



DRAFT CONTRACT AGREEMENT (DCA) & SCHEDULES

For

**Construction of Twin Tube Uni-directional Tunnel at Nilgrar on
Srinagar-Leh section of NH-1 in the UT of Jammu & Kashmir
[Package-2B of Z-Morh-Zojila section]**

On

ENGINEERING, PROCUREMENT & CONSTRUCTION (EPC) MODE

**NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT
CORPORATION LIMITED
(MINISTRY OF ROAD TRANSPORT & HIGHWAYS, GOVT. OF INDIA)**

MAY, 2020

**NHIDCL, 3RD FLOOR, PRESS TRUST OF INDIA BUILDING, 4, PARLIAMENT STREET,
NEW DELHI – 110001**

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Part I

Preliminary

Engineering, Procurement and Construction Agreement

THIS AGREEMENT¹ is entered into on this the day of , 2020

Between

[The President of India through National Highways and Infrastructure Development Corporation Limited established under the Company Act, represented by its **Managing Director** and having its principal office at 3rd Floor, PTI Building, 4-Parliament Street, New Delhi-110001] (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

{-----} the selected bidder having its registered office at, (hereinafter referred to as the “**Contractor**” which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns) of the **Other Part**.

Whereas:

- A. The Government of India entrusted the development, maintenance and management of “**Construction of Twin Tube Uni-directional Tunnel at Nilgrar on Srinagar-Leh section of NH-1 in the UT of Jammu & Kashmir [Package-2B of Z-Morh-Zojila section] on EPC mode**” to the Authority;
- B. The Authority resolved to “**Construction of Twin Tube Uni-directional Tunnel at Nilgrar on Srinagar-Leh section of NH-1 in the UT of Jammu & Kashmir [Package-2B of Z-Morh-Zojila section]**” on Engineering, Procurement, Construction (“EPC”) basis in accordance with the terms and conditions to be set forth in an agreement to be entered into.
- C. The Authority accordingly invited the proposals (the “**Request for Proposals**” or “**RFP**”) from the eligible bidders as per the technical and commercial terms and conditions prescribed in the RFP for undertaking the Project.
- D. After evaluation of the bids received, the Authority accepted the bid of the selected bidder and issued its Letter of Acceptance No. dated(hereinafter called the “**LOA**”) to the selected bidder for rehabilitation and augmentation of the above section of [NH-1] **Srinagar-Leh** at the Contract Price specified hereinafter, requiring the selected bidder to inter alia:
 - (i) to give his consent to enter into this Agreement and the enforceability of the provisions thereof, within 10 (ten) days of the date of issue of LOA;
 - (ii) submit Performance Security and Additional Performance Security (if any) as per RFP requirements, and
 - (iii) execute this Agreement within 30 (thirty) days of the date of issue of LOA.

E. The Contractor has fulfilled the requirements specified in Recital (D) above;

NOW, THEREFORE, in consideration of the foregoing and the respective covenants set forth in this Agreement, the sufficiency and adequacy of which is hereby acknowledged, the Authority hereby covenants to pay the Contractor, in consideration of the obligations specified herein, the Contract Price or such other sum as may become payable under the provisions of the Agreement at the times and in the manner specified by the Agreement and intending to be legally bound hereby, the Parties agree as follows:

A) Volume-I:

The Agreement;
Corrigendum to the Agreement; Addendum, if any, to RFP;
Letter comprising the financial Bid;
Letter of Acceptance;
Power of Attorney;
Joint Venture Agreement, if any;
Legal opinion;
Any other document to be specified

B) Volume-II: Technical Bid

Article 1

Definitions and Interpretations

1.1 Definitions

- (i) The words and expressions beginning with capital letters and defined in this Agreement shall, unless the context otherwise requires, have the meaning ascribed thereto herein, and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules.
- (ii) 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;

“Advance Payment” shall have the meaning set forth in Clause 19.2;

“Affected Party” shall have the meaning set forth in Clause 21.1;

“Affiliate” means, in relation to either Party {and/or Members}, a person who controls, is controlled by, or is under the common control with such Party {or 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);

