NHAI during O&M period i.e. Five Years from the date of Completion of ATMS. The service level parameters mentioned in the service level table shall be measured on a quarterly basis as per the individual service level parameter requirements, through appropriate service level measurement tool of Facility Monitoring System (FMS) and Network Management System (NMS). Measurement of service levels for systems shall be automatic using reports from appropriate management tool of FMS. Measurement of service levels for services, which are not delivered using a dedicated tool, will be carried out using appropriate and relevant reports from the Service Desk tool.

Measurement of Service Level parameters will be carried out on cumulative basis in a quarter. The Concessionaire needs to try to ensure that the service levels as per service level table. Concessionaire needs to submit service level report in a quarter

If the performance of the system/services is degraded significantly at any given point in time during the contract and if the immediate measures are not implemented and issues are not rectified to the complete satisfaction of NHAI, then NHAI will have the right to take appropriate corrective actions including termination of the Agreement.

The Concessionaire and NHAI shall regularly review the performance of the services being provided by the Concessionaire and the effectiveness of his Service Levels. The Concessionaire is responsible for development and implementation of appropriate management tools of FMS. which shall be basis for all project reviews.

For all cases, the failure shall be classified into three severity levels, critical, major and minor. The Concessionaire shall satisfy the Service Levels specified for each type of service as presented in Service Levels table.

1) The Formula of calculation of availability is shown as follows.

Availability={1-{[(A)/(B-C)] *100}}
Where
A= Time for which system is down
B = Total Time
C= Scheduled downtime

Note: Total Time shall measure on 24x7 basis

2) Service Level Requirement for Equipment is shown below table below

No	Parameter	severity levels	Target
1.Traffic Management Centre Equipment & Sub-centre equipment			
1.1	Server Availability (TMC and internet servers including the OS, database and any other application running on it)	Critical	99%
1.2	Console Availability (TMCS)	Critical	99%
1.3	Console Availability (TTMS, ATCC)	Major	97%
1.4	Console Availability (FMS)	Minor	95%
1.5	Console Availability (Internet)	Major	97%
1.6	Operational Availability (VIDS)	Critical	99%
1.7	Operational Availability (1033)	Critical	99%
1.8	Operational Availability (VSDS)	Minor	95%
1.9	Operational Availability (FMS)	Minor	95%
1.10	Storage Availability (Including power availability, network availability, availability of links to applications and databases)	Critical	99%
1.11	Graphic Display	Critical	99%
1.12	Camera Monitor	Major	97%
1.13	Network Connectivity Between Main TCC – Sub centre – Roadside equipment	Critical	99%
2. Field Equipment			
2.1	Average Uptime Time period of the TMCS Camera.	Major	97%
2.2	Average Uptime Time period of the VIDS Camera .	Critical	99%
2.3	Average Uptime Time period of the Internet	Major	97%
2.4	Average Uptime Time period of the VSDS	Major	97%
2.5	Average Uptime Time period of the ATSC and RLVD	Major	97%

3) Service Level Requirement for Operations is shown in table below

S. No.	Requirement	Deliverable & Metric	Remarks
1	**Receive and handle Emergency Calls**		
1.1	24x7 monitoring and handling of Emergency calls received from road-side Emergency telephones or from the 24x7 National Highways helpline.	Daily shift-wise logs accounting for handling ALL calls arriving at the Control center and monitoring of time taken to resolve/address the issues	Automatic ATMS system Generated report on calls arrived and calls handled.
2	**Routine Monitoring of the status of Traffic**		
2.1	24x7 monitoring from the ATMS Control Centre /TMC/ Sub-centre(s) using personnel stipulated in the Process document.	Daily shift-wise activity logs, accounting for 24 x 7 x 365 hours of operation for a typical year	Automatic ATMS system generated report
3.	**Accident / Incident / Traffic Management**		
3.1	Response to incidents (e.g.	a) Informing the ambulance within 3	Automatic ATMS system

	Emergency calls received at the ATMS Control Centre/ TMC / Sub-centre) within stipulated time and enabling of all actions for optimal rescue and traffic normalization, including the rapid deployment of vehicles (ambulances, breakdown cranes and Patrol vehicles)	minutes of receipt of Emergency Call reporting an accident. b) Informing the Selected Trauma Care Centre(s) within 5 minutes of receipt of Emergency Call reporting an accident. c) Sending the first set of appropriate announcement and guidance messages via Mobile apps (as applicable) to road users within 5 minutes of receipt of Emergency Call reporting an accident. d) Continuous monitoring of the progress of Emergency vehicles & capture of their time stamp of reaching site and reaching the trauma care centre (in case of an ambulance) with the victim. e) Providing inputs to the emergency vehicles (in terms of estimated travel times, optimal routes etc.) during their journey to the site and to the trauma care centre.	generated report & recorded audio files
4	**Enforcement Support**		
4.1	Provide evidence of over speeding vehicle and other violations to the police/ enforcement agency for enforcement purposes in prescribed format. Detection of unsafe driving (over speeding, not driving in designated lanes, driving in wrong direction, wrong parking / stopped vehicle, over dimension, etc. Detection of vehicles not permitted to use highways, animal on highways, vehicles damaging highways, spilling of hazardous materials on highways, etc. Detection of vandalism / theft attempt/ damage to highway property / assets (road signs, lighting, crash barrier, median plantation, etc.	Taking cognizance of incidents (after due validation) detected by the VIDS, VSDS, TMCS, etc. e.g. Illegal lane cutting and heavy vehicles in fast lane and provide immediate communication within 1 minutes to relevant agencies. (Police, Emergency vehicles etc.) for taking action. Providing information of incident such as vandalism/ damage to highway property/ theft attempt etc to immediately within 1 minutes to relevant agencies. (Police, patrol vehicles, security, etc.) for taking action. Provide evidence of incident to relevant agencies (Highway Patrol,	Automatic system generated log of action performed in the form of a report

		Police) with Incident location, date and time of detection of incident, type of incident, visual image, within 3 minute of incident detection by VIDS/ TMCS/ VSDS/Motion detection camera/ any other camera connected with ATMS system. Provide evidence of over speeding and other traffic violations (when detected by the VSDS/ VIDS/ TMCS, etc) including the following details: a) Location, Date and time stamp of over speed detection/ violation; b) Vehicle details in terms of vehicle class, registration number; c) An electronic visual image of the vehicle; d) The above information (audited/ validated by Operator) also to be provided by E-mail / API in prescribed format within 3 minutes of the over speed detection / violation detection, etc.	
5	**Real Time Access to ATMS Operations of Control Centers**		
	Keeping the system gateway open for NHAI and other enforcement agencies for remote access / online access / data transfer / live video streaming / access to report module / FMS / NMS, etc. The system gateway shall be kept open 24 x 7 x 365 for NHAI and other enforcement agencies for assessing the availability of individual system component of the ATMS as defined by NHAI from time to time.	99.65% of 24 X 7 X 365 hour monthly System availability for NHAI and other enforcement agencies access	Automatic System generated system availability report as measured by the Network Management System + Random remote access checks by NHAI/ Independent Engineer.

12. ***Service Levels Review Process***

1) Either NHAI or Contractor may raise an issue by documenting the business or technical problem, which presents a reasonably objective summary of both points of view and identifies specific points of disagreement with possible solutions.
2) A meeting or conference call will be conducted to resolve the issue in a timely manner. The documented issues will be distributed to the participants at least 24 hours prior to the discussion if the issue is not an emergency requiring immediate attention.
3) The NHAI and the Contractor shall develop an interim solution, if required, and subsequently the permanent solution for the problem at hand. The Contractor will then communicate the resolution to all interested parties.
4) In case the issue is still unresolved, the arbitration procedures described in the Contract Agreement will be applicable.

13. ***Performance Damages / Penalty***

The Contractor would be penalized for non-compliance in meeting SLR for Operations as well as Maintenance of the Project. Any penalty levied by NHAI or NHAI's representative shall be applicable and deducted from the amount payable during the maintenance period. The Contractor should enable and facilitate continuous measurement of all-round performance of the ATMS System and not just event-based performance. The penalties are detailed here under:

a. For non-compliance of SLR under maintenance requirement, penalty of INR 10,000 per day per sub-system / component / equipment shall be imposed if the down time exceeds the maximum permissible on each instance.

b. For non-compliance of SLR under operations requirement, the penalty of INR 1,00,000 per event shall be imposed.

c. For non-availability of O&M personnel at site, penalty shall be imposed as per the table below:

Sr. No.	Staff	Per day penalty (INR)
A. Technical Staff		
1	System Maintenance Engineer/ Manager	5,000
2	System IT Engineer	4,000
3	System Maintenance Technicians	2,000
4	Maintenance Vehicle with Driver and helper	5,000
5	Man-hoist vehicle with Driver and helper	10,000
B. Control Room Operations Staff		
1	Traffic Management Manager	12,000
2	Traffic Management Engineer	5,500
3	Asst Manager – Operations	3,000
4	Control Room operators	1,500
5	Support Staff	1,200
6	Office Assistant	1,000
7	Security Guard	1,000

d. NHAI shall consider termination of Concessionaire / ATMS sub-Contractor, if the number of non-compliance events exceeds 50 during any month, at the cost and risk of the Concessionaire.

e. Admin rights of all third part tools / software for monitoring SLA shall be with the Authority.

14. ***Spare Parts and Consumables***

The Concessionaire shall maintain required spare parts to maintain required service levels. An undertaking to be submitted along with Technical Proposal that the Concessionaire has the sufficient infrastructure and capability to keep/store spares required for maintenances and will at all times during the contract period maintain sufficient inventory of spares and consumables for operating and maintaining the ATMS and to meet the Service Level requirements.

SCHEDULE - L

(See Clause 18.1.1)

SAFETY REQUIREMENTS

Guiding principles

1.1 Safety Requirements aim at reduction in injuries, loss of life and damage to property resulting from accidents on or about the Project, irrespective of the person(s) at fault.

1.2 Users of the Project include motorised and non-motorized vehicles as well as pedestrians and animals involved in, or associated with accidents. Vulnerable Road Users (VRU) include pedestrians as well as riders of motorized two-wheelers, bicycles and other vehicles which do not provide adequate occupant protection.

1.3 Safety Requirements apply to all phases of construction, operation and maintenance with emphasis on identification of factors associated with accidents, consideration of the same, and implementation of appropriate remedial measures.

1.4 Safety Requirements include measures associated with traffic management and regulation such as road signs, pavement marking, traffic control devices, roadside furniture, highway design elements, enforcement and emergency response.

2 Obligations of the Concessionaire

The Concessionaire shall abide by the following insofar as they relate to safety of the Users:

(a) Applicable Laws and Applicable Permits;

(b) Manual for Safety in Road Design, issued by MoRTH;

(c) Relevant Standards/Guidelines of IRC relating to safety, road geometries, bridges, culverts, road signs, pavement marking and roadside furniture;

(d) Provisions of this Agreement; and

(e) Good Industry Practice.

3 Appointment of Safety Consultant

For carrying out safety audit of the Project under and in accordance with this Schedule-L, the Authority shall appoint from time to time, one or more qualified firms or organisations as its consultants (the "Safety Consultant"). The Safety Consultant shall employ a team comprising, without limitation, one road safety expert and one traffic planner to undertake safety audit of the Project.

4 Safety measures during Development Period

4.1 No later than 90 (ninety) days from the date of this Agreement, the Authority shall appoint a Safety Consultant for carrying out safety audit at the design stage of the Project. The Safety Consultant shall collect data on all fatal crashes and other road accidents which occurred on the Project in the preceding two years by obtaining copies of the relevant First Information Reports (FIRs) from the police stations having jurisdiction. The information contained in such FIRs shall be summarised in the form prescribed by the Authority for this

purpose and the data shall be analysed for the type of victims killed or injured, impacting vehicles, location of accidents and other relevant factors.

4.2 The Concessionaire shall provide to the Safety Consultant, in four copies, the relevant drawings containing the design details that have a bearing on safety of Users (the "Safety Drawings"). Such design details shall include horizontal and vertical alignments; sightlines; layouts of intersections; interchanges; road cross-section; bridges and culverts; side drains; provision for parked vehicles, slow moving vehicles (tractors, bullock carts, bicycles) and pedestrians; bus bays; truck lay-bys; and other incidental or consequential information. The Safety Consultant shall review the design details and forward 3 (three) copies of the Safety Drawings with its recommendations, if any, to the Independent Engineer who shall record its comments, if any, and forward one copy each to the Authority and the Concessionaire.

4.3 The accident data and the design details shall be compiled, analysed and used by the Safety Consultant for evolving a package of recommendations consisting of safety related measures for the Project. The safety audit shall be completed in a period of three months and a report thereof (the "Safety Report") shall be submitted to the Authority, in 5 (five) copies. One copy each of the Safety Report shall be forwarded by the Authority to the Concessionaire and the Independent Engineer forthwith.

4.4 The Concessionaire shall endeavor to incorporate the recommendations of the Safety Report in the design of the Project, as may reasonably be required in accordance with Applicable Laws, Applicable Permits, Manuals and Guidelines of the Authority, Specifications and Standards, and Good Industry Practice. If the Concessionaire does not agree with any or all of such recommendations, it shall state the reasons thereof and convey them to the Authority forthwith. In the event that any or all of the works and services recommended in the Safety Report fall beyond the scope of Schedule-B, Schedule-C or Schedule-D, the Concessionaire shall make a report thereon and seek the instructions of the Authority for funding such works in accordance with the provisions of Article 18.

4.5 Without prejudice to the provisions of Paragraph 4.4, the Concessionaire and the Independent Engineer shall, within 15 (fifteen) days of receiving the Safety Report, send their respective comments thereon to the Authority, and no later than 15 (fifteen) days of receiving such comments, the Authority shall review the same along with the Safety Report and by notice direct the Concessionaire to carry out any or all of the recommendations contained therein with such modifications as the Authority may specify; provided that any works or services required to be undertaken hereunder shall be governed by the provisions of Article 18.

5 Safety measures during Construction Period

5.1 A Safety Consultant shall be appointed by the Authority, no later than 4 (four) months prior to the expected COD, for carrying out a safety audit of the completed Construction Works.

5.2 The Safety Consultant shall collect and analyses the accident data for the preceding two years in the manner specified in Paragraph 4.1 of this Schedule- L. It shall study the Safety Report for the Development Period and inspect the Project to assess the adequacy of safety measures. The Safety Consultant shall complete the safety audit within a period of 4 (four) months and submit a Safety Report recommending a package of additional road safety measures, if any, that are considered essential for reducing accident hazards on the Project. Such recommendations shall be processed, mutatis mutandis, and acted upon in the manner set forth in Paragraphs 4.3, 4.4 and 4.5 of this Schedule-L.

5.3 The Concessionaire shall make adequate arrangements during the Construction Period for the safety of workers and road Users in accordance with the guidelines of IRC for safety in construction zones, and notify the Authority and the Independent Engineer about such arrangements.

6 Safety measures during Operation Period

6.1 The Concessionaire shall develop, implement and administer a surveillance and safety program for Users, including correction of safety violations and deficiencies and all other actions necessary to provide a safe environment in accordance with this Agreement.

6.2 The Concessionaire shall establish a Highway Safety Management Unit (the "HSMU") to be functional on and after COD, and designate one of its officers to be in-charge of the HSMU. Such officer shall have specialist knowledge and training in road safety and traffic engineering by having attended a course conducted by a reputed organization on the subject.

6.3 The Concessionaire shall keep a copy of every FIR recorded by the Police with respect to any accident occurring on the Project. In addition, the Concessionaire shall also collect data for all cases of accidents not recorded by the Police but where a vehicle rolled over or had to be towed away. The information so collected shall be summarized in the form prescribed by the Authority for this purpose. The Concessionaire shall also record the exact location of each accident on a road map. The aforesaid data shall be submitted to the Authority at the conclusion of every quarter and to the Safety Consultant as and when appointed.

6.4 The Concessionaire shall submit to the Authority before the 31st(thirty first) May of each year, an annual report (in ten copies) containing, without limitation, a detailed listing and analysis of all accidents of the preceding Accounting Year and the measures taken by the Concessionaire pursuant to the provisions of Paragraph 6.1 of this Schedule-L for averting or minimizing such accidents in future.

6.5 Once in every Accounting Year, a safety audit shall be carried out by the Safety Consultant to be appointed by the Authority. It shall review and analyses the annual report and accident data of the preceding year, and undertake an inspection of the Project. The Safety Consultant shall complete the safety audit within a period of 1 (one) month and submit a Safety Report recommending specific improvements, if any, required to be made to the road, bridges, culverts, markings, signs, road furniture and Project Facilities, including cattle crossings and pedestrian crossings. Such recommendations shall be processed, mutatis mutandis, and acted upon in the manner set forth in Paragraphs 4.3, 4.4 and 4.5 of this Schedule-L.

7 Costs and expenses

Costs and expenses incurred in connection with the Safety Requirements set forth herein, including the provisions of Paragraph 2 of this Schedule-L, shall be met in accordance with Article 18, and in particular, the remuneration of the Safety Consultant, safety audit, and costs incidental thereto, shall be met by the Concessionaire.

SCHEDULE - M

(See Clause 21.1)

SELECTION OF INDEPENDENT ENGINEER

1 Selection of Independent Engineer

1.1 The provisions of the Model Request for Proposals for Selection of Technical Consultants, issued by the Ministry of Finance, GOI vide OM 24(23)/PF-II/ 2008 dated 21 May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an Independent Engineer. Provided, however, that no entity which is owned or controlled by the Authority shall be eligible for appointment as the Independent Engineer hereunder.

1.2 In the event of termination of an Independent Engineer appointed in accordance with the provisions of Paragraph 1.1, the Authority shall appoint another firm of Technical Consultants forthwith or may engage a government-owned entity in accordance with the provisions of Paragraph 5 of this Schedule-M.

1.3 The Concessionaire may, in its discretion, nominate a representative to participate in the process of selection to be undertaken by the Authority under this Schedule-M.

2 Terms of Reference

The Terms of Reference for the Independent Engineer shall substantially conform to Schedule-N.

3 Fee and expenses

3.1 In determining the nature and quantum of duties and services to be performed by the Independent Engineer during the Development Period and Construction Period, the Authority shall endeavor that payments to the Independent Engineer on account of fee and expenses do not exceed 3% (three per cent) of the Bid Project Cost. Payments not exceeding such 3% (three per cent) shall be borne equally by the Authority and the Concessionaire in accordance with the provisions of this Agreement and any payments in excess thereof shall be borne entirely by the Authority.

3.2 The nature and quantum of duties and services to be performed by the Independent Engineer during the Operation Period shall be determined by the Authority in conformity with the provisions of this Agreement and with due regard for economy in expenditure. All payments made to the Independent Engineer on account of fee and expenses during the Operation Period shall be borne equally by the Authority and the Concessionaire.

4 Selection every three years

No later than 3 (three) years from the date of appointment of Independent Engineer pursuant to the provisions of Paragraph 1 of this Schedule-M, and every 3 (three) years thereafter, the Authority shall engage another firm in accordance with the criteria set forth in this Schedule-M.

5 Appointment of government entity as Independent Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Independent Engineer; provided

that such entity shall be a body corporate having as one of its primary function the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government- owned entity which is owned or controlled by the Authority shall not be eligible for appointment as Independent Engineer.

SCHEDULE - N

(See Clause 21.2.1)

TERMS OF REFERENCE FOR INDEPENDENT ENGINEER

1 Scope

These Terms of Reference for the Independent Engineer (the "TOR") are being specified pursuant to the Concession Agreement dated (the "Agreement"), which has been entered into between the Authority and the "Concessionaire") for 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) on design, build, operate and transfer (the "DBOT Annuity or Hybrid Annuity") basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

2 Definitions and interpretation

2.1 The words and expressions beginning with or in capital letters used in this TOR and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.

2.2 References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.

2.3 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Agreement shall apply, mutatis mutandis, to this TOR.

3.1 The role and functions of the Independent Engineer shall include the following:

(I) review of the Drawings and Documents as set forth in Paragraph 4;

(ii) Review, inspection and monitoring of Construction Works as set forth in Paragraph 5; conducting Tests on completion of construction and issuing Completion/ Provisional Certificate as set forth in Paragraph 5

(iv) Review, inspection and monitoring of O&M as set forth in Paragraph 6;

(v) review, inspection and monitoring of Divestment Requirements as set forth in Paragraph 7;

(vi) determining, as required under the Agreement, the costs of any works or services and/or their reasonableness;

(vii) determining, as required under the Agreement, the period or any extension thereof, for performing any duty or obligation;

(viii) Assisting the Parties in resolution of Disputes as set forth in Paragraph 9; and

(ix) Undertaking all other duties and functions in accordance with the Agreement.

3.2 The Independent Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.

4 Development Period

4.1 During the Development Period, the Independent Engineer shall undertake a detailed review of the Drawings to be furnished by the Concessionaire along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys and traffic surveys. The Independent Engineer shall complete such review and send its comments/ observations to the Authority and the Concessionaire within 15 (fifteen) days of receipt of such Drawings. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.

4.2 The Independent Engineer shall review any modified Drawings or supporting Documents sent to it by the Concessionaire and furnish its comments within 7 (seven) days of receiving such Drawings or Documents.

4.3 The Independent Engineer shall review the Drawings sent to it by the Safety Consultant in accordance with Schedule-L and furnish its comments thereon to the Authority and the Concessionaire within 7 (seven) days of receiving such Drawings. The Independent Engineer shall also review the Safety Report and furnish its comments thereon to the Authority within 15 (fifteen) days of receiving such report.

4.4 The Independent Engineer shall review the detailed design, construction methodology, quality assurance procedures and the procurement, engineering and construction time schedule sent to it by the Concessionaire and furnish its comments within 15 (fifteen) days of receipt thereof.

4.5 Upon reference by the Authority, the Independent Engineer shall review and; comment on the EPC Contract or any other contract for construction, operation and maintenance of the Project, and furnish its comments within 7 (seven) days from receipt of such reference from the Authority.

5 Construction Period

5.1 In respect of the Drawings, Documents and Safety Report received by the Independent Engineer for its review and comments during the Construction Period, the provisions of Paragraph 4 shall apply, mutatis mutandis.

5.2 The Independent Engineer shall review the monthly progress report furnished by the Concessionaire and send its comments thereon to the Authority and the Concessionaire within 7 (seven) days of receipt of such report.

5.3 The Independent Engineer shall inspect the Construction Works and the Project once every month, preferably after receipt of the monthly progress report from the Concessionaire, but before the 20th (twentieth) day of each month in any case, and make out a report of such inspection (the "Inspection Report") setting forth an overview of the status, progress, quality and safety of construction, including the work methodology adopted, the materials used and their sources, and conformity of Construction Works with the Scope of the Project and the Specifications and Standards. In a separate section of the Inspection Report, the Independent Engineer shall describe in reasonable detail the lapses, defects or deficiencies observed by it in the construction of the Project. The Inspection Report shall also contain a

review of the maintenance of the existing lanes in conformity with the provisions of the Agreement. The Independent Engineer shall send a copy of its Inspection Report to the Authority and the Concessionaire within 7 (seven) days of the inspection.

5.4 The Independent Engineer may inspect the Project more than once in a month if any lapses, defects or deficiencies require such inspections.

5.5 For determining that the Construction Works conform to Specifications and Standards, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests on a sample basis, to be specified by the Independent Engineer in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 5.5, the tests specified in the IRC Special Publication-11 (Handbook of Quality Control for Construction of Roads and Runways) and the Specifications for Road and Bridge Works issued by the Authority (the "Quality Control Manuals") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance. The Independent Engineer shall issue necessary directions to the Concessionaire for ensuring that the tests are conducted in a fair and efficient manner, and shall monitor and review the results thereof.

5.6 The sample size of the tests, to be specified by the Independent Engineer under Paragraph 5.5, shall comprise 10% (ten per cent) of the quantity or number of tests prescribed for each category or type of tests in the Quality Control Manuals; provided that the Independent Engineer may, for reasons to be recorded in writing, increase the aforesaid sample size by up to 10% (ten per cent) for certain categories or types of tests.

5.7 The timing of tests referred to in Paragraph 5.5, and the criteria for acceptance/ rejection of their results shall be determined by the Independent Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Concessionaire for its own quality assurance in accordance with Good Industry Practice.

5.8 In the event that the Concessionaire carries out any remedial works for removal or rectification of any defects or deficiencies, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests to determine that such remedial works have brought the Construction Works into conformity with the Specifications and Standards, and the provisions of this Paragraph 5 shall apply to such tests.

5.9 In the event that the Concessionaire fails to achieve any of the Project Milestones, the Independent Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Independent Engineer shall determine that completion of the Project is not feasible within the time specified in the Agreement, it shall require the Concessionaire to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which COD shall be achieved. Upon receipt of a report from the Concessionaire, the Independent Engineer shall review the same and send its comments to the Authority and the Concessionaire forthwith.

5.10 If at any time during the Construction Period, the Independent Engineer determines that the Concessionaire has not made adequate arrangements for the safety of workers and Users in the zone of construction or that any work is being carried out in a manner that threatens the safety of the workers and the Users, it shall make a recommendation to the Authority forthwith, identifying the whole or part of the Construction Works that should be suspended for ensuring safety in respect thereof.

5.11 In the event that the Concessionaire carries out any remedial measures to secure the safety of suspended works and Users, it may, by notice in writing, require the Independent Engineer to inspect such works, and within 3 (three) days of receiving such notice, the Independent Engineer shall inspect the suspended works and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.

5.12 If suspension of Construction Works is for reasons not attributable to the Concessionaire, the Independent Engineer shall determine the extension of dates set forth in the Project Completion Schedule, to which the Concessionaire is reasonably entitled, and shall notify the Authority and the Concessionaire of the same.