“Agreement” means this Agreement, its Recitals, the Schedules hereto and any amendments thereto, or any supplementary agreement made in accordance with the provisions contained in this Agreement;

“Applicable Laws” means all laws, brought into force and effect by the GOI or the State Government including rules, regulations and notifications made thereunder, and judgements, 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, licences, permits, authorisations, 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 Highway during the subsistence of this Agreement;

“Appointed Date” means the date declared by the Authority as the project commencement date with the consent of the contractor, as per the process prescribed in Article 3 and 8 of this Agreement;

“Arbitration Act” means the Arbitration and Conciliation Act, 1996, with all its subsequent amendments;

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

“Authority Default” shall have the meaning set forth in Clause 23.2;

“Authority’s Engineer” shall have the meaning set forth in Clause 18.1;

“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 fulfil any obligations of the Authority under this Agreement;

“Bank” means a bank incorporated in India and recognized by the Reserve Bank of India

“Base Rate” means the floor rate of interest announced by the State Bank of India for all its lending operations;

“Base Date” means the last date of the calendar month, which precedes the Bid Due Date by at least 28 (twenty eight) days;

“Bid” means the documents in their entirety comprised in the bid submitted by the [selected bidder/ Joint venture] in response to the Request for Proposal in accordance with the provisions thereof;

“Bid Security” means the bid security provided by the Contractor to the Authority in accordance with the Request for Proposal, and which is to remain in force until substituted by the Performance Security;

“Breach” means and refers to the stage where either party fails to cure the defaults in spite of three cure period notices, which amounts to breaking of the agreement.

“Change in Law” means the occurrence of any of the following after the Base 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 come into effect until the Base Date; or
- (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 Base Date.

“Change of Scope” shall have the meaning set forth in Article 13;

“Change of Scope Notice” shall have the meaning set forth in Clause 13.2 (i); **“Change of**

Scope Request” shall have the meaning set forth in Clause 13.2 (ii); **“Change of Scope Order”** shall have the meaning set forth in Clause 13.2 (iv); **“Completion Certificate”** shall have the meaning set forth in Clause 12.2; **“Construction”** shall have the meaning set forth in Clause 1.2 (f);

“Construction Period” means the period commencing from the Appointed Date and ending on the date of the Completion Certificate;

“Construction Zone” shall have the meaning set forth in Clause 8.3 (i);

“Contract Price” means the amount specified in Clause 19.1 (i);

“Contractor” shall have the meaning attributed thereto in the array of Parties hereinabove as set forth in the Recitals;

“Contractor Default” shall have the meaning set forth in Clause 23.1;

“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 default by the Contractor requires any reasonable action by the Contractor that must be approved by the Authority or the Authority’s Engineer hereunder, the applicable Cure Period shall be extended by the period taken by the Authority or the Authority’s Engineer to accord their approval;

“Damages” shall have the meaning set forth in paragraph (w) of Clause 1.2;

“Defect” means any defect or deficiency in Construction of the Works or any part thereof, which does not conform with the Specifications and Standards, and in the case of Maintenance, means any Defect or deficiency which is specified in Schedule-E; **“Defects Liability Period”** shall have the meaning set forth in Clause 17.1; **“Dispute”** shall have the meaning set forth in Clause 26.1;

“Dispute Resolution Procedure” means the procedure for resolution of Disputes set forth in Article 26;

“Drawings” means all of the drawings, calculations and documents pertaining to the Project Highway as set forth in Schedule-I, and shall include ‘as built’ drawings of the Project Highway;

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

“Emergency” means a condition or situation that is likely to endanger the safety or security of the individuals on or about the Project Highway, 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 Highway, 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 to payees or beneficiaries or any similar arrangement under any insurance policy pertaining to the Project Highway, where applicable herein but excluding utilities referred to in Clause 9.1;

“EPC” means engineering, procurement and construction;

“Final Payment Certificate” shall have the meaning set forth in Clause 19.15;

“Final Payment Statement” shall have the meaning set forth in Clause 19.13;

“Force Majeure” or “Force Majeure Event” shall have the meaning ascribed to it in Clause 21.1;

“GAD” or “General Arrangement Drawings” shall have the meaning set forth in Clause 3.1 (iii) (b);