5.13 The Independent Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-I and issue a Completion Certificate or Provisional Certificate, as the case may be. For carrying out its functions under this Paragraph 5.13 and all matters incidental thereto, the Independent Engineer shall act under and in accordance with the provisions of Article 14 and Schedule-I.

5.14 Upon reference from the Authority, the Independent Engineer shall make a fair and reasonable assessment of the costs of providing information, works and services as set forth in Article 16 and certify the reasonableness of such costs for payment by the Authority to the Concessionaire.

5.15 The Independent Engineer shall aid and advise the Concessionaire in preparing the Maintenance Manual.

5.16 Upon reference from the Authority, the Independent Engineer shall undertake the assessment of cost of civil works, as per applicable schedule of rates, for the reduction of Scope of work as provided in Clause 16.6.1 of the Concession Agreement.

6 Operation Period

6.1 In respect of the Drawings, Documents and Safety Report received by the Independent Engineer for its review and comments during the Operation Period, the provisions of Paragraph 4 shall apply, mutatis mutandis.

6.2 The Independent Engineer shall review the annual Maintenance Program furnished by the Concessionaire and send its comments thereon to the Authority and the Concessionaire within 15 (fifteen) days of receipt of the Maintenance Program.

6.3 The Independent Engineer shall review the monthly status report furnished by the Concessionaire and send its comments thereon to the Authority and the Concessionaire within 7 (seven) days of receipt of such report.

6.4 The Independent Engineer shall inspect the Project once every month, preferably after receipt of the monthly status report from the Concessionaire, but before the 20th (twentieth) day of each month in any case, and make out an O&M Inspection Report setting forth an overview of the status, quality and safety of O&M including its conformity with the Maintenance Requirements and Safety Requirements. In a separate section of the O&M Inspection Report, the Independent Engineer shall describe in reasonable detail the lapses, defects or deficiencies observed by it in O&M of the Project. The Independent Engineer shall send a copy of its O&M Inspection Report to the Authority and the Concessionaire within 7 (seven) days of the inspection.

6.5 The Independent Engineer may inspect the Project more than once in a month, if any lapses, defects or deficiencies require such inspections.

6.6 The Independent Engineer shall in its O&M Inspection Report specify the tests, if any, that the Concessionaire shall carry out, or cause to be carried out, for the purpose of determining that the Project is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Concessionaire in this behalf.

6.7 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- K, the Independent Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.

6.8 The Independent Engineer shall determine if any delay has occurred in completion of repair or remedial works in accordance with the Agreement, and shall also determine the Damages, if any, payable by the Concessionaire to the Authority for such delay.

6.9 The Independent Engineer shall examine the request of the Concessionaire for closure of any lane(s) of the carriageway for undertaking maintenance/repair thereof, keeping in view the need to minimize disruption in traffic and the time required for completing such maintenance/repair in accordance with Good Industry Practice. It shall grant permission with such modifications, as it may deem necessary, within 3 (three) days of receiving a request from the Concessionaire. Upon expiry of the permitted period of closure, the Independent Engineer shall monitor the re-opening of such lane(s), and in case of delay, determine the Damages payable by the Concessionaire to the Authority under Clause 17.7.

6.10 The Independent Engineer shall monitor and review the curing of defects and deficiencies by the Concessionaire as set forth in Clause 19.4.

6.11 In the event that the Concessionaire notifies the Independent Engineer of any modifications that it proposes to make to the Project, the Independent Engineer shall review the same and send its comments to the Authority and the Concessionaire within 15 (fifteen) days of receiving the proposal.

6.12 The Independent Engineer shall undertake traffic sampling, as and when required by the Authority, under and in accordance with the provisions of this Agreement.

7 Termination

7.1 At any time, not earlier than 90 (ninety) days prior to Termination but not later than 15 (fifteen) days prior to such Termination, the Independent Engineer shall, in the presence of a representative of the Concessionaire, inspect the Project for determining compliance by the Concessionaire with the Divestment Requirements set forth in Clause 32.1 and, if required, cause tests to be carried out at the Concessionaire's cost for determining such compliance. If the Independent Engineer determines that the status of the Project is such that its repair and rectification would require a larger amount than the sum set forth in Clause 33.2, it shall recommend retention of the required amount in the Escrow Account and the period of retention thereof.

7.2 The Independent Engineer shall inspect the Project once in every 15 (fifteen) days during a period of 90 (ninety) days after Termination for determining the liability of the

Concessionaire under Article 33, in respect of the defects or deficiencies specified therein. If any such defect or deficiency is found by the Independent Engineer, it shall make a report in reasonable detail and send it forthwith to the Authority and the Concessionaire.

8 Determination of costs and time

8.1 The Independent Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.

8.2 The Independent Engineer shall determine the period, or any extension thereof, that is required to be determined by it under the Agreement.

9 Assistance in Dispute resolution

9.1 When called upon by either Party in the event of any Dispute, the Independent Engineer shall mediate and assist the Parties in arriving at an amicable settlement.

9.2 In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the Independent Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

10 Other duties and functions

The Independent Engineer shall perform all other duties and functions specified in the Agreement.

11 Miscellaneous

11.1 The Independent Engineer shall notify its programmer of inspection to the Authority and to the Concessionaire, who may, in their discretion, depute their respective representatives to be present during the inspection.

11.2 A copy of all communications, comments, instructions, Drawings or Documents sent by the Independent Engineer to the Concessionaire pursuant to this TOR, and a copy of all the test results with comments of the Independent Engineer thereon shall be furnished by the Independent Engineer to the Authority forthwith.

11.3 The Independent Engineer shall obtain, and the Concessionaire shall furnish in 2 (two) ..... Copies thereof, all communications and reports required to be submitted, under this Agreement, by the Concessionaire to the Independent Engineer, whereupon the Independent Engineer shall send 1 (one) of the copies to the Authority along with its comments thereon.

11.4 The Independent Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

11.5 Upon completion of its assignment hereunder, the Independent Engineer shall duly classify and list all Drawings, Documents, results of tests and other relevant records, and hand them over to the Authority or such other person as the Authority may specify, and obtain written receipt thereof. Two copies of the said documents shall also be furnished in their editable digital format or in such other medium or manner as may be acceptable to the Authority.

11.6 Wherever no period has been specified for delivery of services by the Independent Engineer, the Independent Engineer shall act with the efficiency and urgency necessary for discharging its functions in accordance with Good Industry Practice.

SCHEDULE -O

(See Clause 25.1.2)

ESCROW AGREEMENT

THIS ESCROW AGREEMENT is entered into on this the day of 20 AMONGST

1 Limited, a company incorporated under the provisions of the Companies Act, 2013 and having its registered office at (hereinafter referred to as the "Concessionaire" which expression shall, unless repugnant to the context or meaning thereof, include its successors, permitted assigns and substitutes);

2 (insert name and particulars of Lenders' Representative) and having its registered office at acting for and on behalf of the Senior Lenders as their duly authorized agent with regard to matters arising out of or in relation to this Agreement (hereinafter referred to as the "Lenders' Representative" which expression shall, unless repugnant to the context or meaning thereof, include its successors and substitutes);

3 (insert name and particulars of the Escrow Bank) and having its registered office at (hereinafter referred to as the "Escrow Bank" which expression shall, unless repugnant to the context or meaning thereof, include its successors and substitutes); and

4 The President of India/ Governor of represented by and having its principal offices at (hereinafter referred to as the "Authority" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns).

WHEREAS:

(A) The Authority has entered into a Concession Agreement dated with the Concessionaire (the "Concession Agreement") for the 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) (the "Project") on design, build, operate and transfer (the "DBOT Annuity or Hybrid Annuity") basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this Agreement.

(B) Senior Lenders have agreed to finance the Project in accordance with the terms and conditions set forth in the Financing Agreements.

(C) The Concession Agreement requires the Concessionaire to establish an Escrow Account, inter alia, on the terms and conditions stated therein.

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

1 DEFINITIONS AND INTERPRETATION

1.1 Definitions

In this Agreement, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them:

"Agreement" means this Escrow Agreement and any amendment thereto made in accordance with the provisions contained herein;

"Concession Agreement" means the Concession Agreement referred to in Recital (A) above and annexed hereto as Annex-A, and shall include all of its Recitals and Schedules and any amendments made thereto in accordance with the provisions contained in this behalf therein;

"Cure Period" means the period specified in this Agreement for curing any breach or default of any provision of this Agreement by the Concessionaire, and shall commence from the date on which a notice is delivered by the Authority or the Lenders' Representative, as the case may be, to the Concessionaire asking the latter to cure the breach or default specified in such notice;

"Escrow Account" means an escrow account established in terms of and under this Agreement, and shall include the Sub-Accounts;

"Escrow Default" shall have the meaning ascribed thereto in Clause 6.1;

"Lenders' Representative" means the person referred to as the Lenders' Representative in the foregoing Recitals;

"Parties" means the parties to this Agreement collectively and "Party" shall mean any of the Parties to this Agreement individually;

"Payment Date" means, in relation to any payment specified in Clause 4.1, the date(s) specified for such payment; and

"Sub-Accounts" means the respective sub-accounts of the Escrow Account, into which the monies specified in Clause 4.1 would be credited every month and paid out if due, and if not due in a month then appropriated proportionately in such month and retained in the respective sub-accounts and paid out therefrom on the Payment Date(s).

1.2 Interpretation

1.2.1 References to Lenders' Representative shall, unless repugnant to the context or meaning thereof, mean references to the Lenders' Representative, acting for and on behalf of Senior Lenders.

1.2.2 The words and expressions beginning with capital letters and defined in this Agreement shall have the meaning ascribed thereto herein, and the words and expressions used in this Agreement and not defined herein but defined in the Concession Agreement shall, unless repugnant to the context, have the meaning ascribed thereto in the Concession Agreement.

1.2.3 References to Clauses are, unless stated otherwise, references to Clauses of this Agreement.

1.2.4 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Concession Agreement shall apply, mutatis mutandis, to this Agreement.

2 ESCROW ACCOUNT

2.1 Escrow Bank to act as trustee

2.1.1 The Concessionaire hereby appoints the Escrow Bank to act as trustee for the Authority, the Lenders' Representative and the Concessionaire in connection herewith and authorizes the Escrow Bank to exercise such rights, powers, authorities and discretion as are specifically delegated to the Escrow Bank by the terms hereof together with all such rights, powers, authorities and discretion as are reasonably incidental hereto, and the Escrow Bank accepts such appointment pursuant to the terms hereof.

2.1.2 The Concessionaire hereby declares that all rights, title and interest in and to the Escrow Account shall be vested in the Escrow Bank and held in trust for the Authority, the Lenders' Representative and the Concessionaire, and applied in accordance with the terms of this Agreement. No person other than the Authority, the Lenders' Representative and the Concessionaire shall have any rights hereunder as the beneficiaries of or as third party beneficiaries under this Agreement.

2.2 Acceptance of Escrow Bank

The Escrow Bank hereby agrees to act as such and to accept all payments and other amounts to be delivered to and held by the Escrow Bank pursuant to the provisions of this Agreement. The Escrow Bank shall hold and safeguard the Escrow Account during the term of this Agreement and shall treat the amount in the Escrow Account as monies deposited by the Concessionaire, Senior Lenders or the Authority with the Escrow Bank. In performing its functions and duties under this Agreement, the Escrow Bank shall act in trust for the benefit of, and as agent for, the Authority, the Lenders' Representative and the Concessionaire or their nominees, successors or assigns, in accordance with the provisions of this Agreement.

2.3 Establishment and operation of Escrow Account

2.3.1 Within 30 (thirty) days from the date of this Agreement, and in any case prior to the Appointed Date, the Concessionaire shall open and establish the Escrow Account with the (name of Branch) Branch of the Escrow Bank. The Escrow Account shall be denominated in Rupees.

2.3.2 The Escrow Bank shall maintain the Escrow Account in accordance with the terms of this Agreement and its usual practices and applicable regulations, and pay the maximum rate of interest payable to similar customers on the balance in the said account from time to time.

2.3.3 The Escrow Bank and the Concessionaire shall, after consultation with the Lenders' Representative, agree on the detailed mandates, terms and conditions, and operating procedures for the Escrow Account, but in the event of any conflict or inconsistency between this Agreement and such mandates, terms and conditions, or procedures, this Agreement shall prevail.

2.4 Escrow Bank's fee The Escrow Bank shall be entitled to receive its fee and expenses in an amount, and at such times, as may be agreed between the Escrow Bank and the Concessionaire. For the avoidance of doubt, such fee and expenses shall form part of the O&M Expenses and shall be appropriated from the Escrow Account in accordance with Clause 4.1.

2.5 Rights of the Parties Save and except as otherwise provided in the Concession Agreement, the rights of the Authority, the Lenders' Representative and the Concessionaire in the monies held in the Escrow Account are set forth in their entirety in this Agreement and the Authority, the Lenders' Representative and the Concessionaire shall have no other rights against or to the monies in the Escrow Account.

2.6 Substitution of the Concessionaire The Parties hereto acknowledge and agree that upon substitution of the Concessionaire with the Nominated Company, pursuant to the Substitution Agreement, it shall be deemed for the purposes of this Agreement that the Nominated Company is a Party hereto and the Nominated Company shall accordingly be deemed to have succeeded to the rights and obligations of the Concessionaire under this Agreement on and with effect from the date of substitution of the Concessionaire with the Nominated Company.

3 DEPOSITS INTO ESCROW ACCOUNT

3.1 Deposits by the Concessionaire

3.1.1 The Concessionaire agrees and undertakes that it shall deposit into and/or credit the Escrow Account with:

(a) All monies received in relation to the Project from any source, including the Senior Lenders, lenders of Subordinated Debt and the Authority;

(b) All funds received by the Concessionaire from its shareholders, in any manner or form;

(c) Any other revenues; rentals, deposits or capital receipts, as the case may be, from or in respect of the Project; and

(d) All proceeds received pursuant to any insurance claims.

3.1.2 The Concessionaire may at any time make deposits of its other funds into the Escrow Account, provided that the provisions of this Agreement shall apply to such deposits.

3.2 Deposits by the Authority

The Authority agrees and undertakes that, as and when due and payable, it shall deposit into and/or credit the Escrow Account with:

(a) Grant and any other monies disbursed by the Authority to the Concessionaire;

(b) All revenues collected by the Authority in exercise of its rights under the Concession Agreement; and

(c) Termination Payments

Provided that, notwithstanding the provisions of Clause 4.1.1, the Authority shall be entitled to appropriate from the aforesaid amounts, any amounts due and payable to it by the Concessionaire, and the balance remaining shall be deposited into the Escrow Account.

3.3 Deposits by Senior Lenders

The Lenders' Representative agrees, confirms and undertakes that the Senior Lenders shall deposit into and/or credit the Escrow Account with all disbursements made by them in relation to or in respect of the Project; provided that notwithstanding anything to the

contrary contained in this Agreement, the Senior Lenders shall be entitled to make direct payments to the EPC Contractor under and in accordance with the express provisions contained in this behalf in the Financing Agreements.

3.4 Interest on deposits

The Escrow Bank agrees and undertakes that all interest accruing on the balances of the Escrow Account shall be credited to the Escrow Account; provided that the Escrow Bank shall be entitled to appropriate therefrom the fee and expenses due to it from the Concessionaire in relation to the Escrow Account and credit the balance remaining to the Escrow Account.

4 WITHDRAWALS FROM ESCROW ACCOUNT

4.1 Withdrawals during Concession Period

4.1.1 At the beginning of every month, or at such shorter intervals as the Lenders' Representative and the Concessionaire may by written instructions determine, the Escrow Bank shall withdraw amounts from the Escrow Account and appropriate them in the following order by depositing such amounts in the relevant Sub-Accounts for making due payments, and if such payments are not due in any month, then retain such monies in such Sub-Accounts and pay out therefrom on the Payment Date(s):

(a) All taxes due and payable by the Concessionaire for and in respect of the Project;

(b) [Deleted];

(c) All payments relating to construction of the Project, subject to and in accordance with the conditions, if any, set forth in the Financing Agreements;

(d) O&M Expenses, subject to the ceiling, if any, set forth in the Financing Agreements;

(e) O&M Expenses and other costs and expenses incurred by the Authority in accordance with the provisions of the Concession Agreement, and certified by the Authority as due and payable to it;

(f) Any amounts due and payable to the Authority;

(g) Monthly proportionate provision of Debt Service due in an Accounting Year;

(h) all payments and Damages certified by the Authority as due and payable to it by the Concessionaire pursuant to the Concession Agreement;

(i) Monthly proportionate provision of debt service payments due in an Accounting Year in respect of Subordinated Debt;

(j) any reserve requirements set forth in the Financing Agreements; and

(k) Balance, if any, in accordance with the instructions of the Concessionaire.

4.1.2 No later than 60 (sixty) days prior to the commencement of each Accounting Year, the Concessionaire shall provide to the Escrow Bank, with prior written approval of the Lenders' Representative, details of the amounts likely to be required for each of the payment obligations set forth in this Clause 4.1; provided that such amounts may be

subsequently modified, with prior written approval of the Lenders' Representative, if fresh information received during the course of the year makes such modification necessary.

4.2 Withdrawals upon Termination upon Termination of the Concession Agreement, all amounts standing to the credit of the Escrow Account shall, notwithstanding anything in this Agreement, be appropriated and dealt with in the following order:

(a) All taxes due and payable by the Concessionaire for and in respect of the Project;

(b) Deleted;

(c) 90% (ninety per cent) of Debt Due excluding Subordinated Debt;

(d) all payments and Damages certified by the Authority as due and payable to it by the Concessionaire pursuant to the Concession Agreement, including any claims in connection with or arising out of Termination;

(e) Retention and payments arising out of, or in relation to, liability for defects and deficiencies set forth in Article 33 of the Concession Agreement;

(f) Outstanding Debt Service including the balance of Debt Due;

(g) Outstanding Subordinated Debt;

(h) Incurred or accrued O&M Expenses;

(i) Any other payments required to be made under the Concession Agreement; and

(j) Balance, if any, in accordance with the instructions of the Concessionaire: Provided that the disbursements specified in Sub-clause (i) of this Clause 4.2 shall be undertaken only after the Vesting Certificate has been issued by the Authority.

4.3 Application of insufficient funds:

Funds in the Escrow Account shall be applied in the serial order of priority set forth in Clauses 4.1 and 4.2, as the case may be. If the funds available are not sufficient to meet all the requirements, the Escrow Bank shall apply such funds in the serial order of priority until exhaustion thereof.

4.4 Application of insurance proceeds

Notwithstanding anything in this Agreement, the proceeds from all insurance claims, except life and injury, shall be deposited into and/or credited to the Escrow Account and utilized for any necessary repair, reconstruction, reinstatement, replacement, improvement, delivery or installation of the Project, and the balance remaining, if any, shall be applied in accordance with the provisions contained in this behalf in the Financing Agreements.

4.5 Withdrawals during Suspension

Notwithstanding anything to the contrary contained in this Agreement, the Authority may exercise all or any of the rights of the Concessionaire during the period of Suspension under Article 30 of the Concession Agreement. Any instructions given by the Authority to the Escrow Bank during such period shall be complied with as if such instructions were given by the Concessionaire under this Agreement and all actions of the Authority hereunder shall be deemed to have been taken for and on behalf of the Concessionaire.

5 OBLIGATIONS OF THE ESCROW BANK

5.1 Segregation of funds

Monies and other property received by the Escrow Bank under this Agreement shall, until used or applied in accordance with this Agreement, be held by the Escrow Bank in trust for the purposes for which they were received, and shall be segregated from other funds and property of the Escrow Bank.

5.2 Notification of balances

7(seven) business days prior to each Payment Date (and for this purpose the Escrow Bank shall be entitled to rely on an affirmation by the Concessionaire and/or the Lenders' Representative as to the relevant Payment Dates), the Escrow Bank shall notify the Lenders' Representative of the balances in the Escrow Account and Sub-Accounts as at the close of business on the immediately preceding business day.

5.3 Communications and notices

In discharge of its duties and obligations hereunder, the Escrow Bank:

(a) May, in the absence of bad faith or gross negligence on its part, rely as to any matters of fact which tight reasonably be expected to be within the knowledge of the Concessionaire upon a certificate signed by or on behalf of the Concessionaire;

(b) may, in the absence of bad faith or gross negligence on its part, rely upon the authenticity of any communication or document believed by it to be authentic;

(c) shall, within 5 (five) business days after receipt, deliver a copy to the Lenders' Representative of any notice or document received by it in its capacity as the Escrow Bank from the Concessionaire or any other person hereunder or in connection herewith; and

(d) shall, within 5 (five) business days after receipt, deliver a copy to the Concessionaire of any notice or document received by it from the Lenders' Representative in connection herewith.

5.4 No set off

The Escrow Bank agrees not to claim or exercise any right of set off, banker's lien or other right or remedy with respect to amounts standing to the credit of the Escrow Account. For the avoidance of doubt, it is hereby acknowledged and agreed by the Escrow Bank that the monies and properties held by the Escrow Bank in the Escrow Account shall not be considered as part of the assets of the Escrow Bank and being trust property, shall in the case of bankruptcy or liquidation of the Escrow Bank, be wholly excluded from the assets of the Escrow Bank in such bankruptcy or liquidation.

5.5 Regulatory approvals

The Escrow Bank shall use its best efforts to procure, and thereafter maintain and comply with, all regulatory approvals required for it to establish and operate the Escrow Account. The Escrow Bank represents and warrants that it is not aware of any reason why such regulatory approvals will not ordinarily be granted to the Escrow Bank.

6 ESCROW DEFAULT

6.1 Escrow Default

6.1.1 Following events shall constitute an event of default by the Concessionaire (an "Escrow Default") unless such event of default has occurred as a result of Force Majeure or any act or omission of the Authority or the Lenders' Representative:

(a) the Concessionaire commits breach of this Agreement by failing to deposit any receipts into the Escrow Account as provided herein and fails to cure such breach by depositing the same into the Escrow Account within a Cure Period of 5 (five) business days;

(b) the Concessionaire causes the Escrow Bank to transfer funds to any account of the Concessionaire in breach of the terms of this Agreement and fails to cure such breach by depositing the relevant funds into the Escrow Account or any Sub-Account in which such transfer should have been made, within a Cure Period of 5 (five) business days; or

(c) the Concessionaire commits or causes any other breach of the provisions of this Agreement and fails to cure the same within a Cure Period of 5 (five) business days.

6.1.2 Upon occurrence of an Escrow Default, the consequences thereof shall be dealt with under and in accordance with the provisions of the Concession Agreement.

7 TERMINATION OF ESCROW AGREEMENT

7.1 Duration of the Escrow Agreement

This Agreement shall remain in full force and effect so long as any sum remains to be advanced or is outstanding from the Concessionaire in respect of the debt, guarantee or financial assistance received by it from the Senior Lenders, or any of its obligations to the Authority remain to be discharged, unless terminated earlier by consent of all the Parties or otherwise in accordance with the provisions of this Agreement.

7.2 Substitution of Escrow Bank

The Concessionaire may, by not less than 45 (forty five) days prior notice to the Escrow Bank, the Authority and the Lenders' Representative, terminate this Agreement and appoint a new Escrow Bank, provided that the new Escrow Bank is acceptable to the Lenders' Representative and arrangements are made satisfactory to the Lenders' Representative for transfer of amounts deposited in the Escrow Account to a new Escrow Account established with the successor Escrow Bank.

The termination of this Agreement shall take effect only upon coming into force of an Escrow Agreement with the substitute Escrow Bank.

7.3 Closure of Escrow Account

The Escrow Bank shall, at the request of the Concessionaire and the Lenders' Representative made on or after the payment by the Concessionaire of all outstanding amounts under the Concession Agreement and the Financing Agreements including the payments specified in Clause 4.2, and upon confirmation of receipt of such payments, close the Escrow Account and Sub- Accounts and pay any amount standing to the credit thereof

to the Concessionaire. Upon closure of the Escrow Account hereunder, the Escrow Agreement shall be deemed to be terminated.

8 SUPPLEMENTARY ESCROW AGREEMENT

8.1 Supplementary escrow agreement

The Lenders' Representative and the Concessionaire shall be entitled to enter into a supplementary escrow agreement with the Escrow Bank providing, inter alia, for detailed procedures and documentation for withdrawals from Sub- Accounts pursuant to Clause 4.1.1 and for matters not covered under this Agreement such as the rights and obligations of Senior Lenders and lenders of Subordinated Debt, investment of surplus funds, restrictions on withdrawals by the Concessionaire in the event of breach of this Agreement or upon occurrence of an Escrow Default, procedures relating to operation of the Escrow Account and withdrawal therefrom, reporting requirements and any matters incidental thereto; provided that such supplementary escrow agreement shall not contain any provision which is inconsistent with this Agreement and in the event of any conflict or inconsistency between provisions of this Agreement and such supplementary escrow agreement, the provisions of this Agreement shall prevail.

9 INDEMNITIES

9.1 General indemnity

9.1.1 The Concessionaire will indemnify, defend and hold the Authority, Escrow Bank and the Senior Lenders, acting through the Lenders' Representative, harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of any breach by the Concessionaire of any of its obligations under this Agreement or on account of failure of the Concessionaire to comply with Applicable Laws and Applicable Permits.

9.1.2 The Authority will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Authority to fulfil any of its obligations under this Agreement materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement or this Agreement other than any loss, damage, cost and expense arising out of acts done in discharge of their lawful functions by the Authority, its officers, servants and agents.

9.1.3 The Escrow Bank will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Escrow Bank to fulfil its obligations under this Agreement materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Escrow Bank, its officers, servants and agents.

9.2 Notice and contest of claims

In the event that any Party hereto receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under Clause 9.1 or in respect of which it is entitled to reimbursement (the "Indemnified Party"), it shall notify the other Party responsible for indemnifying such claim hereunder (the "Indemnifying Party") within 15 (fifteen) days of

receipt of the claim and shall not settle or pay the claim without the prior approval of the Indemnifying Party, which approval shall not be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim, it may conduct the proceedings in the name of the Indemnified Party and shall bear all costs involved in contesting the same. The Indemnified Party shall provide all cooperation and assistance in contesting any claim and shall sign all such writings and documents as the Indemnifying Party may reasonably require.

10 DISPUTE RESOLUTION

10.1 Dispute resolution

10.1.1 Any dispute, difference or claim arising out of or in connection with this Agreement, which is not resolved amicably, shall be decided finally by reference to arbitration to a Board of Arbitrators comprising one nominee of each Party to the dispute, and where the number of such nominees is an even number, the nominees shall elect another person to such Board. Such arbitration shall be held in accordance with the Rules of Arbitration of the International Centre for Alternative Dispute Resolution, New Delhi (the "Rules") or such other rules as may be mutually agreed by the Parties, and shall be subject to the provisions of the Arbitration and Conciliation Act, 1996.

10.1.2 The Arbitrators shall issue a reasoned award and such award shall be final and binding on the Parties. The place of arbitration shall be the capital of the State and the language of arbitration shall be English.

11. MISCELLANEOUS PROVISIONS

11.1 Governing law and jurisdiction

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

11.2 Waiver of sovereign immunity The Authority unconditionally and irrevocably:

(a) agrees that the execution, delivery and performance by it of this Agreement constitute commercial acts done and performed for commercial purpose;

(b) agrees that, should any proceedings be brought against it or its assets, property or revenues in any jurisdiction in relation to this Agreement or any transaction contemplated by this Agreement, no immunity (whether by reason of sovereignty or otherwise) from such proceedings shall be claimed by or on behalf of the Authority with respect to its assets;

(c) waives any right of immunity which it or its assets, property or revenues now has, may acquire in the future or which may be attributed to it in any jurisdiction; and

(d) consents generally in respect of the enforcement of any judgment or award against it in any such proceedings to the giving of any relief or the issue of any process in any jurisdiction in connection with such proceedings (including the making, enforcement or execution against it or in respect of any assets, property or revenues whatsoever irrespective of their use or intended use of any order or judgment that may be made or given in connection therewith).

11.3 Priority of agreements

In the event of any conflict between the Concession Agreement and this Agreement, the provisions contained in the Concession Agreement shall prevail over this Agreement.

11.4 Alteration of terms

All additions, amendments, modifications and variations to this Agreement shall be effectual and binding only if in writing and signed by the duly authorized representatives of the Parties.

11.5 Waiver

11.5.1 Waiver by any Party of a default by another Party in the observance and performance of any provision of or obligations under this Agreement:

(a) Shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions of or obligations under this Agreement;

(b) shall not be effective unless it is in writing and executed by a duly authorized representative of the Party; and

(c) shall not affect the validity or enforceability of this Agreement in any manner.

11.5.2 Neither the failure by any Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement or any obligation thereunder nor time or other indulgence granted by any Party to another Party shall be treated or deemed as waiver of such breach or acceptance of any variation or the relinquishment of any such right hereunder.

11.6 No third party beneficiaries This Agreement is solely for the benefit of the Parties and no other person or entity shall have any rights hereunder.

11.7 Survival

11.7.1 Termination of this Agreement:

(a) shall not relieve the Parties of any obligations hereunder which expressly or by implication survive termination hereof; and

(b) except as otherwise provided in any provision of this Agreement expressly limiting the liability of either Party, shall not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of, or caused by, acts or omissions of such Party prior to the effectiveness of such termination or arising out of such termination.

11.7.2 All obligations surviving the cancellation, expiration or termination of this Agreement shall only survive for a period of 3 (three) years following the date of such termination or expiry of this Agreement.

11.8 Severability

If for any reason whatever any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will

negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to dispute resolution under Clause 10.1 of this Agreement or otherwise.

11.9 Successors and assigns

This Agreement shall be binding on and shall inure to the benefit of the Parties and their respective successors and permitted assigns.

11.10 Notices

All notices or other communications to be given or made under this Agreement shall be in writing and shall either be delivered personally or sent by courier or registered post with an additional copy to be sent by facsimile or e-mail. The address for service of each Party, its facsimile number and e-mail are set out under its name on the signing pages hereto. A notice shall be effective upon actual receipt thereof, save that where it is received after 5.30 (five thirty) p.m. on a business day, or on a day that is not a business day, the notice shall be deemed to be received on the first business day following the date of actual receipt. Without prejudice to the foregoing, a Party giving or making a notice or communication by facsimile or e-mail shall promptly deliver a copy thereof personally, or send it by courier or registered post to the addressee of such notice or communication. It is hereby agreed and acknowledged that any Party may by notice change the address to which such notices and communications to it are to be delivered or mailed. Such change shall be effective when all the Parties have notice of it.

11.11 **Language**

All notices, certificates, correspondence and proceedings under or in connection with this Agreement shall be in English.

11.12 **Authorized representatives**

Each of the Parties shall, by notice in writing, designate their respective authorized representatives through whom only all communications shall be made. A Party hereto shall be entitled to remove and/or substitute or make fresh appointment of such authorized representative by similar notice.

11.13 Original Document

This Agreement may be executed in four counterparts, each of which when executed and delivered shall constitute an original of this Agreement.

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

THE COMMON SEAL OF CONCESSIONAIRE has been affixed pursuant to the resolution passed by the

AND DELIVERED
For and on behalf of

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theBoard of Directors of the Concessionaire has been affixed For and on behalf of pursuant to the resolution passed by the SENIOR LENDERS by the Board of Directors of the Concessionaire Lenders Representative: at its meeting held on the day of 20 hereunto affixed in the presence of , Director, who has signed these presents in token thereofand Company Secretary / Authorized Officer who has countersigned the same in token thereof[¥]

SENIOR LENDERS by the

Lender's representative:

(Signature)

(Name)

(Designation)

(Address)

(Fax No.)

(E-mail address)

SIGNED, SEALED AND DELIVERED

For and on behalf of

THE ESCROW BANK by

(Signature)

(Name)

(Designation)

(Address)

(Fax No.)

(E-mail address)

SIGNED, SEALED

In the presence of:

(Signature)

(Name)

(Designation)

(Address)

(Fax N°)

(E-mail address)

SIGNED, SEALED AND DELIVERED

for and on behalf of

THE AUTHORITY by:

(Signature)

(Name)

(Designation)

(Address)

(Fax No.)

(E-mail address)

[¥] To be affixed in accordance with the articles of association of the Concessionaire and the resolution passed by its Board of Directors.

SCHEDULE - P

(See Clause 27.2.1)

PANEL OF CHARTERED ACCOUNTANTS

1 Panel of Chartered Accountants

Pursuant to the provisions of Clause 27.2.1 of the Agreement, the Authority and the Concessionaire shall prepare a mutually agreed panel of 5 (five) reputable firms of Chartered Accountants having their registered offices in India (the "Panel of Chartered Accountants"). The criteria for preparing such Panel and the procedure to be adopted in this behalf shall be as set forth in this Schedule-P.

2 Invitation for empanelment

2.1 The Authority shall invite offers from all reputed firms of Chartered Accountants who fulfil the following eligibility criteria, namely:

(a) the firm should have conducted statutory audit of the annual accounts of at least one hundred companies registered under the Companies Act, 1956, including any re-enactment or amendment thereof, of which at least ten should have been public sector undertakings;

(b) The firm should have at least 5 (five) practicing Chartered Accountants on its rolls, each with a minimum experience of ten years in the profession;

(c) The firm or any of its partners should not have been disqualified or black-listed by the Comptroller and Auditor General of India or the Authority; and

(d) The firm should have an office in the State or in an adjacent State with at least 2 (two) practicing Chartered Accountants on its rolls in such State.

2.2 Interested firms meeting the eligibility criteria shall be required to submit a statement of their capability including the bio-data of all the practicing Chartered Accountants on its rolls. In particular, each firm shall be required to furnish year-wise information relating to the names of all the companies with an annual turnover exceeding Rs. 25,00,00,000 (Rs. twenty five crore) whose annual accounts were audited by such firm in any of the preceding 5 (five) Accounting Years

3 Evaluation and selection

3.1 The information furnished by each firm shall be scrutinized and evaluated by the Authority and 1 (one) point shall be awarded for each annual audit of the companies specified in Paragraph 2.2 above. (For the avoidance of doubt and by way of illustration, a firm which has conducted audit of the annual accounts of any such company for 5 (five) years shall be awarded 5 (five) points).

3.2 The Authority shall prepare a list of all the eligible firms along with the points scored by each such firm and 5 (five) firms scoring the highest points shall be identified and included in the draft Panel of Chartered Accountants.

4 Consultation with the Concessionaire

The Authority shall convey the aforesaid panel of firms to the Concessionaire for scrutiny and comments, if any. The Concessionaire shall be entitled to scrutinize the relevant records of the Authority to ascertain whether the selection of firms has been undertaken in accordance with the prescribed procedure and it shall send its comments, if any, to the Authority within 15 (fifteen) days of receiving the aforesaid panel.

5 Mutually agreed panel

5.1 The Authority shall, after considering all relevant factors including the comments, if any, of the Concessionaire, finalize and constitute a panel of 5 (five) firms which shall be deemed to be the mutually agreed Panel of Chartered Accountants.

5.2 After completion of every 5 (five) years from the date of preparing the mutually agreed Panel of Chartered Accountants, or such earlier period as may be agreed between the Authority and the Concessionaire, a new panel shall be prepared in accordance with the provisions of this Schedule-P.

SCHEDULE - Q

(See Clause 32.4)

VESTING CERTIFICATE

1 The Chairman, National Highways Authority of India (the "**Authority**") refers to the Concession Agreement dated ..... (the "**Agreement**") entered into between the Authority and **M/s Ambala Kala Ama Highway Private Limited** (the "**Concessionaire**") for 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) (the "**Project Highway**") on design, build, operate and transfer ("**DBOT Annuity or Hybrid Annuity**") basis.

2 The Authority hereby acknowledges compliance and fulfilment by the Concessionaire of the Divestment Requirements set forth in Clause 32.1 of the Agreement on the basis that upon issue of this Vesting Certificate, the Authority shall be deemed to have acquired, and all title and interest of the Concessionaire in or about the Project shall be deemed to have vested unto the Authority, free from any encumbrances, charges and liens whatsoever.

3 Notwithstanding anything to the contrary contained hereinabove, it shall be a condition of this Vesting Certificate that nothing contained herein shall be construed or interpreted as waiving the obligation of the Concessionaire to rectify and remedy any defect or deficiency in any of the Divestment Requirements and/or relieving the Concessionaire in any manner of the same.

Signed this..... day of....., 20..... At.....

AGREED, ACCEPTED AND SIGNED	SIGNED, SEALED AND DELIVERED
For and on behalf of	for and on behalf of
CONCESSIONAIRE by:	AUTHORITY by:
(Signature)	(Signature)
(Name)	(Name)
(Designation)	(Designation)
(Address)	(Address)

In the presence of:

1. 2.

SCHEDULE - R

(See Clause 34.3.1)

SUBSTITUTION AGREEMENT

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

AMONGST

1 The NATIONAL HIGHWAYS AUTHORITY OF INDIA, established under the National Highways Authority of India Act 1988 , represented by..... and having its principal offices at ..... (Hereinafter referred to as the "Authority" which expression shall unless repugnant to the context or meaning thereof include its administrators, successors and assigns);

2 .....Limited, a company incorporated under the provisions of the Companies Act, 2013 and having its registered office at ..... (Hereinafter referred to as the **"Concessionaire"** which expression shall unless repugnant to the context or meaning thereof include its successors and permitted assigns and substitutes);

3 ..... (insert name and particulars of Lenders' Representative) and having its registered office at....., acting for and on behalf of the Senior Lenders as their duly authorized agent with regard to matters arising out of or in relation to this Agreement (hereinafter referred to as the **"Lenders' Representative"**, which expression shall unless repugnant to the context or meaning thereof include its successors and substitutes);

WHEREAS:

(A) The Authority has entered into a Concession Agreement dated..... With the Concessionaire (the **"Concession Agreement"**) for the 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O), (the **"Project")** on design, build, operate and transfer basis (the **"DBOT Annuity or Hybrid Annuity"),** and a copy of which is annexed hereto and marked as Annex-A to form part of this Agreement.

(B) Senior Lenders have agreed to finance the Project in accordance with the terms and conditions set forth in the Financing Agreements.

(C) Senior Lenders have requested the Authority to enter into this Substitution Agreement for securing their interests through assignment, transfer and substitution of the Concession to a Nominated Company in accordance with the provisions of this Agreement and the Concession Agreement.

(D) In order to enable implementation of the Project including its financing, construction, operation and maintenance, the Authority has agreed and undertaken to transfer and assign

the Concession to a Nominated Company in accordance with the terms and conditions set forth in this Agreement and the Concession Agreement.

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

1 DEFINITIONS AND INTERPRETATION

1.1 Definitions

In this Substitution Agreement, the following words and expressions shall, unless repugnant to the context or meaning thereof, have the meaning hereinafter respectively assigned to them: **"Agreement"** means this Substitution Agreement and any amendment thereto made in accordance with the provisions contained in this Agreement;

"Financial Default" means occurrence of a material breach of the terms and conditions of the Financing Agreements or a continuous default in Debt Service by the Concessionaire for a minimum period of 3 (three) months;

"Lenders' Representative" means the person referred to as the Lenders' Representative in the foregoing Recitals;

"Nominated Company" means a company, incorporated under the provisions of the Companies Act, 1956, including any re-enactment or amendment thereof, selected by the Lenders' Representative, on behalf of Senior Lenders, and proposed to the Authority for assignment/transfer of the Concession as provided in this Agreement;

"Notice of Financial Default" shall have the meaning ascribed thereto in Clause 3.2.1; and

"Parties" means the parties to this Agreement collectively and "Party" shall mean any of the Parties to this Agreement individually.

1.2 Interpretation

1.2.1 References to Lenders' Representative shall, unless repugnant to the context or meaning thereof, mean references to the Lenders' Representative, acting for and on behalf of Senior Lenders.

1.2.2 References to Clauses are, unless stated otherwise, references to Clauses of this Agreement.

1.2.3 The words and expressions beginning with capital letters and defined in this Agreement shall have the meaning ascribed thereto herein, and the words and expressions used in this Agreement and not defined herein but defined in .the Concession Agreement shall, unless repugnant to the context, have the meaning ascribed thereto in the Concession Agreement.

1.2.4 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Concession Agreement shall apply, mutatis mutandis, to this Agreement.

2 ASSIGNMENT

2.1 Assignment of rights and title

The Concessionaire hereby agrees to assign the rights, title and interest in the Concession to, and in favor of, the Lenders' Representative pursuant to and in accordance with the provisions of this Agreement and the Concession Agreement by way of security in respect of financing by the Senior Lenders under the Financing Agreements.

3 SUBSTITUTION OF THE CONCESSIONAIRE

3.1 Rights of substitution

3.1.1 Pursuant to the rights, title and interest assigned under Clause 2.1, the Lenders' Representative shall be entitled to substitute the Concessionaire by a Nominated Company under and in accordance with the provisions of this Agreement and the Concession Agreement.

3.1.2 The Authority hereby agrees to substitute the Concessionaire by endorsement on the Concession Agreement in favor of the Nominated Company selected by the Lenders' Representative in accordance with this Agreement. For the avoidance of doubt, the Senior Lenders or the Lenders' Representative shall not be entitled to operate and maintain the Project as Concessionaire either individually or collectively.

3.2 Substitution upon occurrence of Financial Default

3.2.1 Upon occurrence of a Financial Default, the Lenders' Representative may issue a notice to the Concessionaire (the "Notice of Financial Default") along with particulars thereof, and send a copy to the Authority for its information and record. A Notice of Financial Default under this Clause 3 shall be conclusive evidence of such Financial Default and it shall be final and binding upon the Concessionaire for the purposes of this Agreement.

3.2.2 Upon issue of a Notice of Financial Default hereunder, the Lenders' Representative may, without prejudice to any of its rights or remedies under this Agreement or the Financing Agreements, substitute the Concessionaire by a Nominated Company in accordance with the provisions of this Agreement.

3.2.3 At any time after the Lenders' Representative has issued a Notice of Financial Default, it may by notice require the Authority to suspend all the rights of the Concessionaire and undertake the operation and maintenance of the Project in accordance with the provisions of Article 30 of the Concession Agreement, and upon receipt of such notice, the Authority shall undertake Suspension under and in accordance with the provisions of the Concession Agreement. The aforesaid Suspension shall be revoked upon substitution of the Concessionaire by a Nominated Company, and in the event such substitution is not completed within 180 (one hundred and eighty) days from the date of such Suspension, the Authority may terminate the Concession Agreement forthwith by issuing a Termination Notice in accordance with the provisions of the Concession Agreement; provided that upon written request from the Lenders' Representative and the Concessionaire, the Authority may extend the aforesaid period of 180 (one hundred and eighty) days by a period not exceeding 90 (ninety) days. For the avoidance of doubt, the Authority expressly agrees and undertakes to terminate the Concession Agreement forthwith, upon receipt of a written request from the Lenders' Representative at any time after 240 (two hundred and forty) days from the date of Suspension hereunder.

3.3 Substitution upon occurrence of Concessionaire Default

3.3.1 Upon occurrence of a Concessionaire Default, the Authority shall by a notice inform the Lenders' Representative of its intention to issue a Termination Notice and grant 15 (fifteen)

days' time to the Lenders' Representative to make a representation, stating the intention to substitute the Concessionaire by a Nominated Company.

3.3.2 In the event that the Lenders' Representative makes a representation to the Authority within the period of 15 (fifteen) days specified in Clause 3.3.1, stating that it intends to substitute the Concessionaire by a Nominated Company, the Lenders' Representative shall be entitled to undertake and complete the substitution of the Concessionaire by a Nominated Company in accordance with the provisions of this Agreement within a period of 180 (one hundred and eighty) days from the date of such representation, and the Authority shall either withhold Termination or undertake Suspension for the aforesaid period of 180 (one hundred and eighty) days; provided that upon written request from the Lenders' Representative and the Concessionaire, the Authority shall extend the aforesaid period of 180 (one hundred and eighty) days by a period not exceeding 90 (ninety) days; provided further that the Lenders' Representative may at any time withdraw its representation hereunder and upon such withdrawal, the Authority may terminate this Agreement in accordance with the provisions hereof.

3.4 Procedure for substitution

3.4.1 The Authority and the Concessionaire hereby agree that on or after the date of Notice of Financial Default or the date of representation to the Authority under Clause 3.3.2, as the case may be, the Lenders' Representative may, without prejudice to any of the other rights or remedies of the Senior Lenders, invite, negotiate and procure offers, either by private negotiations or public auction or tenders for the take over and transfer of the Project including the Concession to the Nominated Company upon such Nominated Company's assumption of the liabilities and obligations of the Concessionaire towards the Authority under the Concession Agreement and towards the Senior Lenders under the Financing Agreements.

3.4.2 To be eligible for substitution in place of the Concessionaire, the Nominated Company shall be required to fulfil the eligibility criteria that were laid down by the Authority for short listing the bidders for award of the Concession; provided that the Lenders' Representative may represent to the Authority that all or any of such criteria may be waived in the interest of the Project, and if the Authority determines that such waiver shall not have any material adverse effect on the Project, it may waive all or any of such eligibility criteria.

3.4.3 Upon selection of a Nominated Company, the Lenders' Representative shall request the Authority to:

(a) Accede to transfer to the Nominated Company the right to construct, operate and maintain the Project in accordance with the provisions of the Concession Agreement;

(b) Endorse and transfer the Concession to the Nominated Company, on the same terms and conditions, for the residual Concession Period; and

(c) Enter into a Substitution Agreement with the Lenders' Representative and the Nominated Company on the same terms as are contained in this Agreement.

3.4.4 If the Authority has any objection to the transfer of Concession in favor of the Nominated Company in accordance with this Agreement, it shall within 15 (fifteen) days from the date of proposal made by the Lenders' Representative, give a reasoned order after hearing the Lenders' Representative. If no such objection is raised by the Authority, the Nominated

Company shall be deemed to have been accepted. The Authority shall thereupon transfer and endorse the Concession within 15 (fifteen) days of its acceptance/deemed acceptance of the Nominated Company; provided that in the event of such objection by the Authority, the Lenders' Representative may propose another Nominated Company whereupon the procedure set forth in this Clause 3.4 shall be followed for substitution of such Nominated Company in place of the Concessionaire.

3.4.5 The transfer of Concession hereunder to a Nominated Company may, notwithstanding anything to the contrary in this Agreement and the Concession Agreement, be undertaken by transfer of no less than 75% (seventy five per cent) of the equity of the Concessionaire to the Nominated Company, and upon such transfer hereunder, the Concessionaire shall be deemed to be the Nominated Company under and in accordance with the provisions of this Agreement and the Concession Agreement.

3.5 Selection to be binding

The decision of the Lenders' Representative and the Authority in selection of the Nominated Company shall be final and binding on the Concessionaire. The Concessionaire irrevocably agrees and waives any right to challenge the actions of the Lenders' Representative or the Senior Lenders or the Authority taken pursuant to this Agreement including the transfer/assignment of the Concession in favor of the Nominated Company. The Concessionaire agrees and confirms that it shall not have any right to seek revaluation of assets of the Project or the Concessionaire's shares. It is hereby acknowledged by the Parties that the rights of the Lenders' Representative are irrevocable and shall not be contested in any proceedings before any court or Authority and the Concessionaire shall have no right or remedy to prevent, obstruct or restrain the Authority or the Lenders' Representative from effecting or causing the transfer by substitution and endorsement of the Concession as requested by the Lenders' Representative.

4 PROJECT AGREEMENTS

4.1 Substitution of Nominated Company in Project Agreements

The Concessionaire shall ensure and procure that each Project Agreement contains provisions that entitle the Nominated Company to step into such Project Agreement, in its discretion, in place and substitution of the Concessionaire in the event of such Nominated Company's assumption of the liabilities and obligations of the Concessionaire under the Concession Agreement.

5 TERMINATION OF CONCESSION AGREEMENT

5.1 Termination upon occurrence of Financial Default

At any time after issue of a Notice of Financial Default, the Lenders' Representative may by a notice in writing require the Authority to terminate the Concession Agreement forthwith, and upon receipt of such notice, the Authority shall undertake Termination under and in accordance with the provisions of Article 31 of the Concession Agreement.

5.2 Termination when no Nominated Company is selected

In the event that no Nominated Company acceptable to the Authority is selected and recommended by the Lenders' Representative within the period of 180 (one hundred and eighty) days or any extension thereof as set forth in Clause 3.3.2, the Authority may terminate the Concession Agreement forthwith in accordance with the provisions thereof.

5.3 Realization of Debt Due

The Authority and the Concessionaire hereby acknowledge and agree that, without prejudice to their any other right or remedy, the Lenders' Representative is entitled to receive from the Concessionaire, without any further reference to or consent of the Concessionaire, the Debt Due upon Termination of the Concession Agreement. For realization of the Debt Due, the Lenders' Representative shall be entitled to make its claim from the Escrow Account in accordance with the provisions of the Concession Agreement and the Escrow Agreement.

6 DURATION OF THE AGREEMENT

6.1 Duration of the Agreement

This Agreement shall come into force from the date hereof and shall expire at the earliest to occur of the following events:

(a) Termination of the Agreement; or

(b) No sum remains to be advanced and no sum are outstanding to the Senior Lenders, under the Financing Agreements.

7 INDEMNITY

7.1 General indemnity

7.1.1 The Concessionaire will indemnify, defend and hold the Authority and the Lenders' Representative harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense of whatever kind and nature arising out of any breach by the Concessionaire of any of its obligations under this Agreement or on account of failure of the Concessionaire to comply with Applicable Laws and Applicable Permits.

7.1.2 The Authority will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Authority to fulfil any of its obligations under this Agreement, materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement or this Agreement, other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Authority, its officers, servants and agents.

7.1.3 The Lenders' Representative will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Lenders' Representative to fulfil its obligations under this Agreement, materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement, other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Lenders' Representative, its officers, servants and agents.

7.2 Notice and contest of claims

In the event that any Party hereto receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under Clause 7.1 or in respect of which it is entitled to reimbursement (the "Indemnified Party"), it shall notify the other Party responsible for indemnifying such claim hereunder (the "Indemnifying Party") within 15 (fifteen) days of receipt of the claim and shall not settle or pay the claim without the prior approval of the

Indemnifying Party, such approval not to be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim, it may conduct the proceedings in the name of the Indemnified Party and shall bear all costs involved in contesting the same. The Indemnified Party shall provide all cooperation and assistance in contesting any claim and shall sign all such writings and documents as the Indemnifying Party may reasonably require.

8 DISPUTE RESOLUTION

8.1 Dispute resolution

8.1.1 Any dispute, difference or claim arising out of or in connection with this Agreement which is not resolved amicably shall be decided by reference to arbitration to a Board of Arbitrators comprising one nominee each of the Authority, Concessionaire and the Lenders' Representative. Such arbitration shall be held in accordance with the Rules of Arbitration of the International Centre for Alternative Dispute Resolution, New Delhi (the "**Rules**") or such other rules as may be mutually agreed by the Parties, and shall be subject to provisions of the Arbitration and Conciliation Act, 1996.

8.1.2 The Arbitrators shall issue a reasoned award and such award shall be final and binding on the Parties. The place of arbitration shall be the capital of the State and the language of arbitration shall be English.