“GOI” or “Government” 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 contractor 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 Contractor in accordance with this Agreement, Applicable Laws and Applicable Permits in reliable, safe, economical and efficient manner;

“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 Highway or the performance of all or any of the services or obligations of the Contractor under or pursuant to this Agreement;

“Handover Memorandum” shall have the meaning set forth in Clause 8.2;

“IRC” means the Indian Roads Congress;

“Indemnified Party” means the Party entitled to the benefit of an indemnity pursuant to Article 25;

“Indemnifying Party” means the Party obligated to indemnify the other Party pursuant to Article 25;

“Indirect Political Event” shall have the meaning set forth in Clause 21.3;

“Insurance Cover” means the aggregate of the maximum sums insured under the insurance taken out by the Contractor pursuant to Article 20, and includes all insurances required to be taken out by the Contractor under Clauses 20.1 and 20.9 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, programmes 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;

“Interim Payment Certificate” or **“IPC”** means the interim payment certificate issued by the Authority’s Engineer for payment to the Contractor in respect of Contractor’s claims for payment raised in accordance with the provisions of this Agreement;

“Joint Venture” means the group of entities which have come together for implementation of this Project;

“Lead Member” shall, in the case of a joint venture, mean the member of such joint venture who shall have the authority to bind the contractor and each member of the Joint venture; and shall be deemed to be the Contractor for the purposes of this Agreement; the Lead Member shall itself undertake and perform at least 51% (fifty one per cent) of the total length of the Project Highway;

“LOA” or **“Letter of Acceptance”** means the letter of acceptance issued by the Authority as referred to in Recital (D);

“Maintenance” means the maintenance of the Project Highway as set forth in Article 14 for the period specified therein;

“Maintenance Inspection Report” shall have the meaning set forth in Clause 15.2;

“Maintenance Manual” shall have the meaning ascribed to it in Clause 10.7;

“Maintenance Programme” shall have the meaning set forth in Clause 14.3;

“Maintenance Period” shall have the meaning set forth in Clause 14.1;

“Maintenance Requirements” shall have the meaning set forth in Clause 14.2;

“Major Bridge” means a bridge having a total length of more than 60 (sixty) metres between the inner faces of the dirt walls as specified in IRC:5;

“Manual” shall mean the Manual of Standards and Specifications for Project Highways;

“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;

“Materials” comprise of all the supplies used by the Contractor used in the Works or for the maintenance of the Project Highway;

“Monthly Maintenance Statement” shall have the meaning set forth in Clause 19.6;

“MORTH” means the Ministry of Road Transport and Highways or any substitute thereof dealing with Highways;

“Non-Political Event” shall have the meaning set forth in Clause 21.2;

“Parties” means the parties to this Agreement collectively and “Party” shall mean any of the parties to this Agreement individually;

“Performance Security” and **“Additional Performance Security”** shall have the meaning set forth in Clause 7.1;

“Plant” means the apparatus and machinery intended to form or forming part of the works of the Works;

“Political Event” shall have the meaning set forth in Clause 21.4;

“Programme” shall have the meaning set forth in Clause 10.1 (iii);

“Project” means the construction and maintenance of the Project Highway 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;

“Project Assets” means all physical and other assets relating to (a) 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, kilometre-stones, [toll plaza(s)], electrical systems, communication systems, rest areas, relief centres, maintenance depots and administrative offices; and (b) Project Facilities situated on the Site;

“Project Completion Date” means the date on which the Completion Certificate is issued;

“Project Completion Schedule” means the progressive Project Milestones set forth in Schedule-J for completion of the Project Highway 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 the existing road {, proposed bypasses and tunnels} forming part of [NH-** from km ** to km **] and all Project Assets, and its subsequent development and augmentation in accordance with this Agreement;

“Project Milestone” means the project milestone set forth in Schedule-J;

“Proof Consultant” shall have the meaning set forth in Clause 10.2;

“Quality Assurance Plan” or **“QAP”** shall have the meaning set forth in Clause 11.2;

“Re.”, “Rs.” or “Rupees” or “Indian Rupees” or “INR” means the lawful currency of the Republic of India;

“Request for Proposals” or **“RFP”** shall have the meaning set forth in Recital ‘C’;

“Retention Money” shall have the meaning set forth in Clause 7.5;

“Right of Way” means and refers to the total land required and acquired for the project, both in its width and length, together with all way leaves, easements, unrestricted access and other rights of way, howsoever described, necessary for construction and maintenance of the Project Highway in accordance with this Agreement;

“Safety Consultant” shall have the meaning set forth in Clause 10.1;

“Scheduled Completion Date” shall be the date set forth in Clause 10.3;

“Scheduled Construction Period” means the period commencing from the Appointed Date and ending on Scheduled Completion Date;

“Scope of the Project” shall have the meaning set forth in Clause 2.1;

“Section” means a part of the Project Highway;

“Site” shall have the meaning set forth in Clause 8.1;

“Specifications and Standards” means the specifications and standards relating to the quality, quantity, capacity and other requirements for the Project Highway, as set forth in Schedule-D, and any modifications thereof, or additions thereto, as included in the design and engineering for the Project Highway submitted by the Contractor to, and expressly approved by, the Authority;

“Stage Payment Statement” shall have the meaning set forth in Clause 19.4;

“Structures” means an elevated road or a flyover, as the case may be;

“Sub-contractor” means any person or persons to whom a part of the Works or the Maintenance has been subcontracted by the Contractor and the permitted legal successors in title to such person, but not an assignee to such person;

“Suspension” shall have the meaning set forth in Article 22;

“Taking Over Certificate” shall have the meaning set forth in Clause 14.10;

“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 Highway 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;

“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 either Party to the other upon Termination in accordance with Article 23;

“Terms of Reference” or “TOR” shall have the meaning set forth in Clause 18.2;

“Tests” means the tests set forth in Schedule-K to determine the completion of Works in accordance with the provisions of this Agreement;

“Time Extension” shall have the meaning set forth in Clause 10.5;

“User” means a person who travels or intends to travel on the Project Highway or any part thereof in/on any vehicle;

“Valuation of Unpaid works” shall have the meaning set forth in Clause 23.5;

“Works” means all works including survey and investigation, design, engineering, procurement, construction, Plant, Materials, maintenance, temporary works and other things necessary to complete the Project Highway in accordance with this Agreement; and

“WPI” means the wholesale price index for various commodities as published by the Ministry of Commerce and 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 WPI published for the period ending with the preceding month.

1.2 Interpretation

- (i) 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, survey and investigation, design, developing, engineering, procurement, supply of plant, materials, equipment, labour, delivery, transportation, installation, processing, fabrication, testing, and commissioning of the Project Highway, including maintenance during the Construction Period, removing of defects, if any, 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, up-gradation and other activities incidental thereto during the Construction Period, 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) references to a “business day” shall be construed as a reference to a day (other than a Sunday) on which banks in Delhi 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 “reorganization” of a company or corporation shall be construed so as to include any equivalent or analogous proceedings under the law of the jurisdiction in which such company or corporation is incorporated or any jurisdiction in which such company or corporation carries on business including the seeking of liquidation, winding-up, reorganization, dissolution, arrangement, protection or relief of debtors;
- (s) save and except as otherwise provided in this Agreement, any reference, at any time, to any agreement, deed, instrument, licence or document of any description shall be construed as reference to that agreement, deed, instrument, licence or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Clause 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 or report required under or pursuant to this Agreement from or by any Party or the Authority’s Engineer shall be valid and effective only if it is in writing under the hand of a duly authorized representative of such Party or the Authority’s Engineer, as the case may be, in this behalf and not otherwise;
- (u) the Schedules and Recitals to this Agreement form 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 or Schedules in this Agreement shall, except where the context otherwise requires, mean references to Recitals, Articles, Clauses, Sub-clauses and Schedules of or to this Agreement, and references to a Paragraph shall, subject to any contrary indication, be construed as a reference to a Paragraph of this Agreement or of the Schedule 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 or liquidated damages (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 for the reasons specified in the Agreement, such extended time shall also be of the essence.
- (ii) Unless expressly provided otherwise in this Agreement, any Documentation required to be provided or furnished by the Contractor to the Authority shall be provided free of cost and in three copies, and if the Authority is required to return any such Documentation with its comments and/or approval, it shall be entitled to retain two copies thereof.
- (iii) 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.
- (iv) 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 and errors/discrepancies

- (i) 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. this Agreement at (a) above shall prevail over the agreements and documents at (b).
- (ii) Subject to the provisions of Clause 1.4 (i), 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.