9 MISCELLANEOUS PROVISIONS

9.1 Governing law and jurisdiction

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

9.2 Waiver of sovereign immunity

The Authority unconditionally and irrevocably:

(a) agrees that the execution, delivery and performance by it of this Agreement constitute commercial acts done and performed for commercial purpose;

(b) agrees that, should any proceedings be brought against it or its assets, property or revenues in any jurisdiction in relation to this Agreement or any transaction contemplated by this Agreement, no immunity (whether by reason of sovereignty or otherwise) from such proceedings shall be claimed by or on behalf of the Authority with respect to its assets;

(c) waives any right of immunity which it or its assets, property or revenues now has, may acquire in the future or which may be attributed to it in any jurisdiction; and

(d) consents generally in respect of the enforcement of any judgment or award against it in any such proceedings to the giving of any relief or the issue of any process in any jurisdiction in connection with such proceedings (including the making, enforcement or execution against it or in respect of any assets, property or revenues whatsoever irrespective of their use or intended use of any order or judgment that may be made or given in connection therewith).

9.3 Priority of agreements

In the event of any conflict between the Concession Agreement and this Agreement, the provisions contained in the Concession Agreement shall prevail over this Agreement.

9.4 Alteration of terms

All additions, amendments, modifications and variations to this Agreement shall be effectual and binding only if in writing and signed by the duly authorized representatives of the Parties

9.5 Waiver

9.5.1 Waiver by any Party of a default by another Party in the observance and performance of any provision of or obligations under this Agreement:

(a) Shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions of or obligations under this Agreement;

(b) Shall not be effective unless it is in writing and executed by a duly authorized representative of the Party; and

(c) Shall not affect the validity or enforceability of this Agreement in any manner.

9.5.2 Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement or any obligation thereunder nor time or other indulgence granted by a Party to another Party shall be treated or deemed as waiver of such breach or acceptance of any variation or the relinquishment of any such right hereunder.

9.6 **No third party beneficiaries**

This Agreement is solely for the benefit of the Parties and no other person or entity shall have any rights hereunder.

9.7 Survival

9.7.1 Termination of this Agreement:

(a) Shall not relieve the Parties of any obligations hereunder which expressly or by implication survive termination hereof; and

(b) except as otherwise provided in any provision of this Agreement expressly limiting the liability of either Party, shall not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of such Party prior to the effectiveness of such termination or arising out of such termination.

9.7.2 All obligations surviving the cancellation, expiration or termination of this Agreement shall only survive for a period of 3 (three) years following the date of such termination or expiry of this Agreement.

9.8 Severability

If for any reason whatever any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be

substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to dispute resolution under Clause 8 of this Agreement or otherwise.

9.9 Successors and assigns

This Agreement shall be binding on and shall inure to the benefit of the Parties and their respective successors and permitted assigns.

9.10 Notices

All notices or other communications to be given or made under this Agreement shall be in writing, shall either be delivered personally or sent by courier or registered post with an additional copy to be sent by facsimile or e-mail. The address for service of each Party, its facsimile number and e-mail address are set out under its name on the signing pages hereto. A notice shall be effective upon actual receipt thereof, save that where it is received after 5.30 (five thirty) p.m. on any day, or on a day that is a public holiday, the notice shall be deemed to be received on the first working day following the date of actual receipt. Without prejudice to the foregoing, a Party giving or making a notice or communication by facsimile or e-mail shall promptly deliver a copy thereof personally, or send it by courier or registered post to the addressee of such notice or communication. It is hereby agreed and acknowledged that any Party may by notice change the address to which such notices and communications to it are to be delivered or mailed. Such change shall be effective when all the Parties have notice of it.

9.11 Language

All notices, certificates, correspondence and proceedings under or in connection with this Agreement shall be in English.

9.12 Authorized representatives

Each of the Parties shall by notice in writing designate their respective authorized representatives through whom only all communications shall be made. A Party hereto shall be entitled to remove and/or substitute or make fresh appointment of such authorized representative by similar notice.

9.13 Original Document

This Agreement may be executed in three counterparts, each of which when executed and delivered shall constitute an original of this Agreement.

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

THE COMMON SEAL OFCONCESSIONAIRE has been affixed pursuant to the resolution passed by the Board of Directors of the Concessionaire at its meeting held on the.....day of the .....20.....here unto affixed in to the presence of.....the Director, who has	SIGNED, SEALED AND DELIVERED For and behalf of THE AUTHORITY by:

signed these presents in token thereof, ...Company Secretary /Authorized Officer who has countersigned the same in token thereof*.

(Signature)
(Name)
(Designation)
(Address)
(Fax No.) (e-mail address)

(Signature)
(Name)
(Designation)
(Address)
(Fax No.) (e-mail address)

SIGNED, SEALED AND DELIVERED

For and on behalf of

SENIOR LENDERS by the

Lenders' Representative:

(Signature)

(Name)

(Designation)

(Address)

(Fax No.)

(E-mail address)

In the presence of: 1. 2.

*To be affixed in accordance with the articles of association of the Concessionaire and the resolution passed by its Board of Directors

SCHEDULE - S

(See Clause 38)

PROCEDURE FOR DISPUTE RESOLUTION BOARD

The parties to the Concession Agreement mutually agree as follows:

(1) The Board shall comprise of three Members having experience in the field of construction or have been involved in the Works related to construction and with the interpretation of contractual documents. One Member shall be selected by each of the Authority and the Concessionaire from the list maintained by NHAI hosted on its website (www.nhai.gov.in). In the event the parties fail to select the member within 28 days of the date of the signing of Concession Agreement, in that eventuality, upon the request of either or both parties such Member shall be selected by SAROD within 14 days. The third Member shall be selected by the other two members from the same list. If the two Members selected by or on behalf of the parties fail to select the third Member within 14 days after the later of their selections, then upon the request of either or both parties such third Member shall be selected by SAROD within 14 days. The third Member shall serve as Chairman of the Board.

(2) The Board shall be Constituted when each of the three Board Members has signed a Board Member's declaration of Acceptance as required by the DRB's rules and procedures (which, along with the declaration of acceptance form, are attached as Annexure herewith).

(3) In the event of death, disability, or resignation of any Member, such Member shall be replaced in the same manner as the Member being replaced was selected. If for any other reason, a Member fails or is unable to serve, the Chairman (or failing the action of the Chairman then either of the other Members) shall inform the Parties and such non-serving Member shall be replaced in the same manner as the Member being replaced was selected. Any replacement made by the parties shall be completed within 28 days after the event giving rise to the vacancy on the Board, failing which the replacement shall be made by SAROD in the same manner as described above. Replacement shall be considered complete when the new Member signs the Board Member's Declaration of Acceptance. Throughout any replacement process, the Member not being replaced shall continue to serve and the Board shall continue to function and its activities shall have the same force and effect as if the vacancy had not occurred, provided, however, that the Board shall not conduct a hearing nor issue a decision until the replacement is completed.

(4) If either the Authority or the Concessionaire is dissatisfied with any decision of the Board, and/or if the Board fails to issue its decision within 56 days after receipt of all the pleadings (along with the supporting documents) of the parties by the Chairman of the Board or any extension mutually agreed upon by the Authority and the Concessionaire, in such a case, either the Authority or the Concessionaire may, within 28 days after his receipt of the decision, or within 28 days after the expiry of the said period, as the case may be, give notice to the other party, with a copy for information to the Independent Engineer, of his intention to refer the matter to the Conciliation Committee of Independent Experts (CCIE) of the Authority for Conciliation/amicable settlement.

(5) It is mandatory to refer all the disputes to DRB before issuance of completion certificate and satisfactory completion of punch list items. No dispute shall be entertained after completion of aforementioned date.

(6) If the Board has issued a decision to the Authority and the Concessionaire within the said 56 days or any extension mutually agreed upon by the Authority and the Concessionaire

and no notice of intention to commence Conciliation by the Conciliation Committee of Independent Experts (CCIE) of the Authority for Conciliation/amicable settlement as to such dispute has been given by either the Authority or the Concessionaire within 28 days after the parties received such decision from the Board, the decision shall become final and binding upon the Authority and Concessionaire.

(7) Whether or not it has become final and binding upon the Authority and the Concessionaire, a decision shall be admissible as evidence in any subsequently dispute resolution procedure, including any arbitration or litigation having any relation to the dispute to which the decision relates.

(8) All decision of DRB which have become final and binding or till they have been reversed in subsequent conciliation/ Arbitration process shall be implemented by the parties forthwith. Such implementation shall also include any relevant action of the Independent Engineer.

(9) If during the Concession Period, the Authority and the Concessionaire are of the opinion that the Dispute Resolution Board is not performing its function property, the Authority and the Concessionaire may together disband the Dispute Resolution Board and reconstitute it. In that case, a new board shall be selected in accordance with the provision applying to the selection of the original Board as specified above, except that words "within 28 days after the signing of this Concession Agreement" shall be replaced by the words "within 28 days after the date on which the notice disbanding the original Board became effective".

(10) The Authority and the Concessionaire shall jointly sign a notice specifying that the Board shall stand disbanded with effect from the date specified in the notice. The notice shall be posted by email to each Member of the Board. A Member shall be deemed to have received the e mail even if he refuses to have received the same.

(11) All other terms and conditions of the original Concession Agreement shall remain unaltered/unaffected and the parties shall remain bound by terms and conditions as contained therein.

Annexure A to Schedule-S

Disputes Resolution Board's Rules and Procedures

1. Except for providing the services required hereunder, the Board Members shall not give any advice to either party or to the Independent Engineer concerning conduct of the Works. The Board Members:

   a. Shall have no financial interest in any party to the Concession Agreement, or the independent Engineer, or a financial interest in the Concession, except for payment for services on the Board.

   b. Shall have had no previous employment by, or financial ties to, any party to the Concession Agreement, or the Independent Engineer, except for fee based consulting services/advisers on other projects, and/or be Retired Government Officers (not connected in whole or part with the project), all of which must be disclosed in writing to both parties prior to appointment to the Board.

   c. Shall have disclosed in writing to both parties prior to appointment to the Board any and all recent or close professional or personal relationships with any director, officer, or employee of any party to the Concession Agreement, or the Independent Engineer, and any and all prior involvement in the project to which the Contract relates;

   d. Shall not, while Board Member, be employed whether as a consultant or adviser or otherwise by either party to the Concession Agreement, or the Independent Engineer, except as a Board Member, without the prior consent of the parties and the other Board Members;

   e. Shall not, while a Board Member, engage in discussion or make any agreement with any party to the Concession Agreement, or with the Independent Engineer, regarding employment whether as a consultant or otherwise whether after the Concession is completed or after service as a Board Member is completed.

   f. Shall remain and be impartial and independent of the parties and shall disclose in writing to the Authority, the Concessionaire and one another any fact or circumstance which might be such as to cause either the Authority or the Concessionaire to question the continued existence of the impartiality and independence required of Board Member; and

   g. Shall be fluent in the language of the Concession.

2. Except for its participation in the Board's activities as provided in the Concession Agreement and in this Agreement none of the Employer, the Concessionaire, and or the Independent Engineer shall solicit advice or consultation from the Board or the Board Member on matters dealing with the conduct of the Works.

3. The Concessionaire shall:

   (a) Furnish to each Board member one copy of all documents which the Board may request including Concession Agreement, progress reports and other documents pertinent to the performance of the Concession Agreement.

   (b) In cooperation with the Authority, coordinate the site visits of the Board, including conference facilities, and secretarial and copying service.

4. The Board shall begin its activities following the signing of a Board Member's Declaration of Acceptance by all three Board Members, and it shall terminate these activities as set forth below:

   (a) The Board shall terminate its regular activities when either (i) issuance of completion certificate and completion of punch list items or (ii) the parties have terminated the Concession and when, in either case, the Board has communicated to the parties and the Independent Engineer its decision on all disputes previously referred to it.

   (b) Once the Board has terminated its regular activities as provided by the previous paragraph, the Board shall remain available to process any dispute referred to it by either party. In case of such a referral, Board Members shall receive payments as provided in paragraphs 7(a)(ii), (iii) and (iv).

5. Board Members shall not assign or subcontract any of their work under these Rules and Procedures.

6. The Board Members are Independent and not employees or agents of either the Authority or the Concessionaire.

7. Payments to the Board Member for their services shall be governed by the following provision:

   (a) Each Board Member will receive payments as follows:

      i. A retainer fee per calendar month as specified in the schedule of fee made part of this Schedule and its revision from time to time. This retainer fee shall be considered as payment in full for:

         (A) Being available, on 7 days' notice, for all hearings, Site Visits, and other meetings of the Board.

         (B) Being conversant with all project developments and maintaining relevant files.

         (C) All offices and overhead expenses such as secretarial services, photocopying and office supplies (but not include telephone calls, faxes and telexes) incurred in connection with the duties as a Board Member.

      ii. A daily fee as specified in the schedule of fee in respect of fee for site visit & meeting, fee for meeting/ hearing not at site and extra charges for days (max. of 02 days for travel on each occasion) other than hearing/ meeting days.

      iii. Expenses, in addition to the above, all reasonable and necessary travel expenses (including economy class air fare, subsistence, and other direct travel expenses). Receipts for all expenses in excess of Rs. 2000/- (Rupees Two Thousand only) shall be provided.

      iv. Reimbursement of any taxes that may be levied on payments made to the Board Member pursuant to this paragraph 7.

   (b) The retainer fee and other fees shall remain fixed for the period of each Board Member's term until revised by NHAI.

(c) Phasing out of monthly retainer fee. Beginning with the next month after the completion certificate (or, if there are more than one, the one issued last) has been issued, the Board members shall receive only one-third of the monthly retainer fee till next one year. Beginning with the next month after the Board has terminated its regular activities pursuant to paragraph 4(a) above, the Board members shall no longer receive any monthly retainer fee.

(d) Payments to the Board Members shall be shared equally by the Authority and the Concessionaire. The concerned Project Implementation Unit (PIU) of Authority shall pay members' invoices within 30 calendar days after receipt of such invoices and shall invoice the Concessionaire for one-half of the amounts of such invoices. The Concessionaire shall pay such invoice within 30 days' time period after receipt of such invoices.

8. Boards Site Visits:

(a) The Boards shall visit the Site and meet the representative of the Authority, the Concessionaire and the Independent Engineer at regular intervals, at times of critical construction events, at the written request of either party, and in any case not less than 6 times in any period of 12 months. The timing of Site visits shall be as agreed among the Authority, the Concessionaire and the Board, but failing agreement shall be fixed by the Board.

(b) Site visits shall include an informal discussion of the status of the construction of the works. Site visits shall be attended by personnel from the Authority, the Concessionaire and the Independent Engineer.

(c) At the conclusion of each Site visit, the Board shall prepare a report covering its activities during the visit and shall send copies to the parties and to the Independent Engineer.

9. Procedure for Dispute Referral to the Board:

(a) If either party objects to any action or inaction of the other party or the Independent Engineer, the objecting party may file a written Notice of Dispute to the other party with a copy to the Independent Engineer stating that it is given pursuant to the Agreement and state clearly and in details the basis of the dispute.

(b) The party receiving the Notice of Dispute will consider it and respond to it in writing within 14 days after receipt.

(c) This response shall be final and conclusive on the subject, unless a written appeal to the response is filled with the responding party within 10 days after receiving the response and call upon Independent Engineer to mediate and assist the parties in arriving an amicable settlement thereof. Both parties are encouraged to pursue the matter further to attempt to settle the dispute.

(d) If the Independent Engineer receiving the Notice of Dispute fails to provide a written response within 14 days after receipt of such Notice or failing mediation by Independent Engineer, either party may require such dispute to be referred to the Board, either party may refer the dispute to the Board by written Request to the Board. The Request for decision shall state clearly and in full detail the specific issues of the dispute (s) to be considered by Board and shall be addressed to the Chairman of the Board, with copies to the other Board Members, the other party, and the Independent Engineer, and it shall state that it is made pursuant to this Agreement.

(e) When a dispute is referred to the Board, and the Board is satisfied that the dispute requires the Board's assistance, the Board decide when to conduct a hearing on the dispute. The Board may request that written documentation and arguments from both parties be submitted to each Board Member before the hearing begins. The parties shall submit insofar as possible agreed statements of the relevant facts.

(f) During the hearing, the Concessionaire, the Authority, and the Independent Engineer shall each have ample opportunity to be heard and to offer evidence. The Board's decision for resolution of the dispute will be given in writing to the Authority, the Concessionaire and the Independent Engineer as soon as possible, and in any event not more than 56 days or any mutually extended period between the Authority and the Concessionaire. The time period of 56 days of issuance of DRB decision will reckon/start from the day of first hearing that begins after submission of complete pleadings (including supporting documents, if any) by the parties.

10. Conduct of Hearings:

(a) Normally hearings will be conducted at the Site, but any location that would be more convenient and still provide all required facilities and access to necessary documentation may be utilized by the Board. Private session of the Board may be held at any cost effective location convenient to the Board. Video recordings of all hearings shall invariably be made.

(b) The Authority, the Independent Engineer and the Concessionaire shall be given opportunity to have representatives at all hearings. Parties should restrain to bring any Advocate/ Law Firm during DRB hearings.

(c) During the hearings, no Board Member shall express any opinion concerning the merit of the respective arguments of the parties.

(d) After the hearings are concluded, the Board shall meet privately to formulate its decision. The private meeting (s) of the Board shall not exceed 3 sittings. All Board deliberations shall be conducted in private, with all Members' individual views kept strictly confidential. The Board's decisions, together with an explanation of its reasoning shall be submitted in writing to both parties and to the Independent Engineer. The decision shall be based on the pertinent concession provisions, applicable laws and regulations and the facts and circumstance involved in the dispute.

(e) The Boards shall make every effort to reach a unanimous decision. If this proves impossible the majority shall decide and the dissenting Member may prepare a written minority report together with an explanation of its reasoning for submission to both parties and to the independent Engineer.

11. In all procedural matters, including the furnishing of written documents and arguments relating to disputes, site visits and conduct of hearings, the Board shall have full and the final authority. If a unanimous decision on any such matter proves impossible, the majority shall prevail.

12. After having been selected and where necessary approved each Board Member shall sign two copies of the following declaration and make one copy available each to the Authority and to the Concessionaire.

"BOARD MEMBER'S DECLARATION OF ACCEPTANCE"

WHEREAS

(a) A Concession Agreement (the **Concession**) for the_____ project [fills in the name of project] has been signed on _____ [fill in date] between _____ [name of Authority] and _____ [name of Concessionaire] (the Concessionaire).;

(b) The provisions of Agreement and Dispute Resolution Board's rules and procedure provided for establishment and operation of Dispute Resolution Boards (DRB).

(c) The undersigned has been selected to serve as a Board Member on said Board;

NOW THEREFORE, the undersigned Board Member hereby declares as follows:

1. I accept the selection as a Board Member and agree to serve on the Board and to be bound by the provisions of Concession Agreement and rules and procedure provided for establishment and operation of Dispute Resolution Board (DRB).

2. With respect to paragraph 1 of Dispute Resolution Board's Rules and Procedure. Said Annex Λ, I declare

   (a) that I have no financial interest of the kind referred to in subparagraph (a):

   (b) that I have had no previous employment nor financial ties of the kind referred to in subparagraph (b): and

   (c) that I have made to both parties any disclosures that may be required by subparagraph (b) and (c).

3. I declare that I have _____ no. of Arbitrations (list enclosed) and ____no. of DRBs (list enclosed) in progress and that I will give sufficient time for the current assignment.

BOARD MEMBER

_____

_____[insert name of Board Member]

Date: _____

Schedule of expenses and fees payable to the Member (s) of Dispute Resolution Board (DRB)

The fee and other expenses payable to Members of DRB shall be as under:-

S. No.	PARTICULAR	AMOUNT PAYBLE
1.	Retainer-ship fee, secretarial assistance and incidental charges (telephone, fax, postage etc.)	Rs. 50,000/- per month for one package and maximum of Rs. 75,000/- per month for 2 or more packages
2. (i)	Fee for site visit or meetings at site	Rs. 25,000/- per day
(ii)	Fee for meetings/hearings not at site	Rs. 10,000/- per day
3.	Traveling expenses	Economy class by air, AC first class by train and AC taxi by road
4.	Lodging & Boarding	Rs. 15,000/- per day (Metro Cities); or Rs. 10,000/- per day (in other cities); or Rs. 5,000/- per day (own arrangement)
5.	Extra charges for days other than hearing/meeting days (travel days maximum of 2 days on each occasion)	Rs. 5,000/-
6.	Local conveyance	Rs. 2,000/-

Notes:

(i) Lodging, boarding and travelling expenses will be allowed only for those members who are residing 100 kms away from the place of meeting.

(ii) Delhi, Mumbai, Chennai, Kolkata, Bangalore and Hyderabad shall be considered as Metro Cites.

(iii) The above schedule of fee and expenses shall be applicable on or after the date of issue of this circular.

(iv) The expenses are to be shared equally by the parties i.e. Authority and Concessionaire.

AMENDMENTS AND CORRIGENDUM

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

NHAI/ HR/Ambala-KalaAmb/2022

Date:12.07.2022

To,

All the eligible bidders

Amendment-1

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).

Ref: RFP invited on 01.07.2022 for the subject project.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the subject project.

2. In this regard, please find enclosed herewith Request for Proposal (RFP), Draft Concession Agreement (DCA), Bidding Excel Sheet, Schedule A,B,C & D, Plan & Profile drawings, GAD of Structures , Traffic Signage Plan , Drainage Plan and Utility Relocation Plan.

Yours faithfully,

(V K Joshi)
General Manager (Tech)

Enclosure: Request for Proposal (RFP), Draft Concession Agreement (DCA), Bidding Excel Sheet, Schedule A, B , C & D, Plan & Profile drawings, GAD of Structures, Traffic Signage Plan , Drainage Plan and Utility Relocation Plan.

N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
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फैक्स / Fax : 91-11-25093507 / 25093514

NHAI/ HR/Ambala-KalaAmb/2022

Date: 10.08.2022

To,

All the eligible bidders

Amendment-2

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) -**Extension of bid due date- reg.**

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that the Bid Due Date is hereby extended from 16.08.2022 to 30.08.2022. Revised bidding schedule is as below:

S. No.	Event	Revised Schedule
1	Online Bid Submission close date and time	At 11:00 am on 30.08.2022
2	Technical Bid opening date and time	At 11:30 am on 31.08.2022

Yours faithfully,

(V K Joshi)
General Manager (Tech)

भा.रा.रा.मा.प्रा., नई दिल्ली
N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt. Ltd.
AKHPL
Kaithal

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
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जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली 110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

NHAI/ HR/Ambala-KalaAmb/2022

Date: 26.08.2022

To,

All the eligible bidders

Amendment-3

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) -**Extension of bid due date- reg.**

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that the Bid Due Date is hereby extended from 30.08.2022 to 05.09.2022. Revised bidding schedule is as below:

S. No.	Event	Revised Schedule
1	Online Bid Submission close date and time	At 11:00 am on 05.09.2022
2	Technical Bid opening date and time	At 11:30 am on 06.09.2022

Yours faithfully,

(V K Joshi)
General Manager (Tech)

भा.रा.रा.रा.प्रा., नई दिल्ली
N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt. Ltd.
AKHPL
Kaithal

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G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

HR/Ambala-KalaAmb/2022

Date: 02.09.2022

To,

All the eligible bidders

Amendment-4

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) **-Extension of bid due date- reg.**

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that the Bid Due Date is hereby extended from 05.09.2022 to 13.09.2022. Revised bidding schedule is as below:

S. No.	Event	Revised Schedule
1	Online Bid Submission close date and time	At 11:00 am on 13.09.2022
2	Technical Bid opening date and time	At 11:30 am on 14.09.2022

Yours faithfully,

(V K Joshi)
General Manager (Tech)

N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt Ltd
AKHPL
Kaithal

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
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G-5 & 6, Sector-10, Dwarka, New Delhi-110075

दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

HR/Ambala-KalaAmb/2022

Date: 12.09.2022

To,

All the eligible bidders

Amendment-5

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) -**Extension of bid due date- reg**.

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that the Bid Due Date is hereby extended from 13.09.2022 to 20.09.2022. Revised bidding schedule is as below:

S. No.	Event	Revised Schedule
1	Online Bid Submission close date and time	At 11:00 am on 20.09.2022
2	Technical Bid opening date and time	At 11:30 am on 21.09.2022

Yours faithfully,

(V K Joshi)
General Manager (Tech)

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

N.H.A.I., NEW DELHI

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
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G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

HR/Ambala-KalaAmb/2022

Date: 19.09.2022

To,

All the eligible bidders

Amendment-6

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) **-Extension of bid due date- reg.**

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that the Bid Due Date is hereby extended from 20.09.2022 to 27.09.2022. Revised bidding schedule is as below:

S. No.	Event	Revised Schedule
1	Online Bid Submission close date and time	At 11:00 am on 27.09.2022
2	Technical Bid opening date and time	At 11:30 am on 28.09.2022

Yours faithfully,

(V K Joshi)
General Manager (Tech)

Ambala Kala Amb Highway Pvt. Ltd. KHPL Kaithal

N.H.A.I., NEW DELHI

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
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G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

HR/Ambala-KalaAmb/2022

Date: 21.09.2022

To,

All the eligible bidders

Amendment-7

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) - **Reply of pre-bid queries and corrigendum/addendum to tender documents - reg.**

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work. In this regards, it is to intimate that following documents are being uploaded for above mentioned work:-

S.no	Description	Remark
1)	Corrigendum to RFP, DCA	As per revised financial analysis, estimated project cost of the project has been revised from Rs. 642.24 Cr. to Rs. 643.17 Cr. Accordingly, Changes have been incorporated in RFP, DCA.
2)	Revised Schedule A	Updated with existing utility details
3)	Revised Schedule D	ATMS provisions regarding maintenance have been amended. Accordingly, changes have been incorporated in schedule D , and Annex –II of schedule – K.
4)	Revised Schedule B & C	Revised in view of change in location of Fee Plaza location and as per pre bid queries sent by bidders
5)	Revised P&P of Main Carriageway	
6)	Revised P&P of service road	
7)	Corrigendum to traffic signage plan	Traffic signage plan (Km. 16 to Km. 18) and (Km 26 to Km 28) have been revised on account of change in location of fee plaza.
8)	Main report of DPR	As sought in pre-bid queries
9)	Geotechnical Report	As sought in pre-bid queries
10	Hydrology Report	As sought in pre-bid queries
11	KMZ of alignment	As sought in pre-bid queries
12	Profile of Loop/Ramps at Trumpet interchange	As sought in pre-bid queries

3. Bidders vide various letters/emails have raised pre-bid queries. Reply of pre-bid queries raised by bidders is enclosed as **Annexure-I**.

Yours faithfully,

(V K Joshi)
General Manager (Tech)

Enclosure: As above.

Sub.: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).

Corrigendum

Sl. No.	Clause No.	Existing Clause	Modified Clause
1.	NIT Table	Estimated Project Cost of **Rs. 642.24 Crore**	Estimated Project Cost of **Rs. 643.17 Crore**
2.	Clause 1.1.1 of RFP Table	Estimated Project Cost of **Rs. 642.24 Crore**	Estimated Project Cost of **Rs. 643.17 Crore**
3.	Clause 1.2.4 of RFP	A Bidder is required to deposit, along with its Bid, a Bid Security of **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)** (the "Bid Security"), refundable not later than 90(ninety) days from the Bid Due Date, except in the case of the Selected Bidder whose Bid Security shall be retained till it has provided a Performance Security under the Agreement. The Bidders will have an option to provide Bid Security in the form of a demand draft or a bank guarantee acceptable to the Authority, and in such event, the validity period of the bank guarantee shall not be less than 120 (one hundred and twenty) days from the Bid Due Date with a claim period of 60 (sixty) days, and may be extended as may be mutually agreed between the Authority and the Bidder from time to time. The validity of the demand draft shall not be less than 60 (sixty) days from the bid due date. Upon submission of Demand draft, the same shall be encashed by the Authority. This Guarantee shall be transmitted through SFMS Gateway to NHAI's Bank. The Bid shall be summarily rejected if it is not accompanied by the Bid Security.	A Bidder is required to deposit, along with its Bid, a Bid Security of **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)** (the "Bid Security"), refundable not later than 90(ninety) days from the Bid Due Date, except in the case of the Selected Bidder whose Bid Security shall be retained till it has provided a Performance Security under the Agreement. The Bidders will have an option to provide Bid Security in the form of a demand draft or a bank guarantee acceptable to the Authority, and in such event, the validity period of the bank guarantee shall not be less than 120 (one hundred and twenty) days from the Bid Due Date with a claim period of 60 (sixty) days, and may be extended as may be mutually agreed between the Authority and the Bidder from time to time. The validity of the demand draft shall not be less than 60 (sixty) days from the bid due date. Upon submission of Demand draft, the same shall be encashed by the Authority. This Guarantee shall be transmitted through SFMS Gateway to NHAI's Bank. The Bid shall be summarily rejected if it is not accompanied by the Bid Security.
4.	Clause 2.1.6 of RFP	The Bidder shall deposit a Bid Security of **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)** in accordance with the provisions of this RFP. The Bidder has the option to provide the Bid Security either as a Demand Draft or in the form of a Bank Guarantee acceptable to the Authority, as per format at Appendix-II. The Bidders shall also make online payment towards cost of bid document of Rs. 70,000/- (Rupees Seventy Thousand Only) specifying the tender ID and Bid due date to NHAI.	The Bidder shall deposit a Bid Security of **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)** in accordance with the provisions of this RFP. The Bidder has the option to provide the Bid Security either as a Demand Draft or in the form of a Bank Guarantee acceptable to the Authority, as per format at Appendix-II. The Bidders shall also make online payment towards cost of bid document of Rs. 70,000/- (Rupees Seventy Thousand Only) specifying the tender ID and Bid due date to NHAI.
5.	Clause 2.2.2 (A) (iii) of RFP	collected and appropriated revenues from Eligible Project(s) in Category 1 and/or Category 2 specified in Clause 3.4.1, such	collected and appropriated revenues from Eligible Project(s) in Category 1 and/or Category 2 specified in Clause 3.4.1, such

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Sl. No.	Clause No.	Existing Clause	Modified Clause
		that the sum total of the above, as further adjusted in accordance with clause 3.4.6, is more than **Rs. 642.24 Crore (Rupees Six Hundred Forty Two Crore and Twenty Four Lakh only)** (the "Threshold Technical Capability").	that the sum total of the above, as further adjusted in accordance with clause 3.4.6, is more than **Rs. 643.17 Crore (Rupees Six Hundred Forty Three Crore and Seventeen Lakh only)** (the "Threshold Technical Capability").
6.	Clause 2.2.2 (AA) of RFP	Provided that at least one similar work of 20% of Estimated Project Cost **Rs. 128.45 Crore (Rupees One Hundred Twenty Eight Crore and Forty Five Lakh Only)** shall have been completed from the Eligible Projects in Category 1 and/or Category 3 specified in Clause 3.4.1. For this purpose, a project shall be considered to be completed, if more than 90% of the value of work has been completed and such completed value of work is equal to or more than 20% of the estimated project cost.	Provided that at least one similar work of 20% of Estimated Project Cost **Rs. 128.63 Crore (Rupees One Hundred Twenty Eight Crore and Sixty Three Lakh Only)** shall have been completed from the Eligible Projects in Category 1 and/or Category 3 specified in Clause 3.4.1. For this purpose, a project shall be considered to be completed, if more than 90% of the value of work has been completed and such completed value of work is equal to or more than 20% of the estimated project cost.
7.	Clause 2.2.2 (B) of RFP	Financial Capacity: The Bidder shall have a minimum Net Worth (the "Financial Capacity") of **Rs. 96.34 Crore (Rupees Ninety Six Crore and Thirty Four Lakh only)** at the close of the preceding financial year§.	Financial Capacity: The Bidder shall have a minimum Net Worth (the "Financial Capacity") of **Rs. 96.48 Crore (Rupees Ninety Six Crore and Forty Eight Lakh only)** at the close of the preceding financial year§.
8.	Clause 2.11.1 (i) of RFP	BID Security of **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)** in the form of Bank Guarantee in the format at Appendix-II from a Scheduled Bank.	BID Security of **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)** in the form of Bank Guarantee in the format at Appendix-II from a Scheduled Bank.
9.	Clause 2.11.2 (e) of RFP	Bid Security of **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)** in the form of Original Demand Draft or Original Bank Guarantee in the format at Appendix-II from a Scheduled Bank.	Bid Security of **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)** in the form of Original Demand Draft or Original Bank Guarantee in the format at Appendix-II from a Scheduled Bank.
10.	Clause 3.4.3 (c) of RFP	the capital cost of the project should be more than **Rs. 32.11 Crore (Rupees Thirty Two Crore and Eleven Lakh only)**; and	the capital cost of the project should be more than **Rs. 32.16 Crore (Rupees Thirty Two Crore and Sixteen Lakh only)**; and
11.	Clause 3.4.4 of RFP	For a project to qualify as an Eligible Project under Categories 3 and 4, the Applicant should have paid for execution of its construction works or received payments from its client(s) for construction works executed, fully or partially, during the 5 (five) financial years immediately preceding the Bid Due Date, and only the payments (gross) actually made or received, as the case may be, during such 5 (five) financial years shall qualify for purposes of computing the Experience Score. However, payments/receipts of less than **Rs. 32.11 Crore (Rupees Thirty Two Crore and Eleven Lakh only)**; shall not be reckoned as payments/receipts for Eligible	For a project to qualify as an Eligible Project under Categories 3 and 4, the Applicant should have paid for execution of its construction works or received payments from its client(s) for construction works executed, fully or partially, during the 5 (five) financial years immediately preceding the Bid Due Date, and only the payments (gross) actually made or received, as the case may be, during such 5 (five) financial years shall qualify for purposes of computing the Experience Score. However, payments/receipts of less than **Rs. 32.16 Crore (Rupees Thirty Two Crore and Sixteen Lakh only)**; shall not be

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Sl. No.	Clause No.	Existing Clause	Modified Clause
		Projects. For the avoidance of doubt, construction works shall not include supply of goods or equipment except when such goods or equipment form part of a turn-key construction contract/ EPC contract for the project. Further, the cost of land shall not be included hereunder.	reckoned as payments/receipts for Eligible Projects. For the avoidance of doubt, construction works shall not include supply of goods or equipment except when such goods or equipment form part of a turn-key construction contract/ EPC contract for the project. Further, the cost of land shall not be included hereunder.
12.	APPENDIX IA Letter Comprising the Technical Bid Point No. 22	I/We offer a Bid Security of **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)** to the Authority in accordance with the RFP Document.	I/We offer a Bid Security of **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)** to the Authority in accordance with the RFP Document.
13.	APPENDIX – II Bank Guarantee for Bid Security Point No. 1	In consideration of you, National Highways Authority of India , having its office at G-5&6, Sector-10, Dwarka, New Delhi-110075, (hereinafter referred to as the "Authority", which expression shall unless it be repugnant to the subject or context thereof include its, successors and assigns) having agreed to receive the Bid of ..... (a Company registered under Companies Act, 1956/2013) and having its registered office at ..... (and acting on behalf of its Consortium) (hereinafter referred to as the "Bidder" which expression shall unless it be repugnant to the subject or context thereof include its/their executors administrators, successors and assigns), for 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) (hereinafter referred to as "the Project") pursuant to the RFP Document dated ..... issued in respect of the Project and other related documents including without limitation the draft concession agreement (hereinafter collectively referred to as "Bidding Documents"), we (Name of the Bank) having our registered office at ..... and one of its branches at ..... (hereinafter referred to as the "Bank"), at the request of the Bidder, do hereby in terms of Clause 2.1.6 read with Clause 2.1.7 of the RFP Document, irrevocably, unconditionally and without	In consideration of you, National Highways Authority of India , having its office at G-5&6, Sector-10, Dwarka, New Delhi-110075, (hereinafter referred to as the "Authority", which expression shall unless it be repugnant to the subject or context thereof include its, successors and assigns) having agreed to receive the Bid of ..... (a Company registered under Companies Act, 1956/2013) and having its registered office at ..... (and acting on behalf of its Consortium) (hereinafter referred to as the "Bidder" which expression shall unless it be repugnant to the subject or context thereof include its/their executors administrators, successors and assigns), for 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) (hereinafter referred to as "the Project") pursuant to the RFP Document dated ..... issued in respect of the Project and other related documents including without limitation the draft concession agreement (hereinafter collectively referred to as "Bidding Documents"), we (Name of the Bank) having our registered office at ..... and one of its branches at ..... (hereinafter referred to as the "Bank"), at the request of the Bidder, do hereby in terms of Clause 2.1.6 read with Clause 2.1.7 of the RFP Document, irrevocably,

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Sl. No.	Clause No.	Existing Clause	Modified Clause
		reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of the Bidding Documents (including the RFP Document) by the said Bidder and unconditionally and irrevocably undertake to pay forthwith to the Authority an amount of **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)** (hereinafter referred to as the "Guarantee") as our primary obligation without any demur, reservation, recourse, contest or protest and without reference to the Bidder if the Bidder shall fail to fulfil or comply with all or any of the terms and conditions contained in the said Bidding Documents.	unconditionally and without reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of the Bidding Documents (including the RFP Document) by the said Bidder and unconditionally and irrevocably undertake to pay forthwith to the Authority an amount of **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)** (hereinafter referred to as the "Guarantee") as our primary obligation without any demur, reservation, recourse, contest or protest and without reference to the Bidder if the Bidder shall fail to fulfil or comply with all or any of the terms and conditions contained in the said Bidding Documents.
14.	APPENDIX – II Bank Guarantee for Bid Security Point No. 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 Bidding Documents including failure of the said Bidder to keep its Bid open during the Bid validity period as set forth in the said Bidding Documents 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. However, our liability under this Guarantee shall be restricted to an amount not exceeding **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)**.	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 Bidding Documents including failure of the said Bidder to keep its Bid open during the Bid validity period as set forth in the said Bidding Documents 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. However, our liability under this Guarantee shall be restricted to an amount not exceeding **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)**.
15.	APPENDIX – II Bank Guarantee for Bid Security Point No. 13	For the avoidance of doubt, the Bank's liability under this Guarantee shall be restricted to **Rs. 6.42 Crore (Rupees Six Crore and Forty Two Lakh only)**. The Bank shall be liable to pay the said amount or any part thereof only if the Authority serves a written claim on the Bank in accordance with paragraph 9 hereof, on or before *** (indicate date falling 180 days after the Bid Due Date)	For the avoidance of doubt, the Bank's liability under this Guarantee shall be restricted to **Rs. 6.43 Crore (Rupees Six Crore and Forty Three Lakh only)**. The Bank shall be liable to pay the said amount or any part thereof only if the Authority serves a written claim on the Bank in accordance with paragraph 9 hereof, on or before *** (indicate date falling 180 days after the Bid Due Date)
16.	Clause 23.7.2 of DCA	Above amount for the performance of Contractors' Maintenance obligations shall be, inclusive of all taxes. The amount payable for maintenance shall be adjusted	Above amount for the performance of Contractors' Maintenance obligations shall be, inclusive of all taxes **(except GST, which shall be payable at**

Sl. No.	Clause No.	Existing Clause	Modified Clause
		on account of variation of Price Index. It is further agreed that the Bid Project Cost hereunder shall be reckoned with reference to the amount specified in Clause 23.1, which shall be adjusted to the extent of Change of Scope and Reduction in Scope, but shall not include any price adjustments in pursuance of variation of Price Index.	**applicable rates).** The amount payable for maintenance shall be adjusted on account of variation of Price Index. It is further agreed that the Bid Project Cost hereunder shall be reckoned with reference to the amount specified in Clause 23.1, which shall be adjusted to the extent of Change of Scope and Reduction in Scope, but shall not include any price adjustments in pursuance of variation of Price Index.
17.	Article 35.1 of RFP	If as a result of Change in Law, the Concessionaire suffers an increase in costs or reduction in net after-tax return or other financial burden, the aggregate financial effect of which exceeds the higher of **Rs. 1.28 crore (Rupees One Crore and Twenty Eight Lakh only)** or 2% (two per cent) of the total Annuity Payments in any Accounting Year, the Concessionaire may so notify the Authority and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in increased costs, reduction in return or other financial burden as aforesaid. Upon notice by the Concessionaire, the Parties shall meet, as soon as reasonably practicable as but no later than 30 (thirty) days from the date of notice and either agree on amendments to this Agreement or on any other mutually agreed arrangement.	If as a result of Change in Law, the Concessionaire suffers an increase in costs or reduction in net after-tax return or other financial burden, the aggregate financial effect of which exceeds the higher of **Rs. 1.29 crore (Rupees One Crore and Twenty Nine Lakh only)** or 2% (two per cent) of the total Annuity Payments in any Accounting Year, the Concessionaire may so notify the Authority and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in increased costs, reduction in return or other financial burden as aforesaid. Upon notice by the Concessionaire, the Parties shall meet, as soon as reasonably practicable as but no later than 30 (thirty) days from the date of notice and either agree on amendments to this Agreement or on any other mutually agreed arrangement.
18.	Article 35.2 of RFP	If as a result of Change in Law, the Concessionaire benefits from a reduction in costs or increase in net after-tax return or other financial gains, the aggregate financial effect of which exceeds the higher of **Rs. 1.28 crore (Rupees One Crore and Twenty Eight Lakh only)** or 2% (two per cent) of the total Annuity Payments in any Accounting Year, the Authority may so notify the Concessionaire and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in decreased costs, increase in return or other financial gains as aforesaid. Upon notice by the Authority, the Parties shall meet, as soon as reasonably practicable as but no later than 30 (thirty) days from the date of notice and either agree on such amendments to this	If as a result of Change in Law, the Concessionaire benefits from a reduction in costs or increase in net after-tax return or other financial gains, the aggregate financial effect of which exceeds the higher of **Rs. 1.29 crore (Rupees One Crore and Twenty Nine Lakh only)** or 2% (two per cent) of the total Annuity Payments in any Accounting Year, the Authority may so notify the Concessionaire and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in decreased costs, increase in return or other financial gains as aforesaid. Upon notice by the Authority, the Parties shall meet, as soon as reasonably practicable as but no later than 30 (thirty) days from the date of notice

Sl. No.	Clause No.	Existing Clause	Modified Clause
		Agreement or on any other mutually agreed arrangement.	and either agree on such amendments to this Agreement or on any other mutually agreed arrangement.
19.	ANNEX – II (Schedule-K)	-	Annex-II of Schedule K is attached.

Annex - II
(Schedule-K)

ATMS Operation & Maintenance Requirement

1. General

1.1 General Requirements

Operation and Maintenance of Advance Traffic Management System (ATMS) shall be executed in the manner originally intended, that is to collect road, traffic and weather condition data, process and analyse the data into useful information, disseminate the information to road users in accordance with the procedures as set forth herein and instructions given by the Engineer. The system shall be in operation for 24 hours a day and 7 days a week without interruption. The Concessionaire shall not divert and modify the procedure without written approval by the NHAI.

The purpose of Operation and Maintenance of ATMS is to keep the traffic management system and related facilities in operation in the manner originally intended, that is to collect road, traffic and weather condition data, process and analyse the data into useful information, disseminate the information to road users and to prolong the life of the system and the equipment. Therefore, time is of essence. Repair must be done in a timely manner.

The specifications described herein shall be considered the minimum standards to be followed for the maintenance and repair of all equipment and software covered under the Contract. Unless otherwise specified, the standards for equipment and equipment performance shall be in accordance with the Technical Specification.

1.2 Scope of Work

Apart from installation of ATMS system, the scope of contract also includes Operation and Maintenance of ATMS for entire O&M period from the date of Completion of works. Except otherwise specified in the Operation & Maintenance Specifications of NHAI's Requirements, it is the Concessionaire's responsibility to provide sufficient manpower to implement flawless execution of ATMS in operation in the manner originally intended, that is to collect road, traffic and weather condition data, process and analyse the data into useful information, disseminate the information to road users and undertake the Services that are not specifically mentioned in these requirements but essential for the safe and efficient traffic operation on the Project. The Concessionaire shall maintain qualified staff at the Traffic Management Centre (TMC), Sub Centre and other places wherever required necessary, tools, shop facilities, equipment, consumables, transportation and materials and perform all works necessary to maintain in good working manner all Advanced traffic management system and associated equipment.

The scope shall also include the following:

1. Accident / incident management from the ATMS Control Centre.
2. Performing periodic mock trials of rescue and incident management (at least once in a month) to maintain the efficiency and effectiveness of the operations team.
3. Routine monitoring of the project stretch from the ATMS Control Centre.
4. Manning the Emergency Telephone console to receive and respond to emergency calls without fail.
5. Monitoring of system status including the status of individual equipment and sub-systems and alerting the maintenance team in case of any failure(s).
6. Communication with the Patrolling/ Police/Emergency response Team / hospitals/ medical aid post, etc. whenever necessary,
7. Monitoring of movement of vehicles mandated for incident management on the project Expressway (Ambulance, route patrol, tow-away cranes) via GPS vehicle tracking and CCTV/ TMCS,
8. Efficient performance of incident management actions and monitoring based on the automatic system related checklist –based tool provided in the TMC.
9. Submit monthly reports of the system performance to the Authority / Independent Engineer by 5th day of the following month.

10. Respond to incidents (e.g. Emergency calls received at the ATMS Control Center) within stipulated time and enabling of all actions for optimal rescue and traffic normalization, including the rapid deployment of vehicles (ambulances, breakdown cranes and Patrol vehicles).
11. Detection of Vehicles not permitted to use project stretch, animal, vehicles damaging, spilling of hazardous material, etc. on the project stretch.
12. Detection of vandalism/ damage / malfunctioning of project property/assets (road signs, lighting, crash barrier, median plantation, etc.)
13. House Keeping of Traffic Management Centre and Sub Centre by a house keeping supervisor, housekeeper, security guard, cleaner, gardener and miscellaneous workers.
14. Administrative work such as purchases, account, human resource, public relation
15. ATMS Building maintenance and recurring charges such as electricity bills, water bill, etc.

Operation & Maintenance services are required to cover the system of Traffic Management Centre, Sub Centre system and following sub system.

1) Traffic Monitor Camera System (TMCS)
2) Video Incident Detection System (VIDS)
3) Automatic Traffic Counter and Classifier (ATCC) module
4) Travel Time Measurement System (TTMS) module
5) Central Processing System
6) Vehicle Speed Detection System (VSD)
7) Adaptive Traffic Signal Control System (ATSC)
8) Digital Transmission System and Communication Cable
9) Power and Other Cables
10) Facility Monitoring System
11) ADAS
12) IMS

Apart from above scope of operation and maintenance of ATMS, following works are out of scope from Operation and Maintenance of ATMS, but scope of NHAI and/or their Contractor.

1) Operation and Maintenance of TMS (Toll Management System)

2. *Operation & Maintenance Service Requirement*

The Concessionaire shall describe the methodology and outline, to execute proposed Services both Operation & Maintenance in sufficient detail in his Services Proposal to enable the NHAI to evaluate the technical capability and qualification of the Concessionaire and to judge whether the proposal is adequately responsive or not.

The Concessionaire shall update and furnish the Service Proposal two (2) months before expected starting date of Operation period for approval by NHAI.

The Services Proposal shall describe the operation and maintenance activities taking Manufacturer or OEM recommendations for all hardware and software into consideration and shall be written in the same sequence as the NHAI's Requirement. Where the supporting documents such as brochure, article, report, or paper are provided, they shall be attached at the end of the proposal or in a separate volume and a cross reference shall be prepared. The Services Proposal shall be written in English.

The Concessionaire shall prepare a list of equipment to be covered by the maintenance based on the actual configuration and quantity of the equipment. If the Concessionaire provides any additional equipment not specifically mentioned in the NHAI's Requirements to complete the Advance traffic management system required under the Contract, they shall be included in the scope of maintenance work and the Concessionaire shall prepare and submit to the Engineer the revised list for his approval.

This plan shall be updated as necessary during the O&M period so as to reflect the actual conditions of O&M.

2.1 Operation Service Requirement

The contents of the Services Proposal shall include but not limited to the following:

1. Scope of services to be rendered
2. Standard Operating Procedures (SOP)
3. Checklist for operations tasks for each sub-system
4. System coverage area and list of equipment
5. ATMS Contractor's general obligation
6. Organization of operation team
7. Standard Operation Procedure (SOP) of sub-systems
8. Records and reports to be prepared by the Concessionaire
9. ATMS Contractor's personnel and personnel management
10. Operation manual
11. Training of Concessionaire's personnel
12. Safety, security and protection of environment
13. Ability to track performance and operation activities
14. Inspection and evaluation

No cost information of the services and operation shall be included in the Services Proposal.

2.2 Maintenance Service Requirement

The contents of the Maintenance Services Proposal shall include but not limited to the following:

1 Scope of services to be rendered
2 System coverage area and list of equipment
3 ATMS Contractor's general obligation
4 Organization of maintenance team
5 Maintenance manual
6 Checklist for Preventive Maintenance tasks on each device
7 Inventory of devices
8 Work order management capabilities
9 Level of Service and device inventory
10 Ability to track performance and maintenance activities
11 Establishing criteria for devices, equipment and systems regarding mean time failure
12 Equipment needed for performing diagnosis on ITS field devices
13 Schedule cross training activities to improve the overall skill level of ATMS technicians

3. Requirements for ATMS Operation Services

The various type of operation related services to be performed by the Concessionaire shall include the following:

3.1 ATMS Operation

The ATMS Operation shall be executed in accordance with the procedures as set forth herein and instructions given by the NHAI. The system shall be in operation for 24 hours a day and 7 days a week without interruption. The Concessionaire shall not divert and modify the procedure without written approval by the NHAI.

3.2 Briefing at shift change

Shift time of operators shall be arranged in such a way that there will be an overlapping period of at least 15 minutes. During the overlapped period, new operation team shall be briefed by the previous operation team as to the following:

1) General traffic condition
2) Weather condition
3) Existing incidents and accident being disposed of
4) On-going and scheduled work on the Project
5) On-going and scheduled event on the Project and radial roads connected with the Project interchange
6) Equipment malfunctioned and the status of maintenance work
7) Other matters that need attention of the operation team

3.2.1 Confirmation of equipment condition

At the start of a shift, operators shall confirm the condition of all equipment through operation or through the consoles. If there is a new failure that was not reported by the previous shift team, the operator shall record it and report it to the maintenance team for proper maintenance action.

During the operation of the system, if the operator detects any abnormality of the equipment, software, or database, he shall report it to the maintenance team for proper maintenance action. The operator shall refrain from manipulating equipment, modifying operating parameters, reloading software or other action without instruction by the maintenance staff when abnormal or defective behaviour of the equipment or software is found.

If the fault signal or no diagnosis signal response from roadside equipment is received at Traffic Management Centre, operator shall contact the maintenance team and report the location and status of equipment with failure.

3.3 Operation of Emergency Telephone ("1033")

3.3.1 System Setup

The system shall be set to automatic recording mode and all calls shall be recorded automatically. No recorded conversation shall be deleted without the written consent of the NHAI.

3.3.2 Operation

3.3.2.1 Call reception

When operator receives a call from "1033", he shall confirm the following information from the caller:

1. Caller's ID
2. Type of incident (accident, break-down, puncture, out of fuel, fallen object, etc.)
3. Location (kilo post and direction)
4. Request for action

In the case of accident, the followings shall be confirmed in addition to items (1) through (4) above.