1.5 Joint and several liability

- (i) If the Contractor has formed a Joint Venture of two or more persons for implementing the Project:
 - (a) these persons shall, without prejudice to the provisions of this Agreement or any other agreement, be deemed to be jointly and severally liable to the Authority for the performance of the Agreement; and
 - (b) the Contractor shall ensure that no change in the composition of the Joint Venture is effected without the prior consent of the Authority.
- (ii) Without prejudice to the joint and several liability of all the members of the Joint Venture, the Lead Member shall represent all the members of the Joint Venture and shall at all times be liable and responsible for discharging the functions and obligations of the Contractor. The Contractor shall ensure that each member of the Joint Venture shall be bound by any decision, communication, notice, action or inaction of the Lead Member on any matter related to this Agreement and the Authority shall be entitled to rely upon any such action, decision or communication of the Lead Member. The Authority shall have the right to release payments solely to the Lead Member and shall not in any manner be responsible or liable for the *inter se* allocation of payments among members of the Joint Venture.

Part II

Scope of Project

Article 2

Scope of the Project

2.1 Scope of the Project

Under this Agreement, the scope of the Project (the “**Scope of the Project**”) shall mean and include:

- (a) construction of the Project Highway 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) maintenance of the Project Highway in accordance with the provisions of this Agreement and in conformity with the requirements set forth in Schedule-E; and
- (c) performance and fulfillment of all other obligations of the Contractor in accordance with the provisions of this Agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the Contractor under this Agreement.

Article 3

Obligations of the Authority

3.1 Obligations of the Authority

- (i) 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.
- (ii) The Authority shall be responsible for the correctness of the Scope of the Project, Project Facilities, Specifications and Standards and the criteria for testing of the completed Works.
- (iii) The Authority shall, upon submission of the Performance Security as per the RFP by the Contractor, shall provide to the Contractor:
 - (a) No less than 90% (ninety per cent) of the required Right of Way of the Construction Zone of total length of the Project Highway within a period of 30 (thirty) days from the date of this Agreement, which shall be in contiguous stretches of length not less than 1(one) kilometre.
 - (b) approval of the general arrangement drawings (the “GAD”) from railway authorities to enable the Contractor to construct road over-bridges/ under-bridges at level crossings on the Project Highway in accordance with the Specifications and Standards, and subject to the terms and conditions specified in such approval, within a period of 60 (sixty) days from the Appointed Date, and reimbursement of all the costs and expenses paid by the Contractor to the railway authorities for and in respect of the road over-bridges/under bridges; and.
 - (c) all environmental clearances as required under Clause 4.3.
- (iv) Delay in providing the Right of Way or approval of GAD by railway authorities, as the case may be, in accordance with the provisions of Clause 3.1 (iii) shall entitle the Contractor to Damages in a sum calculated in accordance with the provisions of Clause 8.3 of this Agreement and Time Extension in accordance with the provisions of Clause 10.5 of this Agreement. For the avoidance of doubt, the Parties agree that the Damages for delay in approval of GAD by the railway authorities for a particular road overbridge/ under-bridge shall be deemed to be equal to the Damages payable under the provisions of Clause 8.3 for delay in providing Right of Way for a length of 2 (two) kilometre for each such road over-bridge/ under-bridge.
- (v) Notwithstanding anything to the contrary contained in this Agreement, the Parties expressly agree that the aggregate Damages payable under Clauses 3.1 (iv), 8.3 and 9.5 shall not exceed 1% (one per cent) of the Contract Price. For the avoidance of doubt, the Damages payable by the Authority under the aforesaid Clauses shall not be additive if they arise concurrently from more than one cause but relate to the same part of the Project Highway.

Both the parties agree that payment of such Damages shall be full and final settlement of all claims of the Contractor and such compensation shall be the sole remedy against delays of the Authority and both parties further agree that the payment of Damages shall be the final cure for the Contractor against delays of the Authority, without recourse to any other payments.

- (vi) The Authority agrees to provide support to the Contractor and undertakes to observe, comply with and perform, subject to and in accordance with the provisions of this Agreement and the Applicable Laws, the following:
- (a) upon written request from the Contractor, and subject to the Contractor complying with Applicable Laws, provide reasonable support to the Contractor in procuring Applicable Permits required from any Government Instrumentality for implementation of the Project;
 - (b) upon written request from the Contractor, provide reasonable assistance to the Contractor in obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favourable than those generally available to commercial customers receiving substantially equivalent services;
 - (c) procure that no barriers that would have a material adverse effect on the works are erected or placed on or about the Project Highway by any Government Instrumentality or persons claiming through or under it, except for reasons of Emergency, national security, law and order or collection of inter-state taxes;
 - (d) not do or omit to do any act, deed or thing which may in any manner violate any provisions of this Agreement;
 - (e) support, cooperate with and facilitate the Contractor in the implementation of the Project in accordance with the provisions of this Agreement; and
 - (f) upon written request from the Contractor and subject to the provisions of Clause 4.3, provide reasonable assistance to the Contractor and any expatriate personnel of the Contractor or its Sub-contractors to obtain the applicable visas and the requisite work permits for the purposes of discharge by the Contractor or its Sub-contractors of their obligations under this Agreement and the agreements with the Sub-contractors.

3.2 Maintenance obligations prior to the Appointed Date

The Authority shall, prior to the Appointed Date, maintain the Project Highway, at its own cost and expense, so that its traffic worthiness and safety are at no time materially inferior as compared to its condition 10 (ten) days prior to the last date for submission of the Bid, and in the event of any material deterioration or damage other than normal wear and tear, undertake repair thereof. For the avoidance of doubt, the Authority shall undertake only routine maintenance prior to the Appointed Date, and it shall undertake special repairs only in the event of excessive deterioration or damage caused due to unforeseen events such as floods or earthquake.

3.3 Environmental Clearances

The Authority represents and warrants that the environmental clearances required for construction of the Project shall be procured by the Authority prior to the date of issue of LOA. For the avoidance of doubt, the present status of environmental clearances is specified in Schedule-A.

3.4 Deemed Termination upon delay

Without prejudice to the provisions of Clauses 8.3, and subject to the provisions of Clause 7.3, the Parties expressly agree that in the event the Appointed Date does not occur, for any reason whatsoever, within 90 days of signing of the Agreement and submission of the full Performance Security by the Contractor, the Agreement shall be deemed to have been terminated. The Authority shall pay damages to the Contractor equivalent to 1% of the Contract Price (3% in case of standalone bridge projects). All other rights, privileges, claims and entitlements of the Contractor under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased. The Contractor shall hand over all information in relation to the Highway, including but not limited to any data, designs, drawings, structures, information, plans, etc. prepared by them for the Highway, to the Authority.

Article 4

Obligations of the Contractor

4.1 Obligations of the Contractor

- (i) Subject to and on the terms and conditions of this Agreement, the Contractor shall undertake the survey, investigation, design, engineering, procurement, construction, and maintenance of the Project Highway and observe, fulfill, comply with and perform all its obligations set out in this Agreement or arising hereunder.
- (ii) The Contractor shall comply with all Applicable Laws and Applicable Permits (including renewals as required) in the performance of its obligations under this Agreement.
- (iii) Subject to the provisions of Clauses 4.1 (i) and 4.1 (ii), the Contractor shall discharge its obligations in accordance with Good Industry Practice and as a reasonable and prudent person.
- (iv) The Contractor shall remedy any and all loss, defects, or damage to the Project Highway from the Appointed Date until the end of the Construction Period at the Contractor's cost, save and except to the extent that any such loss, defect, or damage shall have arisen from any wilful default or neglect of the Authority.
- (v) The Contractor shall remedy any and all loss, defect or damage to the Project Highway during the Defects Liability Period at the Contractor's cost to the extent that such loss, defect or damage shall have arisen out of the reasons specified in Clause 17.3.
- (vi) The Contractor shall remedy any and all loss or damage to the Project Highway during the Maintenance Period at the Contractor's cost, including those stated in Clause 14.1 (ii), save and except to the extent that any such loss or damage shall have arisen on account of any wilful default or neglect of the Authority or on account of a Force Majeure Event.
- (vii) The Contractor 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 set forth in Schedule-F and obtain and keep in force and effect such Applicable Permits in conformity with the Applicable Laws;
 - (b) procure, as required, the appropriate proprietary rights, licenses, agreements and permissions for Materials, methods, processes and systems used or incorporated into the Project Highway;
 - (c) make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Sub-contractors in connection with the performance of its obligations under this Agreement;
 - (d) ensure and procure that its Sub-contractors comply with all Applicable Permits