1. Type and severity of accident
2. Number of persons injured
3. Necessity of ambulance, wrecker and/or fire brigade
4. Possibility of drivability of vehicle involved in the accident

In the case of breakdown, the followings shall be confirmed in addition to items (1) through (4) above.

1. The lane where that broken-down vehicle is stopping
2. Vehicle type
3. Reason of breakdown
4. Necessity of wrecker or crane

The operator shall inform the caller to implement temporary safety measures such as placing safety triangle or waving flag to prevent secondary incident and advise the caller to stay at a safe place.

In the case of simple inquiry such as location of exit for specific destination, the operator shall provide necessary information to the caller.

3.3.2.2 Countermeasure

The operator shall inform the patrol team of the incident so that they can take proper actions at site. If a call involves request for assistance such as dispatching wrecker, the operator shall inform the relevant agencies and request appropriate action to be taken.

3.3.2.3 Message

If the incident reported is the type that affects traffic flow or traffic safety on the Project, the operator shall provide incident information and display the incident information to the Mobile App.

3.3.2.4 Reporting

The operator shall fill up the prescribed incident form for every incident that requires actions to be taken by the NHAI, operator or other agencies.

When operator receive a call from patrol team or other related agencies regarding completion or clearing of incident, operator shall remove the incident message.

3.3.2.5 Mobile communication

The operating procedure from the mobile communication shall be same as that for "1033" emergency call system. If operator receives a call from a road user or patrol team through mobile phone, the operator shall act in a same manner as a call from "1033".

3.4 Operation of Traffic Monitor Camera System (TMCS)

3.4.1 System Setup

Under normal condition of the Project, the TMCS system shall be set to sequential display mode in which video image from all TMCS cameras is sequentially displayed on the multiple video monitors. The number of monitors used and scanning interval of each video camera is user selectable.

The TMCS camera shall also perform the automatic incident detection functions in each pre-set position. Under normal condition of the Project, the TMCS cameras shall be set at home position and shall periodically to other pre-set positions to enable automatic incident detection.

Image recording function shall be set to ON and image from all TMCS cameras shall be recorded automatically.

3.4.2 Operation

3.4.2.1 Monitoring

The operator shall from time to time watch the TMCS monitor which sequentially displays video image from all cameras at pre-set interval to monitor and confirm normal traffic flow.

If any abnormality is found in the video image, the operator shall discontinue sequential changeover mode and select and fix the camera that captures the scene of incident and observe the incident. If the incident is the type that requires assistance, the operator shall inform relevant agencies of the incident and request appropriate action to be taken.

If a report of incident is received and incident location is within the coverage area of a TMCS camera, the operator shall select the TMCS camera of incident location, operate the camera and focus on the incident to monitor to get first-hand information of the incident.

3.4.2.2 Incident detection

If the Video Incident Detection System (VIDS) detects an incident such as a vehicle moving in reverse direction, VIDS console issues an alarm and incident image will be displayed on the VIDS console monitor and Graphics Display.

The operator shall request Mobile operator to contact the relevant agencies such as patrol team, traffic police, fire brigades, ambulance or wrecker service, explain briefly the incident, and request them to take necessary action immediately.

3.4.2.3 Message

If the incident detected and reported is the type that affects traffic flow or traffic safety on the Project, the operator shall disseminate the incident information to the Mobile app as per the operating procedures.

3.5 Operation of Automatic Traffic Counter-cum-Classifier (ATCC) System and Travel Time Measuring System (TTMS)

3.5.1 System Setup

No specific system setup is required for ATCC and TTMS once its normal operation is confirmed at the time of system commissioning, as no additional hardware or filed equipment has been installed on the Project for ATCC and TTMS functionalities. The ATMS Software

processes the data from ANPR and VIDS cameras for traffic counting and classification, and travel time estimation. However, threshold values that are used to detect abnormal traffic conditions shall be reviewed from time to time to confirm that the values are appropriate.

3.5.2 Operation

3.5.2.1 Monitoring

Operator shall from time to time but at least once an hour check the ATCC and TTMS data for any abnormality. If any abnormal data is found, the operator shall confirm whether the actual traffic flow is different from the normal, or the data is erroneous. If the data is found erroneous, the operator shall inform the maintenance team for further investigation.

3.5.2.2 Abnormal traffic condition

If the ATCC and TTMS module detects a traffic flow parameter at a lane or section is lower or higher than the predetermined threshold, the ITS console issues an alarm to the monitor display as abnormal traffic condition.

If an alarm is issued, the operator shall capture the image of traffic by TMCS at the sensing area and confirm whether the abnormal data is caused by the abnormal traffic condition or by ANPR equipment failure.

If any incident is identified by the TMCS system and requires attention or help, the Traffic operator shall contact the relevant agencies such as patrol team, traffic police, fire brigades, ambulance etc. for their action.

After the contact with the relevant agencies, operator shall disseminate adequate messages to the Mobile App.

When Traffic operator confirms that the traffic condition has become normal, operator to remove the messages or change the message with second priority. Operator shall also inform the relevant agencies of the termination of the incident.

3.5.2.3 Monthly review

At the end of every month, the operator shall go through the data collected by the ATCC and TTMS for any abnormality that could have been overlooked during daily operation. If an abnormal data is found, the operation shall further examine the data and determine whether the traffic condition became abnormal due to an incident or the ANPR equipment was defective. If any abnormality that is attributable to erroneous system operation is found, the operator shall inform the maintenance team for further investigation.

3.6 Operation of Messages on Mobile App

3.6.1 Type of information provided

Different types of message shall be sent to the Mobile App. These types are summarized below. With regard to the message format, the same shall be finalised in consultation with the Independent Engineer.

Social messages shall not be sent at any time. Only the messages useful for the user to provide them the information / alert / warning for any incident, road closure, traffic jam, over-speeding alerts etc. or travel time shall be sent. Travel advisory or travel time may be sent when there is no alert / warning is required to be disseminated to the commuters.

3.6.2 Advance warning message

Advance warning message gives the road users running at upstream section an advance notice of the incident at downstream section. The incident includes traffic congestion, slow traffic, accident, stalled vehicle, lane closure, fallen object, work zone and weather conditions. The message is effective in reducing possibility of secondary incidents.

3.6.3 Advisory message

Advisory message provides the road users with useful information about a specific problem along their route. This information allows the road users to change their speed or lane in

advance of the problem area, or the road users may elect to voluntarily take an alternative route to their destination.

3.6.4 Early notice

Early notice informs the road users of a planned event such as road work on the Project or the closure of an interchange. This type of message has lower priority than other types of message and will be displayed only when there is no real-time message to be shown.

3.6.5 Language used

Three languages, English, Hindi, and another one local language will be used for messages. Thus, the operator shall be fluent in these languages. Except short message, messages will be displayed in one of the three languages. Message shall carry the same meaning regardless of the language used. For short message that can be expressed in one line, the same message may be displayed simultaneously in three lines.

3.6.6 Message Layout

Standard layout shall be followed consistently to express information for easier understanding by the road users.

3.6.7 Message Composition Method

TCC operator can choose message creation from three (3) methods as indicated below.

1) Combination of pre-defined message
The word which are frequently used such as "accident", "congestion", "construction work", "slow down" and so on are used to compose a message combination. They contain words indicating location, event and instruction.

2) Ready-made message
Operator may select one of the ready-made messages stored in the console.

3) Manual composition
Any message which operator cannot select from console; operator can create any message through keyboard.

4) Graphic symbols
Operator may provide a graphic symbol that graphically represent an incident and help Project road users to understand instantly without reading messages.

3.6.8 Message display

Upon reception of incident information from other operators or directly from other agencies, the operator shall send proper message with adequate location and direction without undue delay.

The operator shall evaluate the priority of the current and new incidents and decide whether the message being displayed is replaced with the new message or not.

The incident that exists at immediate downstream section shall have higher priority than the incident that is located more than one section away in general. If there are two incidents in a same section between two interchanges, incident of higher severity will take precedence over the incident with lower severity. If there are two incidents of same severity, incident nearer to the GPS location of the mobile app shall be displayed first.

3.6.9 Message removal

Upon reception of the notice that an incident for which a message is displayed has been resolved, the operator shall remove the message or replace with another message immediately. The message of the incident that has been resolved shall not be displayed unnecessarily.

The operator shall check the effectiveness of all the messages being displayed at every 15 minutes and confirm the message needs to be continued or removed. The operator shall remove the message or replace with another message if the message being displayed is no longer applicable.

3.7 Security & related Incident Management Service

The ATMS Project shall be designed for an end-to-end multi-layer security blanket to protect applications, services, data and the infrastructure from malicious attacks or theft from external (through internet) and internal (through intranet) hackers. Using Firewalls and Intrusion detection systems such attacks and theft should be controlled and well supported (and implemented) with the security policy. The virus and worms attacks should be well defended with Gateway level Anti-virus system, along with console level Anti-virus mechanism. ATMS should be designed to make use of the Secure Socket Layer (SSL)/Virtual Private Network (VPN) technologies to have secured communication between Applications and its end users. Furthermore, all the system logs should be properly stored & archived for future analysis and forensics whenever desired.

These Service Levels would be calculated for each of the following types of incidences:

a) Virus Attack

Any virus infection and passing of malicious code shall be monitored at the gateway level or user complains of virus infection shall be logged at the help desk system and collated every quarter.

b) Denial of Service (DoS) Attack

Non-availability of any services shall be analysed and forensic evidence shall be examined to check whether it was due to external DoS attack.

c) Intrusion

Intrusion is an illegal act of entering, seizing, or taking possession of data hosted by ATMS. Compromise of any kind of data hosted by ATMS.

d) SPAM

SPAM is an unsolicited bulk message, especially advertising, indiscriminately. SPAM statistics on monthly basis shall be monitored through reports generated by Anti-SPAM software.

3.8 Records and Reports

The Concessionaire shall prepare and submit the various reports as stipulated herein in a form mutually agreed. Each report shall contain as a minimum the information listed.

For every incident reported, the operator in the TMC shall gather the information about the details of incident and site condition. List of Incident summarized the information to be collected for different type of incident shall be prepared by Concessionaire.

Operator shall prepare the following reports:

a) Daily report
   1) List of incidents responded by incident category
   2) Contact summary (numbers by category) with Emergency caller, patrol team, traffic police and other relevant agencies

b) Monthly report
   1) Number of contacts with Emergency caller, patrol, police, NHAI and others for each day.
   2) Number of incidents occurred by category for each day
   3) Number of road closure each day by reason for closure
   4) Number of emergency contact call
   5) Number of other contacts

Operators who responded to a call (such as emergency call) shall prepare the reports listed below. The report shall be compiled immediately after responding to the call and shall not be left unrecorded.

c) Emergency Response Report
   1) Incident location
   2) Weather
   3) Road condition
   4) Vehicle condition
   5) Contact record
   6) Dispatch record
   7) Traffic regulation implemented

d) Call Record
   1) Time

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2) Party contacted
3) Incoming or outgoing
4) Call content

e) Clearing/Recovering Record of Object on Road
1) Time when information is received
2) Receiver
3) Contact source
4) Caller
5) Type or kind and name of object
6) Location and direction (clockwise/counter clockwise)
7) Lane number
8) Time cleaning is ordered
9) Name of person instructed
10) ATMS Contractor to which clearing is requested
11) Time of arrival at site
12) Time of clearing work completion

f) Record of Traffic Regulation
1) Time when information is received
2) Location and direction (clockwise/counter clockwise)
3) Lane number
4) Regulation applied
5) Time started and time restored
6) Other information

g) Ambulance Dispatching Report
1) Date and time
2) Reason for dispatch
3) Location and direction (clockwise/counter clockwise)
4) ID of ambulance dispatched
5) Service rendered
6) Entry and exit interchange

h) Fire Engine Dispatching Report
1) Date and time
2) Reason for dispatch
3) Location and direction (clockwise/counter clockwise)
4) ID of fire engine dispatched
5) Service rendered
6) Entry and exit interchange

Operator at day shift shall hand over all reports to the night shift except daily report. When night shift finishes the duty, all reports shall be filed, and their copy shall be submitted to the NHAI.

The Concessionaire shall also prepare and submit to the NHAI as minimum the following deployment reports:

a) Duty plan of the operation team with the name of traffic management chief and operators on a weekly basis.
b) Daily attendance record with In-time and Out-Time for all Concessionaire's staff working at Traffic Control Centre.
c) Daily report of operation as stipulated in the operation manual and as agreed with between NHAI and Concessionaire.

The reports mentioned above are a minimum requirement. The NHAI reserves the right to reasonably demand more reports other than those listed above after the commencement of Services by the Concessionaire.

3.9 Customer Assistance and Close coordination with other organizations

ATMS operator shall provide such information as to the road condition, traffic condition, expected travel time, and route guidance to the Project user through Emergency call or mobile phone if requested by the Project user as part of customer service.

ATMS management (operation and maintenance) must be conducted with close coordination and cooperation with other agencies concerned. Liaison and coordination among related agencies such as traffic police, ambulance and fire brigades must be maintained all the time.

4, ATMS Contractor's Personnel

4.1 ATMS Contractor's Key Personnel

For the purpose of discharging its obligations under the Contract, the Concessionaire shall recruit and deploy the specified number of key personnel of suitable qualification and experience. The Concessionaire shall ensure that the key personnel deployed are of good health, of highest integrity, punctual, well dressed, well behaved and of qualification and experience prescribed hereunder.

The frequent replacement of key personnel is not desirable unless they are found involved in malpractices or non-compliances. However, a permission of replacement of key personnel shall be obtained from the Independent Engineer / NHAI in advance together with the request for approval of replacement. The Independent Engineer / NHAI, if satisfied with the reasons submitted to him, may allow such replacement after verifying the CVs strictly in accordance with the requirements.

4.2 Deployment of Personnel

The Concessionaire shall recruit and deploy the suitable number of traffic management chief and operator. The minimum number of the staff that the Concessionaire shall deploy is presented in the preceding section of these NHAI's Requirements.

The Concessionaire shall furnish to the NHAI, in addition to the list of key personnel provided with the Technical Proposal, a list of persons deployed for the purpose of discharging its obligations under the Contract, containing all the details like their educational qualifications, experience, training undergone, health condition, personal residential addresses and recent photograph.

The personnel to be appointed shall not have any previous criminal record. A certificate to this effect from concerned State Police Authorities shall be made obligatory for verification prior to appointment at Traffic Control Centre.

The NHAI reserves its right to object to the deployment of any personnel for any reason. In such case, the person or persons being objected to by the NHAI shall be removed by the Concessionaire forthwith and replaced within a day from such removal.

The NHAI shall not be liable for any misconduct or misdeeds or any act or incident involving the Concessionaire or any of its personnel in any criminal or civil case. The Concessionaire shall be responsible for consequences and if any such incident takes place, the Concessionaire shall forthwith intimate the said incident to the NHAI.

4.3 Relationship between Concessionaire's staff and NHAI

The Concessionaire specifically agrees that the personnel deployed by it, will not in any way claim employment with the NHAI. The Concessionaire shall be solely responsible for any dispute raised by the personnel deployed by him either during the term of the Concessionaire or thereafter.

In all circumstances it is clearly understood by the parties that the personnel deployed by the Concessionaire shall have no connection whatsoever with the NHAI and the relationship of NHAI and Employee shall be only between the Concessionaire and the personnel deployed by it.

4.4 Welfare of Concessionaire's Employee

The Concessionaire shall be solely responsible and liable for complying with statutory liability for welfare of the employees such as ESI, EPF, workmen's compensation, wages, bonus medical leave, etc.

However, if considered necessary, the NHAI shall have every right to enquire and seek documentary evidence from the Concessionaire to confirm, whether all the statutory dues like ESI, EPF, minimum wages, weekly offs, bonus, medical leave, workman compensation and any other entitlements, in accordance with the statutory dues applicable in the area are being paid.

4.5 Uniform and Name-plate/badges

The Concessionaire shall provide uniforms to the persons engaged in ATMS Operation Services at Traffic Control Centre as approved by NHAI. All staff personnel of the Concessionaire shall wear the uniform and nameplate/name-badges, when on duty without exception. The nameplate/name-badge shall bear the name and designation along with the name of toll collecting Concessionaire.

4.6 Operation Manual

The Concessionaire shall prepare and submit to the Independent Engineer / NHAI for approval, the following operation manuals for their staff two (2) months before the expected starting date of O/M period:

1) Emergency call /mobile, ADAS operating manual
2) TMCS, VIDS operating manual
3) Traffic/System, ATSC, etc. operating manual
4) Control Room (TMC) and Sub-centre operating manual

The manual shall describe the organizational setup of the Concessionaire, the authority and responsibility of each position, person to report, operation procedure of equipment comprising ATMS, report to be prepared and other details that staff at each position must follow.

4.7 Training

The Concessionaire shall conduct training of the staff as specified herein at the time of new recruitment and also from time to time to ensure high quality ATMS Operation Services. The training shall consist of classroom lecture using manual and hands-on training using the Advanced Traffic Management System equipment.

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

a) Basic of traffic engineering
b) Standard incident disposal procedure
c) System log-in, log-out procedure of ATMS
d) Each console and console operation
e) Printer operation
f) Access Control System operations and maintenance
g) Storage device operation
h) Network equipment operation
i) Power supply equipment operation

The Concessionaire shall describe the contents and the expected duration (number of hours) of the training in his Service Proposal.

4.8 Safety, Security and Protection of Environment

4.8.1 Safety of Staff Deployed

Throughout the period of Contract, the Concessionaire shall have full regard for safety of all persons entitled to be upon the Traffic Control Centre area and for the avoidance of danger to such persons specially from moving traffic.

All staff employed by the Concessionaire shall receive the training on the work area safety before assigned to the position. The Concessionaire shall provide all necessary safety equipment such as reflective vests, hardhats to the persons.

5. ***NHAI's Equipment and Property***

5.1 Provision of Equipment and Property

In order to enable the Contractor to discharge its duties of ATMS Operation Services efficiently and uninterruptedly, the NHAI shall provide its existing infrastructural facilities including Advanced Traffic Management System hardware and software, if available as may be considered appropriate by the NHAI.

5.2 Care of Equipment

The Concessionaire shall use the NHAI's equipment and property that the Concessionaire is allowed to use with utmost care and attention. If the equipment or property under custody of the Concessionaire becomes inoperative or defective due to the inappropriate operation or use of them by the Concessionaire's staff, the Concessionaire shall repair or replace them at his own cost after obtaining the instruction from the NHAI as to the remedial measure to be taken.

If any liability or obligation with regard to the repair or replacement of NHAI's equipment and property is remained unfulfilled by the Concessionaire at the time of return upon termination of the Contract, the amount necessary for the repair or replacement shall be detected to the payment due to the Concessionaire.

All consumables including but not limited to the printer paper and printer toner shall be arranged and purchased by the Concessionaire at his own cost.

6. *Inspection and Evaluation*

6.1 Inspection

The NHAI / Independent Engineer reserves the right to conduct inspection of the Concessionaire's work at any time without prior notice, to check, observe, and witness the activities of the Concessionaire at Traffic Control Centre.

The Concessionaire shall permit the NHAI's Representative at any time or times during the execution of the Contract to enter upon any place where the Concessionaire is allowed to access within the NHAI's premises for the purpose of inspection or for any other legitimate purpose. The Concessionaire shall give all required information and inspection of records to the Engineer regarding the operation of the Advanced Traffic Management System, if asked for.

The purpose of the inspection is to monitor the Concessionaire's activities and to ensure that all the activities required under the Contract are being carried out properly by the personnel deployed by the Concessionaire.

The NHAI may exercise any check control to ensure discharge of various obligations by the Concessionaire under the Contract including but not limited to following:

a) Adherence to operation procedure stipulated in the operation manuals;
b) Promptness and responsiveness to Emergency call;
c) Promptness and adequateness to communicate with other organizations;
d) Handling of the system and equipment;
e) Adequateness and promptness of message;
f) Adequateness of record keeping;
g) Cleanness and tidiness of the Traffic Management Centre and the rooms that are used by the Concessionaire's staff;
h) Manner and politeness of Concessionaire's operator toward Emergency callers and Project users;
i) Traffic safety awareness; and
j) Any other check or control as considered appropriate by the NHAI.

6.2 Evaluation by NHAI

The NHAI will conduct from time to time the evaluation of the ATMS Operation Service provided by the Concessionaire under the Contract based on the performance of service level parameters specified in Service level Table.

7. *Requirements for ATMS Maintenance Services*

The various type of maintenance and repair works and related services to be performed by the Concessionaire shall include the following:

7.1 Preventive Maintenance

The Concessionaire shall perform the preventive maintenance of all equipment and software supplied under the Contract in accordance with the preventive maintenance schedule to be developed by the Concessionaire and approved by the Engineer.

7.1.1 Inspection Item for Preventive Maintenance

The Concessionaire shall prepare and submit to the Engineer a list of inspection items for all preventive maintenance work under the Contract two (2) months before the expected starting date of O&M period. The inspection item list shall indicate the type of inspection to be performed daily/weekly, monthly, bi-annually and annually. The inspection item shall cover all the equipment to be supplied under the Contract.

7.1.2 Schedule for Preventive Maintenance

The Concessionaire shall prepare and submit to the NHAI a schedule for all preventive maintenance work under the Contract two (2) months before the expected starting date of O&M period.

The schedule shall be in sufficient detail to indicate which part of the monthly inspection is to be performed in each week and which part of the bi-annual and annual inspections is to be performed in each month and the number of maintenance engineers and technicians to be assigned to the work.

The Concessionaire will be required to revise the schedule if the workload and the manpower assignment are unbalanced or unrealistic. Failure to submit an acceptable schedule within the specified time shall be a sufficient cause for suspension of the Contract and / or withholding of payments due the Concessionaire.

7.1.3 Check List

The Concessionaire shall develop and prepare check lists to be used for preventive maintenance for each type of equipment and software and submit them for the Engineer for his approval. The checklists shall include the type of equipment, equipment ID, location, date of inspection, name of inspector, check item, and remarks.

The check list shall be used every time a periodical inspection of the equipment is made, and results of the inspection shall be recorded together with other details.

The Concessionaire is required to submit a copy of all recorded check lists every month and as requested by the Engineer at any time. Failure to maintain or submit the check lists shall be a sufficient cause for suspension of the Contract and / or withholding of payments due to be payable to the Concessionaire.

7.1.4 Software Preventive Maintenance

The Concessionaire shall perform preventive maintenance of the software to be provided under the Contract as part of the maintenance work. The Contract shall exert the utmost care not to inadvertently damage the software and database and cause erroneous or abnormal operation of the Advanced traffic management system.

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

1) Monitoring of CPU, memory and disk space utilization
2) Monitoring of system availability over TCP/IP
3) Monitoring of anti-virus and system security software operation
4) Backup of the system and restoration of the system when necessary.
5) Monitoring and review of system and event logs.
6) System modification

The work to be done consists of modifying the system, system parameter and other operating conditions and to improve the operation or to conform to new operational requirements. The work shall be done as directed by the Engineer.

7.2 Corrective Maintenance and Accident Repair

The Concessionaire shall provide corrective maintenance and accident repair on a 24-hour a day, 7-day a week basis. Upon reception of a failure notice by the contact person, the Concessionaire shall log the notice and determine the nature and severity of the failure, prepare the repair plan and dispatch the maintenance crew to the site. Immediate action shall be taken to safeguard the public at any time if the failure is of nature that causes hazardous condition. If the fault cannot be permanently repaired immediately, a temporary repair or remedial measure sufficient to safeguard the operation of the Advanced traffic management system shall be affected by the Concessionaire and the NHAI shall be so notified.

The cost of corrective maintenance of the failure that is not attributable to the Concessionaire will be determined by mutual negotiation. The Concessionaire shall assess the extent of the damage, prepare the remedial plan and estimate the cost.

7.2.1 Response Time and Resolution Time

For all cases, the failure shall be classified into three severity levels, critical, major and minor. The Concessionaire shall satisfy the response time and resolution time specified for each type of failure as presented hereunder.

Severity	Response time	Resolution time
Critical failure	30 minutes	2 hours
Major failure	60 minutes	6 hours
Minor failure	2 hours	48 hours

Critical failure is defined as follows:

1) Halt of both active and backup server systems at TMC or sub-Centre.
2) Failure of Internet server.
3) Interruption of active or backup route of communication link to TMC system.
4) Failure of two or more console at TMC.
5) System failure of a server system of each sub-system
6) Failure of uninterruptible power supply.

Major problem is defined as follows:

1) Failure of a console at TMC.
2) Failure of large display at TMC.
3) Failure of two or more units of TMCS display monitor.

Minor failure is defined as those failures other than critical and major failures listed above.

7.2.2 Inspection of Faulty Parts

The Concessionaire shall inspect the faulty part retrieved from the equipment repaired and prepare and submit a report describing the nature of the failure to the Engineer together with his opinion whether the failure is caused by defect, inadequate operation, act by the third party, normal wear and tear or other reasons.

7.2.3 Fault Report and Work Order

Each and every corrective maintenance and accident repair work shall be documented on the fault report form and work order form by the Concessionaire. The Concessionaire shall prepare and submit the form together with the list of inspection items for the approval of the Engineer. A copy of completed work order forms shall be submitted with the monthly invoice. No payment shall be made without submitting the completed work order forms. The Fault Reports shall be kept in a logbook and shall be made available to the Engineer upon request at any time.

7.2.4 Maintenance and repair records

The Concessionaire shall maintain a comprehensive record of all maintenance and repair activities and spare parts consumptions and inventory. The records shall include as a minimum maintenance check lists, fault reports, spare parts receiving and consumption records, and work orders. These records shall be kept in a database and various operations including but not limited to search and retrieval of fault record by specified key, statistical processing of records into performance index, and calculation of MTBF, MTTR and other parameters shall be possible.

8. *Reporting*

The Concessionaire shall prepare and submit a monthly report in the form and contents as specified herein and as agreed with the Engineer

9. *Operation & Maintenance Personnel*

The Concessionaire shall employ traffic management chief and the suitable number of operators. It shall be noted that the number indicated in the table is the minimum requirements by NHAI and it is the Concessionaire's responsibility to provide high quality service seamlessly

and effective staff arrangement shall be recruited if necessary. International Staff shall carry out the technology transfer as an important aspect including Advance traffic management technology through operation and maintenance works to NHAI officers and Concessionaire's local staffs.

The staff member shown in the table is the persons directly engaged in the ATMS Operation and Maintenance Services and the Concessionaire shall recruit and deploy the necessary number of managers, operators and technicians.

The Concessionaire shall provide all personnel necessary for performing the ATMS operation and maintenance by the personnel listed in Table. The Concessionaire shall submit curriculum vitae of the candidate key person for the Engineer's approval two (2) months in advance of the start of operation and maintenance work. These engineers shall be involved in the installation, adjustment, test on completion and training of the NHAI's staff of the Advanced traffic management system to be supplied under the Contract.
The Concessionaire shall submit the list of all ATMS Operation and maintenance staff with name, birth date and address together with copy of ID every month to the Independent Engineer. If there is any change in the composition of the operation and maintenance staff, it shall be reported immediately to the NHAI. The NHAI will issue an ID to each staff member. The Concessionaire shall be responsible for the proper use of the ID to gain the access to the access-controlled places and system facilities and return it immediately if a staff member no longer works for the ATMS Operation and maintenance.

Three-shift (+1 backup) system shall be adopted for ATMS operation. The candidate shift is as shown below.

First shift: 05:45 -14:00 hours

Second shift: 13:45 - 22:00 hours

Third shift: 21:45 - 06:00 hours

9.1 Position and responsibility for position

1) The position, responsibility, and number are estimated by NHAI as follows;

S. No.	Position	Number	Responsibility
1	* Traffic Management Manager	1	Supervising and managing of highway traffic management with Traffic Management Chief
2	*Traffic Management Engineer	1 at TMC & 1 at each sub-centre	Technical aspect of Advanced traffic Management system
3	*Asst Manager – Operations	1 at TMC & 1 at each sub-centre	Management of Control room
4	Control Room / IMS Operator	5 at TMC & 3 at each sub-centre in each shift 1 at each IMS location	Operating activity of the system (Three Shift)
5	*System Maintenance Engineer / Manager	1 for every 50 kms	Management of System maintenance
6	System IT Engineer	1 for every 50 kms	Management of IT System
7	System Maintenance Technicians	1 for every 50 kms in each shift	Actual Maintenance activity (Three Shift)

8	Support Staff	1 at TMC & 1 at each sub-centre	
9	Office Assistant	1 at TMC & 1 at each sub-centre in each shift	
10	Security Guard	1 at TMC & 1 at each sub-centre in each shift	
11	Maintenance Vehicle with Driver and helper	1 for every TMC / subcentre	
12	Man-hoist vehicle with Driver and helper	1 for each project of up to 100 kms	Add 1 for every 2nd sub-centre

Note; Position with asterisk (*) is identified as Key Staff

2) The minimum experience of each position is shown as follows;

Position	Minimum Experience
* Traffic Management Manager	Total Professional experience; 12 years Similar works#; 10 years Manager of similar works; 5 years
*Traffic Management Engineer (BE/B tech Only)	Total Professional experience; 10 years Similar works#; 5years
*Asst Manager	Total Professional experience; 7 years Similar works#; 4 years
Control Room Operator	Similar works#; 2 years
*System Maintenance Engineer (BE/B tech Only)	Total Professional experience; 10 years Similar works#; 7 years
*System IT Engineer (BE/B tech Only)	Similar works#; 5 years
System Maintenance Technicians	Similar works#; 2 years

Note; The position with asterisk (*) shall be at least a BE/BTECH/M.Sc. in electronics, information technology, systems engineering, computer science, civil engineering, highway engineering or traffic engineering.

#Similar works shall mean that the candidate shall have working experience in ATMS/ ITS/ HTMS/ Traffic Management on a 4 lane/6 lane expressway/ highway project/ urban ITS project.

10. ***Maintenance Facilities***

10.1 Maintenance Equipment and Tools

The Concessionaire shall maintain required set of maintenance equipment and tool, and monitoring and testing software normally required for the maintenance of the electrical and server system. The maintenance equipment and tools shall be maintained in good workable condition so that they shall be available all the time. If periodical calibration is required, it shall be calibrated at the regular interval as specified by the supplier of the maintenance equipment. The maintenance staff shall be trained as to the use of the maintenance equipment and tools. The purchase or depreciation cost of the maintenance equipment and tools shall be deemed to be included in the appropriate cost item in the Tender and no separate payment shall be made.

10.2 Maintenance Office

The Concessionaire will be allowed to occupy and use the maintenance room in the TMC/Sub centre free of charge for operation & maintenance purpose. The Concessionaire shall observe the regulations regarding use of the maintenance office. Only persons authorized by the Engineer shall be allowed to use the office and the office shall be used solely for the operation & maintenance of the ATMS. The Concessionaire shall prepare at his cost desks, chairs, shelves, cabinets, telephone, Internet access and other furniture and facilities necessary for the efficient maintenance operation.

10.3 Maintenance Vehicle

The Concessionaire shall provide the suitable number of vehicles for their operation & maintenance use. The vehicle shall be of the type suitable for maintenance work in terms of the number of passengers and load carrying capacity. The vehicle shall meet the relevant government regulations and registered under the name of the Concessionaire. The vehicles shall be maintained in good condition to run on the Project. The vehicle shall clearly indicate as maintenance vehicle on the side of the vehicle and a yellow flashing light shall be provided on the roof of the vehicle. A set of traffic safety devices consisting of safety cones, stand-alone flashing light, and reflective guide and warning signs shall be provided to the maintenance vehicle. The cost of obtaining, operating and maintaining the maintenance vehicle shall be included in the contract and no separate payment shall be made.

11. ***Service Level Requirements (SLR)***

Service level means the service delivery criteria established for the services specified in Service Level Table. The purpose of Service Levels specified in the Service Levels Tables is to clearly define the levels of service which shall be provided by the Concessionaire to NHAI during O&M period i.e. Five Years from the date of Completion of ATMS. The service level parameters mentioned in the service level table shall be measured on a quarterly basis as per the individual service level parameter requirements, through appropriate service level measurement tool of Facility Monitoring System (FMS) and Network Management System (NMS). Measurement of service levels for systems shall be automatic using reports from appropriate management tool of FMS. Measurement of service levels for services, which are not delivered using a dedicated tool, will be carried out using appropriate and relevant reports from the Service Desk tool.

Measurement of Service Level parameters will be carried out on cumulative basis in a quarter. The Concessionaire needs to try to ensure that the service levels as per service level table. Concessionaire needs to submit service level report in a quarter

If the performance of the system/services is degraded significantly at any given point in time during the contract and if the immediate measures are not implemented and issues are not rectified to the complete satisfaction of NHAI, then NHAI will have the right to take appropriate corrective actions including termination of the Agreement.

The Concessionaire and NHAI shall regularly review the performance of the services being provided by the Concessionaire and the effectiveness of his Service Levels. The Concessionaire is responsible for development and implementation of appropriate management tools of FMS. which shall be basis for all project reviews.

For all cases, the failure shall be classified into three severity levels, critical, major and minor. The Concessionaire shall satisfy the Service Levels specified for each type of service as presented in Service Levels table.

1) The Formula of calculation of availability is shown as follows.

Availability={1-{[(A)/(B-C)] *100}}
Where
A= Time for which system is down
B = Total Time
C= Scheduled downtime

Note: Total Time shall measure on 24x7 basis

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2) Service Level Requirement for Equipment is shown below table below

No	Parameter	severity levels	Target
1.Traffic Management Centre Equipment & Sub-centre equipment			
1.1	Server Availability (TMC and internet servers including the OS, database and any other application running on it)	Critical	99%
1.2	Console Availability (TMCS)	Critical	99%
1.3	Console Availability (TTMS, ATCC)	Major	97%
1.4	Console Availability (FMS)	Minor	95%
1.5	Console Availability (Internet)	Major	97%
1.6	Operational Availability (VIDS)	Critical	99%
1.7	Operational Availability (1033)	Critical	99%
1.8	Operational Availability (VSDS)	Minor	95%
1.9	Operational Availability (FMS)	Minor	95%
1.10	Storage Availability (Including power availability, network availability, availability of links to applications and databases)	Critical	99%
1.11	Graphic Display	Critical	99%
1.12	Camera Monitor	Major	97%
1.13	Network Connectivity Between Main TCC – Sub centre – Roadside equipment	Critical	99%
2. Field Equipment			
2.1	Average Uptime Time period of the TMCS Camera.	Major	97%
2.2	Average Uptime Time period of the VIDS Camera .	Critical	99%
2.3	Average Uptime Time period of the Internet	Major	97%
2.4	Average Uptime Time period of the VSDS	Major	97%
2.5	Average Uptime Time period of the ATSC and RLVD	Major	97%

3) Service Level Requirement for Operations is shown in table below

S. No.	Requirement	Deliverable & Metric	Remarks
1	**Receive and handle Emergency Calls**		
1.1	24x7 monitoring and handling of Emergency calls received from road-side Emergency telephones or from the 24x7 National Highways helpline.	Daily shift-wise logs accounting for handling ALL calls arriving at the Control center and monitoring of time taken to resolve/address the issues	Automatic ATMS system Generated report on calls arrived and calls handled.
2	**Routine Monitoring of the status of Traffic**		
2.1	24x7 monitoring from the ATMS Control Centre /TMC/ Sub-centre(s) using personnel stipulated in the Process document.	Daily shift-wise activity logs, accounting for 24 x 7 x 365 hours of operation for a typical year	Automatic ATMS system generated report
3.	**Accident / Incident / Traffic Management**		
3.1	Response to incidents (e.g. Emergency calls received at the ATMS Control Centre/ TMC / Sub-centre) within stipulated time and enabling of all actions for optimal rescue and traffic	a) Informing the ambulance within 3 minutes of receipt of Emergency Call reporting an accident. b) Informing the Selected Trauma	Automatic ATMS system generated report & recorded audio files

	normalization, including the rapid deployment of vehicles (ambulances, breakdown cranes and Patrol vehicles)	Care Centre(s) within 5 minutes of receipt of Emergency Call reporting an accident. c) Sending the first set of appropriate announcement and guidance messages via Mobile apps (as applicable) to road users within 5 minutes of receipt of Emergency Call reporting an accident. d) Continuous monitoring of the progress of Emergency vehicles & capture of their time stamp of reaching site and reaching the trauma care centre (in case of an ambulance) with the victim. e) Providing inputs to the emergency vehicles (in terms of estimated travel times, optimal routes etc.) during their journey to the site and to the trauma care centre.	
4	**Enforcement Support**		
4.1	Provide evidence of over speeding vehicle and other violations to the police/ enforcement agency for enforcement purposes in prescribed format. Detection of unsafe driving (over speeding, not driving in designated lanes, driving in wrong direction, wrong parking / stopped vehicle, over dimension, etc. Detection of vehicles not permitted to use highways, animal on highways, vehicles damaging highways, spilling of hazardous materials on highways, etc. Detection of vandalism / theft attempt/ damage to highway property / assets (road signs, lighting, crash barrier, median plantation, etc.	Taking cognizance of incidents (after due validation) detected by the VIDS, VSDS, TMCS, etc. e.g. Illegal lane cutting and heavy vehicles in fast lane and provide immediate communication within 1 minutes to relevant agencies. (Police, Emergency vehicles etc.) for taking action. Providing information of incident such as vandalism/ damage to highway property/ theft attempt etc to immediately within 1 minutes to relevant agencies. (Police, patrol vehicles, security, etc.) for taking action. Provide evidence of incident to relevant agencies (Highway Patrol, Police) with Incident location, date and time of detection of incident, type of incident, visual image, within 3 minute of incident detection by VIDS/ TMCS/ VSDS/Motion detection camera/ any other camera connected with ATMS system. Provide evidence of over speeding	Automatic system generated log of action performed in the form of a report

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		and other traffic violations (when detected by the VSDS/ VIDS/ TMCS, etc) including the following details: a) Location, Date and time stamp of over speed detection/ violation; b) Vehicle details in terms of vehicle class, registration number; c) An electronic visual image of the vehicle; d) The above information (audited/ validated by Operator) also to be provided by E-mail / API in prescribed format within 3 minutes of the over speed detection / violation detection, etc.	
5	**Real Time Access to ATMS Operations of Control Centers**		
	Keeping the system gateway open for NHAI and other enforcement agencies for remote access / online access / data transfer / live video streaming / access to report module / FMS / NMS, etc. The system gateway shall be kept open 24 x 7 x 365 for NHAI and other enforcement agencies for assessing the availability of individual system component of the ATMS as defined by NHAI from time to time.	99.65% of 24 X 7 X 365 hour monthly System availability for NHAI and other enforcement agencies access	Automatic System generated system availability report as measured by the Network Management System + Random remote access checks by NHAI/ Independent Engineer.

12. ***Service Levels Review Process***

1) Either NHAI or Contractor may raise an issue by documenting the business or technical problem, which presents a reasonably objective summary of both points of view and identifies specific points of disagreement with possible solutions.
2) A meeting or conference call will be conducted to resolve the issue in a timely manner. The documented issues will be distributed to the participants at least 24 hours prior to the discussion if the issue is not an emergency requiring immediate attention.
3) The NHAI and the Contractor shall develop an interim solution, if required, and subsequently the permanent solution for the problem at hand. The Contractor will then communicate the resolution to all interested parties.
4) In case the issue is still unresolved, the arbitration procedures described in the Contract Agreement will be applicable.

13. ***Performance Damages / Penalty***

The Contractor would be penalized for non-compliance in meeting SLR for Operations as well as Maintenance of the Project. Any penalty levied by NHAI or NHAI's representative shall be applicable and deducted from the amount payable during the maintenance period. The Contractor should enable and facilitate continuous measurement of all-round performance of the ATMS System and not just event-based performance. The penalties are detailed here under:

a. For non-compliance of SLR under maintenance requirement, penalty of INR 10,000 per day per sub-system / component / equipment shall be imposed if the down time exceeds the maximum permissible on each instance.
b. For non-compliance of SLR under operations requirement, the penalty of INR 1,00,000 per event shall be imposed.

c. For non-availability of O&M personnel at site, penalty shall be imposed as per the table below:

Sr. No.	Staff	Per day penalty (INR)
A. Technical Staff		
1	System Maintenance Engineer/ Manager	5,000
2	System IT Engineer	4,000
3	System Maintenance Technicians	2,000
4	Maintenance Vehicle with Driver and helper	5,000
5	Man-hoist vehicle with Driver and helper	10,000
B. Control Room Operations Staff		
1	Traffic Management Manager	12,000
2	Traffic Management Engineer	5,500
3	Asst Manager – Operations	3,000
4	Control Room operators	1,500
5	Support Staff	1,200
6	Office Assistant	1,000
7	Security Guard	1,000

d. NHAI shall consider termination of Concessionaire / ATMS sub-Contractor, if the number of non-compliance events exceeds 50 during any month, at the cost and risk of the Concessionaire.

e. Admin rights of all third part tools / software for monitoring SLA shall be with the Authority.

14. ***Spare Parts and Consumables***

The Concessionaire shall maintain required spare parts to maintain required service levels. An undertaking to be submitted along with Technical Proposal that the Concessionaire has the sufficient infrastructure and capability to keep/store spares required for maintenances and will at all times during the contract period maintain sufficient inventory of spares and consumables for operating and maintaining the ATMS and to meet the Service Level requirements.

PRE-BID QUERY REPLY

Annexure- I

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) Project"- **Reply of Pre-Bid Queries reg.**

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
1	General	Geo tech Investigation & Hydrology Report	Please provide the Geo Tech Investigation Report and Hydrology Report.	Geo-Technical Report and Hydrology Report is uploaded on e-tender portal for reference only **(copy enclosed)**. The bidder has to do its own investigation & design and construct as per manual & scope specified in the schedules.
2	General	Plan & Profile of Loops and Ramps	We request the Authority kindly provide the plan and profile details of loops and ramps for Interchanges.	Profile of loop and ramp at interchange for reference only **(copy enclosed)**. Plan of interchange is attached with schedule B.
3	General	Status of land Acquisition i Total Land required for projects (In Ha.) ii Land already in possession (In Ha.) iii Total Additional Land to be acquired a. Private Land (In Ha.) b. Govt. Land (In Ha.) iv Published Notification Under 3(A) (In Ha.) v Published Notification Under 3(D) (In Ha.) vi Determination of Compensation amount under Section 3(G) completed (In Ha.) vii Area of Land for which Funds have been deposited with competent authority for Land Acquisition (CALA) by NHAI (In Ha.) viii Area of land for which compensation has been disbursed by CALA (In Ha.) ix Percentage of Total Land required currently possessed by the authority (%)	Kindly share details of land acquisition of the subject Project the as on date.	**Status of Land Acquisition:** Total Land Required 196.75 Ha Land Available - 21.75 Ha Additional Land Required – 175 Ha. 3D: 3D of **130 Ha** has been published in Gazette 3G: Award U/s 3G for **110 Ha land** has been announced and is under consideration with NHAI for concurrence.

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Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
4	General	Project Alignment	We request the Authority to provide the project alignment's KMZ file for the study of project.	The bidder may carry out its own investigation & analysis before bidding. The requisite project specific details including plan and profile is already uploaded on e-tender portal. For more details, the bidder may visit site and PIU Chandigarh. Alignment plan in .kmz is enclosed for reference only
5	General	Due Date Extension	We are keenly interested to participate in the above bid, but looking into size and complexity of the project we request the Authority to provide at least 3 weeks times for submission of bid from the date of Pre Bid Reply received from your end.	As per amendments issued/to be issued by authority.
6	**Annex III (i) of Schedule A** 481	**Clause I: Alignment Plan** (i) The alignment of the Project Highway is enclosed in alignment plan. Finished road level indicated in the alignment plan shall be followed by the concessionaire as minimum FRL. In any case, the finished road level of the project highway shall not be less than those indicated in the alignment plan. The concessionaire, however, may improve/ upgrade the Road profile as indicated in Alignment plan based on site/design requirement.	Annex III of Schedule A stated that, "Finished Road level indicated in the alignment plan shall be followed by the contractor as minimum FRL". Bidder wants to submit here that, being the project to be executed under HAM Mode, the conceptualization and design of scope of work of project including other proposed facilities defined under Schedule B & C are under the scope of Concessionaire. The concessionaire shall design the project road according to prevailing site condition and as per site requirement considering the Schedule D and other relevant technical specification. Therefore, the word minimum proposals are inappropriate and not relevant will create limitation for concessionaire while planning and designing the proposed project road. So, the Concessionaire should be given the flexibility to design the project road according to the site feasibility. Therefore, the word minimum proposals as mentioned in, Annex III (i) of Schedule A may deleted/ amended accordingly.	The concessionaire has to design the Highways as per requirement of Schedule-B, C & D. For certain parameters Minimum requirements have been fixed by Authority to ensure certain output. The minimum requirement of FRL has been fixed considering the site condition and Concessionaire is free to design the Highway as per technical requirement, while complying with the minimum requirement fixed by the Authority. Hence Finished Road level indicated in the alignment plan is to be followed by the contractor as minimum FRL. If required as per site conditions concessionaire may improve upon the minimum requirements fixed by Authority. Hence it is not required to delete/ amend minimum FRL.
7	**Clause 4, vi), Note, Clause 9 (iii),**	**Note:** Wherever liquefaction is observed in Open foundation and Raft Structures, Ground improvement shall be done to compact the soil to	Does the project lies in liquefied zone? Authority is requested to kindly provide the Geotech Investigation Report for better understanding of the project.	Geo-Technical Report Report is uploaded on e-tender portal for reference only **(copy enclosed)**.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
	Note 5, Schedule B	increase its penetration resistance and satisfy clause 8.4.4 (v) of IRC114.		The bidder has to do its own investigation & design and construct as per manual & scope specified in the schedules.
8	**Clause 4, iii), Note, Schedule B**	**Note:** Approaches to Grade-separated structures shall be of full height RE Wall.	Since the project to be executed under HAM Mode, the conceptualization and design of scope of work of project including other proposed facilities defined under Schedule B & C are under the scope of Concessionaire. The concessionaire shall design the project road according to prevailing site condition and as per site requirement considering the Schedule D and other relevant technical specification. Therefore, binding the Concessionaire for full height RE Wall will create limitation for concessionaire while planning and designing the proposed project road. So, the Concessionaire should be given the flexibility to design the project road according to the site feasibility. Therefore, the clause as mentioned in, Clause 4 (iv) of Schedule B may deleted/amended accordingly.	This requirement has been fixed considering the future requirement and safety of structures beyond concession period. Concessionaire is free to design the structures as per technical requirement, while complying with the minimum requirement fixed by the Authority. Hence it is not required to delete/ amend the concerned Clause of Schedule B
9	**Clause 9 (iii), Note 8, Schedule B**	**Note:** The span arrangements and vertical clearance are tentative and the same shall be followed as per approved GAD by the concern Irrigation Department and any change shall not be treated as change in scope of work.	Authority is requested to kindly provide Irrigation Department approved GAD for better evaluation of the work or may consider any change in span arrangements as the change of scope.	The concessionaire has to design the structures as per the GAD approved by the Irrigation department. Change in Span arrangements and type of structure shall not be considered as CoS, however change in overall length of structure, if any shall be considered as CoS as per concession agreement.
10	**General**	**Plan and Profile of Loop and Ramp**	Authority is requested to kindly share the level details/ plan and profile for the proposed Loop and Ramp.	Profile of loop and ramp at interchange for reference only **(copy enclosed)**. Plan of interchange is attached with schedule B.
11	**Clause 15, Schedule B**	**Change of Scope** The length of structures and bridges specified hereinabove, except for structures over existing water bodies like ponds, lakes etc. shall be treated as an approximate assessment. The proposed span arrangement of structures may be changed based on innovative design of structure, latest	The clause in Schedule B by Authority is not in line of NHAI Policy guidelines dated 17th September, 2020 and are ambiguous. As per NHAI Policy Guideline No 18.53/2020 dated 17th September 2020, Section E, i.e., PROJECT PREPARATION in Sr. No. 08 emphasizes that, "Scope of works in the Project should be precisely defined in Schedule B & C. And Schedule -B and C	Details of Bridges are as per clause 9(iii) and detail of grade separated structure is as per clause 4(vi) of schedule B. Any change in overall length of structures shall be considered as CoS.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		construction techniques and aesthetics of structures. Actual lengths of structures and bridges as required on the basis of detailed investigations shall be determined by the Concessionaire in accordance with the Specifications and Standards. Existing water bodies like ponds, lakes etc., which are to be preserved from environment impact mitigation point of view, shall be bridged to the extent of full ponding level at peak rainy season. Any variations in the lengths specified in this Schedule-B shall not constitute a Change of Scope, save and except any variations in the length arising out of a Change of Scope expressly undertaken in accordance with the provisions of Article16.	should clearly mention the scope of work. ROs and PDs shall ensure the same at the time of preparation of DPRs/Bidding Documents". Hence, Authority is requested to kindly provide the exact details of Structures required or the footnote may delete/ amend accordingly considering any variation in length of Structures and bridges as change of scope under provision of Article 13.	
12	**Clause 25, Schedule B**	**Utilities Shifting** Shifting of obstructing existing utilities indicated in Schedule A to an appropriate location in accordance with the standards and specifications of concerned Utility Owning Department and as per the MoRTH Circular No RW/NH-33044/29/2015 – S&R (R) dated 11th February 2021 is part of the scope of work of the Concessionaire. The bidders may visit the site and assess the quantum of shifting of utilities for the project before submission of their bid. Copy of utility relocation plan is enclosed. The specifications of concerned Utility Owning Department shall be applicable and followed.	Authority is requested to kindly provide Utility relocation plan as mentioned in the clause.	Please refer amendment 7.
13	**Clause 7 (iii) of Schedule B**	**Pavement Design** **Design Traffic** Notwithstanding anything to the contrary contained in this Agreement or the IRC: SP: 84-2019, the Concessionaire shall design the pavement of main carriageway including paved shoulders, loop/ramp at interchange locations as	With the circulars on the usage of New Technology and availability of various IRC codes, the RFP cannot constrain the Concessionaire with a maximum CBR. The Concessionaire shall have the freedom to select the design CBR for a suitable flexible or stabilised pavement meeting the requirements of design traffic	No change.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		flexible pavement designed for minimum design traffic of 112 MSA and for maximum effective subgrade CBR of 9 % while the pavement for connecting/service/slip road shall be designed for minimum design traffic of 20 MSA and maximum effective subgrade CBR of 9 %.		
14	**Clause 8.1.2, Disclaimer**	The Concessionaire acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth in Clause 8.1.1 above and hereby acknowledges and agrees that the Authority shall not be liable for the same in any manner whatsoever to the Concessionaire, {the Consortium Members and their} Associates or any person claiming through or under any of them.	The bidder understands that it only acknowledges and accepts the risk of inadequacy, mistake, or error in or relating to any matter set forth in Clause 8.1.1, which is limited to the Scope defined in Schedule - B. Anything beyond, that is specified in Schedule B shall be considered as additional work and dealt under Change of Scope under Article 16.	The provisions of RFP/ DCA are self-explanatory.
15	**Clause 10.3.4, Procurement of the Site**	The Authority shall make best efforts to procure and grant, no later than 90 (ninety) days from the Appointed Date, ……**In the event, the Authority is unable to provide the remaining Site within 180 (one hundred and eighty days) from the Appointed Date, the remaining Site of the Project Highway shall be removed from the scope of the work under the provision of Change of Scope.**	(a) It is understood that the eligibility for issue of Provisional Certificate, shall be reckoned for ROW that has been handed over to the Concessionaire, within 180 days from the Appointed Date (AD) subject to the payment of Damages to the Concessionaire under this Clause, even in the case, the provision of deemed withdrawal of works on land, which has not been handed over to Concessionaire, within 180 days of AD has not been exercised by either Parties. (b) We understand that all provisions with respect to Payment Milestone, payment of Annuity, Bonus and other due payments shall remain unaffected and shall be paid in full, in case of conditions clarified in (a) above. During course of execution, it is understood that percentage weightage of works assigned for achievement of all Project Milestones shall be reckoned in proportion to the ROW made available to th e Concessionaire with 180 days of AD.	The provisions of RFP/ DCA are self-explanatory.
16	**Clause 11.2.1,**	…The supervision charges only shall be paid by the Authority to the Utility Owning Entity. In the	The Bidder understands that in the event of any delay in approval for Shifting of Utilities or the estimates by the	The provisions of RFP/ DCA are self-explanatory.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
	Shifting of obstructing utilities	event of any delay in shifting thereof, the Concessionaire shall be responsible for failure to perform any of its obligations here under if such failure is not as a direct consequence of delay on the part of the entity owning such electric lines, water pipes or telephone cables, as the case may be.	Authority, the Concessionaire shall not be responsible for such failure and Extension of Time shall be granted for such failure of the Authority.	
17	**Clause 14.2, Completion Certificate**	Upon completion of Construction Works and the Independent Engineer determining the Tests to be successful, it shall forthwith issue to the Concessionaire and the Authority a certificate substantially in the form set forth in Schedule-J (the **"Completion Certificate"**).	Authority is requested to kindly clarify the timelines for issuance of Completion Certificate, after completion of works listed in the "Punch List".	The provisions of RFP/ DCA are self-explanatory. All efforts will be made for issuance of completion certificate within reasonable time and in accordance with Concession Agreement.
18	**Clause 16.2.2 (b), Procedure for Change of Scope**	(b) the options for implementing the proposed Change of Scope and the effect, if any, each such option would have on the costs and time thereof, including a detailed breakdown by work classifications specifying the material and labour costs calculated in accordance with the schedule of rates applicable to the works assigned by the Authority to its contractors, **along with the proposed premium/discount on such rates;** provided that the cost incurred by the Concessionaire in providing such information shall be reimbursed by the Authority to the extent such cost is certified by the Independent Engineer as reasonable.	The Bidder requests to provide the schedule of rates applicable to the works assigned by the Authority to its contractors, along with the proposed premium/discount on such rates.	SOR of concerned NH Division of PWD shall be applicable to workout cost of COS. Premium/Discount shall depend on the bid quoted by selected bidder.
19	**Clause 16.2.3, Procedure for Change of Scope**	Upon receipt of information set forth in Clause 16.2.2, if the Authority decides to proceed with the Change of Scope, it shall convey its preferred option to the Concessionaire, and the Parties shall, with assistance of the Independent Engineer, thereupon make good faith efforts to agree upon the time and costs for implementation thereof. Upon reaching an agreement, the Authority shall issue an order (**the "Change of Scope Order"**) requiring the Concessionaire to	Kindly clarify the timelines on issuance of Change of Scope Order by Authority from the date of Change of Scope Notice.	The provisions of RFP/ DCA are self-explanatory. All efforts will be made for issuance of CoS Order within reasonable time and in accordance with Concession Agreement.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		proceed with the performance thereof. In the event that the Parties are unable to agree, the Authority may, by issuing a Change of Scope Order, require the Concessionaire to proceed with the performance thereof pending resolution of the Dispute, or carry out the works in accordance with Clause 16.5.		
20	**Article 16 – Change of Scope**		It is understood by the bidder that in the event of any additional structure included beyond the scope of work defined in Schedule-B as Change of Scope works, the O&M charges for the same shall be separately payable to the Concessionaire.	The provisions of RFP/ DCA are self-explanatory
21	**Clause 17.8.1, Damage for breach of maintenance obligation**	In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% (two per cent) of the Performance Security, and (b) 0.1% (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.	This Clause may kindly be deleted since Damages prescribed in this Clause are highly irrational, and the said Clause in its current form can have severe financial implications on the Concessionaire and make the execution of the Project commercially unviable. Also, it is submitted that as provisions of Clause 17.9.1 reasonably cover Damages payable for breach of Maintenance Obligation by the Concessionaire, the same be retained/ effected as a sole remedy against breach/ default in relation to maintenance obligations of the Concessionaire.	No Change. As per RFP.
22	**Clause 23.7.1 a, b, c, d**		1. Kindly clarify whether the Bid Project Cost specified in Clause 23.1 of Concession Agreement (CA) shall be revised from time to time in accordance with the provisions of clause 23.2 of Concession Agreement (CA), so as to reflect the variation in price index occurring after the reference Index Date immediately preceding the Bid Date, for calculation of Maintenance payment and renewal payment payable to the Concessionaire.	The provisions of RFP/ DCA are self-explanatory. For further expalanation bidder may refer clause 23.7.2