- and Applicable Laws in the performance by them of any of the Contractor's obligations under this Agreement;
- (e) not do or omit to do any act, deed or thing which may in any manner violate any provisions of this Agreement;
 - (f) support, cooperate with and facilitate the Authority in the implementation and operation of the Project in accordance with the provisions of this Agreement;
 - (g) ensure that the Contractor and its Sub-contractors comply with the safety and welfare measures for labour in accordance with the Applicable Laws and Good Industry Practice and shall appoint full time Safety Officer & Labour Welfare Officer to achieve the compliance;
 - (h) keep, on Site, a copy of this Agreement, publications named in this Agreement, the Drawings, Documents relating to the Project, and Change of Scope orders and other communications given under this Agreement. The Authority's Engineer and its authorized personnel shall have the right of access to all these documents at all reasonable times;
 - (i) cooperate with other contractors employed by the Authority and personnel of any public authority; and
 - (j) not interfere unnecessarily or improperly with the convenience of the public, or the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Authority or of others.
 - (k) Ensure that all payments to the manpower (labour, operators, technicians, officers, engineers etc) are released to their bank account
- (viii) The Contractor shall undertake all necessary superintendence to plan, arrange, direct, manage, inspect and test the Works. The Contractor shall provide all necessary superintendence of the Works for the proper fulfilling of the Contractor's obligations under the Agreement. Such superintendence shall be given by competent person having adequate knowledge of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents) for the satisfactory and safe execution of the Works.
- (ix) The Contractor shall obtain and maintain a project related bank account operational at site where all transactions related to the payment of work will be done. The Contractor shall submit a monthly account statement and a detailed report on utilization of funds transferred to this project related bank account to Authority's Engineer along with Stage Payment Statement. Notwithstanding anything contrary to this agreement, the authority, in the interest and to ensure timely completion of the work, reserves the right to audit such bank accounts to ensure that there is no diversion of funds from this project specific account to any other project being implemented by the Contractor.
- (x) The Contractor shall provide the documents of the Contractor specified in the Agreement, and all Contractors' personnel; Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for the execution, completion of Works and remedying defects.

- (xi) The Contractor shall perform the Works in conformity with the Project requirements and other requirements and standards prescribed under or pursuant to the Agreement.
- (xii) The Contractor shall carry out such work incidental and contingent to the original Scope of the Project to comply with Good Industry Practices.
- (xiii) The Contractor shall maintain required staff and necessary Contractor's equipment and materials within the reach of the Site during the Defects Liability Period so that any defects arising are promptly attended.