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
			2. The Bidder understands that the Bid Project Cost stand modified as per clause 23.2 of the CA, for payment of Maintenance and renewal layers. Kindly clarify 3. Bidder understands that the Cost of renewal works/layer in the respective year shall be paid by the Authority to the Concessionaire in addition to maintenance payment to be defined in the respective year. Kindly clarify? 4. Bidder understands that the Authority shall pay the cost of Two renewal layers during the Operation and Maintenance Period, @2.40 % of the Bid Project Cost and the cost of any additional renewal layer (other than aforesaid Two renewal layers) shall be borne by the Concessionaire. Kindly Clarify. 5. Based on survey and investigation of the existing pavement, if the renewal layer required to be laid only on part length of the project, then how the cost of the renewal layer and maintenance payment shall be calculated and paid to the Concessionaire? Kindly define the methodology. 6. Further, the term original Bid Project Cost is only being used for Flexible pavement and flexible perpetual pavement , not in rigid and stand-alone Bridge/ Tunnel works, which shall also be clarified.	
23	**Clause-23.7.2**	Above amount for the performance of Contractors' Maintenance obligations shall be, inclusive of all taxes. The amount payable for maintenance shall be adjusted on account of variation of Price Index. It is further agreed that the Bid Project Cost hereunder shall be reckoned with reference to the amount specified in Clause 23.1, which shall be adjusted to the extent of Change of Scope and Reduction in Scope, but	As per second sentence of the mentioned clause, the maintenance payment shall be adjusted on account of variation in Price Index. It is understood that the provision in last line of this clause is limited to the amounts affected due to Change of Scope and Reduction in Scope only.	The provisions of RFP/ DCA are self-explanatory.

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Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		shall not include any price adjustments in pursuance of variation of Price Index		
24	**Clause 26.1, Insurance during Concession Period**	The Concessionaire shall effect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable Laws, and such insurances as may be necessary or prudent in accordance with Good Industry Practice. The Concessionaire shall also effect and maintain such insurances as may be necessary for mitigating the risks that may devolve on the Authority as a consequence of any act or omission of the Concessionaire during the Construction Period…..	The bidder understands that in case of extension of Schedule Completion Date for the reasons attributable to the Authority, the additional cost towards the Insurance premium as per the said clause shall be paid separately to the Concessionaire.	The provisions of RFP/ DCA are self-explanatory.
25	**Clause 38.1.3, Dispute Resolution Board**	Failing mediation by the Independent Engineer or without the intervention of the Independent Engineer, either Party may require such Dispute to be referred to the Dispute Resolution Board ("DRB") in accordance with the procedure set forth in Schedule-S to the Concession Agreement….	It is understood that the Bidder will have the flexibility in appointment of respective DRB members, no restriction should be there to select from the list of empaneled persons by NHAI.	The provisions of RFP/ DCA are self-explanatory.
26	**Schedule A Annexure 2**	Details of Right of Way of Construction Zone	Kindly provide the status of Forest Clearance	Forest clearance – In progress
27	**Schedule A Annexure 2**	Details of Right of Way of Construction Zone	Kindly provide the status of Clearance of Built-up Area.	In progress
28	**Schedule B**	Right of Way Details of the Right of Way are given below.	Kindly provide the current status of constructive possession of Site available with the Authority	As per Sr. no 3

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
29	**Schedule – I Tests, S.No 2.8**	Other Tests: The Independent Engineer may require the Concessionaire to carry out or cause to be carried additional Tests, in accordance with Good Industry Practice, for determining the compliance of the Project with Specifications and Standards.	The Authority shall clarify the meaning of the Other tests, **the details need to be mentioned specifically about the types of other tests possible as there is minimum but no limit for maximum.**	Other test, which are required to be carried out for issuance of completion /provisional certificate not covered under schedule-I
30	**New Clause No 1.2.12 for HAM Project**	A Bidder is required to submit, along with its technical BID, a self- certification that the item offered meets the local content requirement for „Class – I local Supplier" / „Class – II local Supplier", as the case may be. The self-certification shall also have details of the location(s) at which the local value addition is made. In case, bidder has not submitted the aforesaid certification the bidder will be treated as "NonLocal Supplier". In the above pretext, the Class – I Local Supplier, Class – II Local Supplier and the Non- Local Supplier are defined as under..... In case of procurement for a value in excess of Rs. 10 crores, the „Class – I local supplier" / „Class – II local supplier" shall provide a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.	In the True Spirit of this clause a bidder has to submit only **Self Certification** regarding the class –1 or Class -II And the Certificate from the Statutory Auditor / Cost Auditor is to be submitted at the Time of Execution of the work. **Please Clarify** Since the word "Upon Construction is missing in these clauses but in the Clause 2.11.1 it is mentioned that the Certificate from Statutory Auditor / Cost Auditor is required **Upon Construction** of the Project.	The provisions of RFP/ DCA are self-explanatory.
31	**Clause No 2.11.1: New Para added for HAM**	2.11.1 The Bidder shall submit the Technical Bid & Financial Bid online through e procurement portal http://etenders.gov.in comprising of the following documents along with supporting documents as appropriate: Self-Certification: Self- certification by the Bidder that its Bid meets the Local Content requirement for „Class – I Local supplier"/ „Class – II Local supplier", as the case may be. The Self-	The Clause needs to be more elaborated and specified regarding submission of the Certificate from Statutory Auditor. (i.e. after execution of the work) Because Statutory Auditor Cannot provided certification of the Future Work based on Assumption. It is also requested to attach a specific format for Self-Declaration in the RPF	The provisions of RFP/ DCA are self-explanatory

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Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		certification shall also have details of the location(s) at which the local value addition is made. In case, bidder do not submit the aforesaid Certification, the bidder will be summarily treated as Non-Local Supplier". In case of procurement for a value in excess of Rs. 10 crores, the „Class – I Local supplier" / „Class – II Local supplier" shall have to provide a Certificate from the Statutory Auditor or Cost Auditor of the Company (in case of Companies) or from a practicing Cost Accountant or practicing Chartered Accountant (in respect of Suppliers other than Companies) giving the percentage of Local Content upon Construction of the Project.		
32	**General**		Kindly clarify the cut-off date upto which the published Circulars / IRC specification / gazette notification published by the Competent Authority / GOI / other relevant organisations such as IRC/ MORTH etc. shall be taken into consideration for preparation bid by the Bidder.	Please refer para 2.1.22 of RFP which states that, All Orders of Ministry of Finance/DPIIT/any other government agencies, as applicable and prevalent on the date of LOA, shall be applicable.
33	**General**	**Geo-Technical Report**	Kindly provide Geo-technical Report for the project.	Geo-Technical Report and Hydrology Report is uploaded on e-tender portal for reference only **(copy enclosed)**. The bidder has to do its own investigation & design and construct as per manual & scope specified in the schedules.
34	**General**	**Detail Project Reports**	Authority are requested to please provide the Detail Project Reports.	The bidder may carry out its own investigation & analysis before bidding. The requisite project specific details including plan and profile is already uploaded on e-tender portal. For more details, the bidder may visit site and PIU Chandigarh. Copy of DPR is enclosed for reference only.
35	**General**	Geotechnical Investigation	Kindly furnish geotechnical investigation report for structure locations.	Geo-Technical Report Report is uploaded on e-tender portal for reference only **(copy enclosed)**.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
				The bidder has to do its own investigation & design and construct as per manual & scope specified in the schedules.
36	**General**	Hydraulic Report	Provide us hydraulic report for all major and minor bridge (over river/streams/nallas).	Hydrology Report is uploaded on e-tender portal for reference only **(copy enclosed)**. The bidder has to do its own investigation & design and construct as per manual & scope specified in the schedules.
37	**General**		Provide us KMZ file of project alignment.	The bidder may carry out its own investigation & analysis before bidding. The requisite project specific details including plan and profile is already uploaded on e-tender portal. For more details, the bidder may visit site and PIU Chandigarh. Alignment plan in .kmz is enclosed for reference only
38	**Plan & Profile**		Provide us profile of Loops (From Ch. 0+000 to Ch. - 0+800) at trumpet interchange on chainage 0+000.	Profile of loop and ramp at interchange for reference only **(copy enclosed)**. Plan of interchange is attached with schedule B.
39	**Schedule B 9. Design of Structures**	9. (iii) Bridges Note: 8. The span arrangements and vertical clearance are tentative and the same shall be followed as per approved GAD by the concern Irrigation Department and any change shall not be treated as change in scope of work.	Provide us approved GAD by the Irrigation authority.	Approval of GAD are in under process with concerned irrigation department.
40	**Schedule B 4 (vii)**	Service roads/slip roads	As per TCS table from ch.12+700 to 12+870 applicable TCS is TCS-1 which is not having service/slip road but service road table is showing service road from ch.12+700 to 12+870. Clarify the ambiguity.	Service/slip road to be provided from ch.12+700 to 12+870. as per service road table given in schedule B. Changes regarding TCS have been incorporated. (Refer Amendment -7)
41	**Schedule B 17(A)**	Stretches for provision of Reinforced Earth Wall	As per TCS table from ch.12+700 to 12+870 applicable TCS is TCS-1 which is not having RE wall but RE wall table is showing RE wall from ch.12+700 to 12+870.	RE wall from ch.12+700 to 12+870 to be provided as per RE wall table given in schedule B.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
			Clarify the ambiguity.	Changes regarding TCS have been incorporated. (Refer Amendment -7)
42	**Schedule B 17(B)**	Stretches for provision of Retaining Wall	Retaining Wall table is not matching with the provided TCS table. Clarify the ambiguity.	Retaining Wall shall be provided as per Retaining Wall table given in schedule B.
43	**Plan & Profile Plan & Profile**		Sudden change in given plan & profile FRL between CH : 29+090 to 29+100 & CH : 29+530 to 29+540 Kindly provide modified FRL	FRL's given are minimum which may be modified as per site condition/IRC/IS code/MORTH specifications.
44	**Plan & Profile Plan & Profile**		At VUP Ch.: 23+620 given SR FRL is 320.405 and MCW FRL is 324.038, difference between both FRL is 3.63 which are not sufficient for underpass. Also difference between given SR FRL & SR OGL for this VUP approach from Ch.: 23+160 to 23+980 is very high. Clarify the ambiguity.	Refer revised P&P (Amendment -7) FRL's given are minimum which may be modified as per site condition/IRC/IS code/MORTH specifications keeping minimum vertical clearance as per relevant IRC.
45	**Schedule C 2.14**	Anti-Glare Screen	As per TCS table length of Anti-glare screen to be provided is 5781m (TCS-2B, TCS-03 & TCS-04) but as per clause 2.14 it is 3421m. Clarify the ambiguity.	Length of Anti-glare screen to be provided has been revised. Refer revised clause 2.14 in schedule C in Amendment 7.
46	**Schedule B 4 (VII)**	Service Roads/Slip Roads	As per given table of Typical cross section (Loop & Ramps) Two ramps are shown on either side of MCW at Interchange Ch. 0+000, same are shown in Service road table which are overlapping. Clarify the ambiguity.	In table of Typical cross section (Loop & Ramps) all ramp and service road are shown. Same service road has also been shown in Service road table
47	Annex – I, Schedule B/ Page B-38	At footnote below table heading Details of SVUP is stated that *"Wherever liquefaction is observed in Open foundation and Raft Structures, Ground improvement shall be done to compact the soil to*	Please confirm provide correct code reference.	Code mentioned in clause is IRC SP 114-2018. Changes have been incorporated (Refer amendment 7) .

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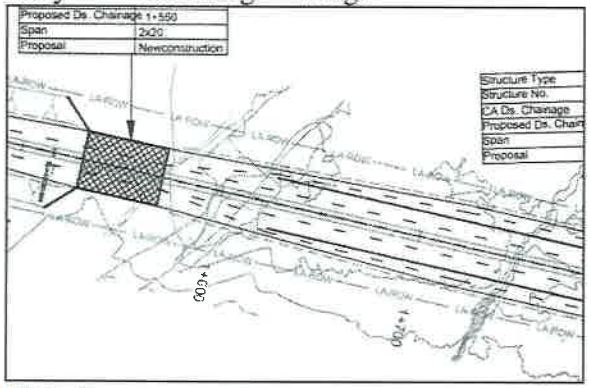
Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		increase its penetration resistance and satisfy clause 8.4.4 (v) of IRC114". Code mention as IRC 114 is Guideline's for Use of Silica Fume in Rigid Pavement not applicable for treatment of liquefaction.		
48	Annex I, Schedule B/ Page B-31 and 32	As per list provided in Page no 31 and 32, Service / Slip Road is not continued in front of VUP, SVUP, FO. However, service / slip road shall also be continued in front of these structures.	Please confirm.	Service / slip road shall also be continued in front of VUP, SVUP, FO structures. But service road at this location is part of junction improvement, hence not included.
49	463 Annex – I, Schedule B/ Page B-32	At bottom of Service / Slip Road list, it is stated that Entry & Exit Arrangement is not included in above list and same shall be provided as per IRC SP: 84-2019. However, while review Plan and Profile, it is noted that Entry & Exit length is also included in list. For example, Service Road is to be provided from Km 1+570 to Km 1+809 which is included exit / entry refer following drawing:  Also, it is not possible to provide exit and entry beyond 1+570 due to presence of Minor Bridge at Km 1+550.	Please confirm length as provided in List of Service Road and Slip Road is including Exit / Entry.	Length of service road/slip road as per table given in schedule B is including Entry & Exit.

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
50	General		It is requested to provide Geotechnical Investigation.	Geo-Technical Report Report is uploaded on e-tender portal for reference only **(copy enclosed).** The bidder has to do its own investigation & design and construct as per manual & scope specified in the schedules.
51	GST		In light of the judgement of the High Court of Karnataka dated 11.07.2022 , wherein GST is no longer applicable on Annuity payments. Kindly confirm the following as whether they are applicable in the subject bid. (i) No GST will be paid by NHAI on Annuity Payments. (ii) No GST will be paid by NHAI on Interest on reducing balance of Completion Cost. (iii) GST will continue to be paid on O&M Payments. Further, in case the above ruling is modified will Change in Law (as per Article 35) be applicable in the event subsequent to bid date.	As per provisions of RFP/DCA
54	Utility Shifting	Existing Utilities (i) Electrical Utilities (a) High Tension/Low Tension Lines (HT/LT Lines) (b) High Tension Lines (HT Lines) (c) Low tension Lines (LT Lines) (a) High Tension/Low Tension Lines (HT/LT Lines)- this list indicated combination of B&C Kindly confirm cost to be added for B & C only or combination of (a) High Tension/Low Tension Lines (HT/LT Lines)		Details of existing utilites have been revised (Refer Amendment 7)

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Ambala Kala Amb Tollway Pvt Ltd AKHPL

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
		The Data is mismatch individually and combination sheet		
55	GST	With reference to the subject tender, the NIT is issued for Estimate Project Cost Rs. 642.24 Crores, whereas in other NHAI NITs are issued for Estimate Project Cost Amount (Rs...Cr excluding GST) specifically. In this NIT/RFP it is not specifically mentioned the Estimate Project Cost is excluded or not. We assume that as like other NITs called for bid the Estimate Project Cost is exclusive of GST. It is also supported by APPENDIX - IB Letter comprising the Financial Bid clause 7 "I/ We hereby submit our Bid consisting of Bid Project Cost of Rs... (Rs. ..... in words) excluding GST". Therefore, kindly confirm the Estimate Project Cost excluding GST or not		Yes, Estimated Project Cost is Excluding of GST. Bidder has to Quote the Bid Project Cost only and it is clear mentioned in the point No. 7 of Appendix IB (Letter Comprising the Technical Bid) *"Bid Project Cost of Rs... (Rs. ..... in words) excluding GST".*
56	495	We are interested to participate in the subject tender.	kindly extend the submission due date for 15 days more i.e., 15.09.2022 for the reasons mentioned below: 1. Kindly confirm GST is included or excluded in the Estimated Project Cost invited for the subject tender. 2. DPR/Executive Summary of technical data has not been provided yet so as to aware the leads of soils, aggregates etc., to compute the estimate. 3. Due to continuous rains from a month, complete survey & investigation could not be taken up within the stipulated time. 4. Insufficient time to take Bank Guarantee for Bid Security as there are holidays form 27.08.2022 to 29.08.2022 and Ganesh chathurdi is also on 31.08.2022.	As per amendments issued/to be issued by authority.

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-250 3507 / 26093514

HR/Ambala-KalaAmb/2022

Date: 26.09.2022

To,

All the eligible bidders

Amendment-8

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) **-Extension of bid due date- reg.**

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that the Bid Due Date is hereby extended from 27.09.2022 to 04.10.2022. Revised bidding schedule is as below:

S. No.	Event	Revised Schedule
1	Online Bid Submission close date and time	At 11:00 am on 04.10.2022
2	Technical Bid opening date and time	At 11:30 am on 06.10.2022

Yours faithfully,

(V K Joshi)
General Manager (Tech)

N.H.A.I., NEW DELHI

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075
दूरभाष / Phone : 91-11-28074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

HR/Ambala-KalaAmb/2022

Date: 03.10.2022

To,

All the eligible bidders

Amendment-9

[Tender ID: 2022_NHAI_121054_1]

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O).

Ref: RFP invited on 01.07.2022 for the above mentioned work.

Dear Sirs,

This is with reference to the RFP invited on 01.07.2022 for the above mentioned work.

2. In this regard, it is to intimate that in earlier uploaded schedule A (amendment 7), there has been minor discrepancies due to typographical error in table at clause 24 (i) (b), same has now been corrected. Further, table at 24 (ii) Public Health Utilities has been amended as per additional Pre-bid Queries.

3. In this regard, Please find attached **Amended schedule A** (modification in clause 24 (i) (b) and clause 24 (ii)) and reply of additional pre-bid queries (attached as **Annexure –I**).

4. Further, it is also intimated that in earlier uploaded Schedule-D, Footer at page 1 of Annex –II (Functional & Technical Specifications of ATMS on NH may be read as "**4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O)**" instead of "4-laning of Bhiwani-Hansi of NH 148B (Design Length 42.934 km) under Bharatmala Pariyojna in the State of Haryana on Hybrid Annuity Mode."

Yours faithfully,

(V K Joshi)
General Manager (Tech)

Enclosure: Amended Schedule A , Annexure -1

Ambala Kala Amb Highway Pvt. Ltd. AKHPL Kaithal

N.H.A.I., NEW DELHI

ADVISORY PVT. LTD. DELHI

Sub: 4-laning of Ambala-Kala Amb section of NH-72 (Part of New NH-344 from Ambala Ring road (Design Chainage (-) 0+800) to Shahzadpur and Part of New NH-7 from Shahzadpur to Kala Amb (HR/HP Border) (Design Chainage 33+015)) in the state of Haryana and Punjab (Design Length 33.815 Km) on Hybrid Annuity Mode under NH(O) Project"- **Reply of Additional Pre-Bid Queries reg.**

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Ambala Kala Amb Highway Pvt. Ltd. Kaithal AKHPL

Sl. No.	Clause No.	Existing Clause/ Description	Issued	Reply
1	**Reply of Pre-Bid** Sr No-12	Utilitiy Relocation Plan	As per the reply on dated 21.09.2022 Sr.no 12. Reg. Utility relocation plan it is mentioned "Please refer amendment 7". As per the attachments Utility relocation plan not uploaded. We requesting the authority to please upload the revised Utility relocation plan.	As per the reply on dated 21.09.2022 Sr.no 12. "Please refer amendment 7 " was mentioned in context of updated existing utility details in Schedule A. The existing utility details (Schedule A) have further been revised as per Amendment 9. It is submitted that utility relocation plan has already been uploaded on 12.07.2022 (Amendment 1).
2	Existing Utilities	Public Health utilities (Water / Sewage Pipe Lines)	As per the tender details mentioned in Schedule-A, the total no. of crossings in public health utilities to be shifted are as under In this regard, we request you to please provide all the necessary details like diameter of pipe & type of pipe.	Details have been incorporated. Please refer Amendment 9

S. No.	Design Chainage (Km)		Length (in Km)				Crossings				Remarks
	From	To	Water Supply Line		Sewage line		Water Supply Line		Sewage line		
			With pumping	With Gravity Flow	With pumping	With Gravity Flow	With pumping	With Gravity Flow	With pumping	With Gravity Flow	
1	25.8	33.615	4.635 Km	Nil	Nil	Nil	40 nos	Nil	Nil	Nil	-