4.2 Obligations relating to sub-contracts and any other agreements

- (i) The Contractor, whether Joint Venture or sole, shall not sub-contract any Works in more than **49% (forty nine per cent)** of the Contract Price and shall carry out Works directly under its own supervision and through its own personnel and equipment in **at least 51% (fifty one per cent)** of the Contract Price. Further, in case the Contractor is a Joint Venture, then the Lead Member shall carry out Works directly through its own resources (men, material and machines etc.) in **at least 51% (fifty one per cent)** of total length of the Project Highway. Provided, however, that in respect of the Works carried out directly by the Contractor, it may enter into contracts for the supply and installation of Materials, Plant, equipment, road furniture, safety devices and labour, as the case may be, for such Works. For the avoidance of doubt, the Parties agree that the Contractor may sub-divide the aforesaid length of **51% (fifty one per cent)** in no more than 5 (five) sections of the Project Highway. The Parties further agree that all obligations and liabilities under this Agreement for the entire project Highway shall at all times remain with the Contractor.
- (ii) In the event any sub-contract for Works, or the aggregate of such sub-contracts with any Sub-contractor, exceeds 5% (five percent) of the Contract Price, the Contractor shall communicate the name and particulars, including the relevant experience of the Sub-contractor, to the Authority prior to entering into any such sub-contract. The Authority shall examine the particulars of the Sub- contractor from the national security and public interest perspective and may require the Contractor, no later than 15 (fifteen) business days from the date of receiving the communication from the Contractor, not to proceed with the sub-contract, and the Contractor shall comply therewith.
- (iii) In the event any sub-contract referred to in Clause 4.2 (ii) relates to a Sub- contractor who has, over the preceding 3 (three) years, not undertaken at least one work of a similar nature with a contract value exceeding 40% (forty per cent) of the value of the sub-contract to be awarded hereunder, and received payments in respect thereof for an amount equal to at least such 40% (forty per cent), the Authority may, no later than 15 (fifteen) business days from the date of receiving the communication from the Contractor, require the Contractor not to proceed with such sub-contract, and the Contractor shall comply therewith without delay or demur.
- (iv) It is expressly agreed that the Contractor shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the agreements with its Sub-contractors or any other agreement that may be entered into

by the Contractor, and no default under any such agreement shall excuse the Contractor from its obligations or liability under this Agreement. However, in case of noncompliance of the Contractor towards his obligations for payments to the approved Subcontractor(s), which is likely to affect the progress of works, the authority reserves the right to intervene and direct the Contractor to release such outstanding payments to approved Sub-contractor(s) out of the payments due for the completed Works in the interest of work.

- (v) In the event, if any sub-contract for Works valuing less than 5% (five percent) of the Contract Price, the Contractor shall communicate the name and particulars, to the Authority through Authority's Engineer within 7 days of subcontracting along with the details of all subcontracts.

4.3 Employment of foreign nationals

The Contractor acknowledges, agrees and undertakes that employment of foreign personnel by the Contractor and/or its Sub-contractors and their sub- contractors 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 always rest with the Contractor. Notwithstanding anything to the contrary contained in this Agreement, refusal of or inability to obtain any such permits and approvals by the Contractor or any of its Subcontractors or their subcontractors shall not constitute a Force Majeure Event, and shall not in any manner excuse the Contractor from the performance and discharge it of its obligations and liabilities under this Agreement, and the Contractor's liabilities hereunder shall remain unaffected by such failure, refusal or inability.

4.4 Contractor's personnel

- (i) The Contractor shall ensure that the personnel engaged by it or by its Sub- contractors in the performance of its obligations under this Agreement are at all times appropriately and adequately qualified, skilled and experienced in their respective functions in conformity with Good Industry Practice. The Contractor will try to hire at least 10% (ten percent) trained workmen as per the National Skills Qualifications Framework. If necessary, the requisite workmen may be got trained by the Contractor at his cost through authorized training centres of the Directorate General of Training (DGT). The Contractor will organize training at project site/ sites for the trainees as and when required as per the training schedule finalized in consultation with the training centres. The trainees shall be paid stipend by the Contractor (subject to a maximum of Rs. 15,000/- per person) on the basis of minimum wages to compensate for loss of income during the training period.
- (ii) The Authority's Engineer may, for reasons to be specified in writing, direct the Contractor to remove any member of the Contractor's or Sub-contractor's personnel. Provided that any such direction issued by the Authority's Engineer shall specify the reasons for the removal of such person.
- (iii) The Contractor shall on receiving such a direction from the Authority's Engineer order for the removal of such person or persons with immediate effect. It shall be the duty of

the Contractor to ensure that such persons are evicted from the Site within 10 (ten) days of any such direction being issued in pursuance of Clause 4.4 (ii). The Contractor shall further ensure that such persons have no further connection with the Works or Maintenance under this Agreement. The Contractor shall then appoint (or cause to be appointed) a replacement.

4.5 Advertisement on Project Highway

The Project Highway or any part thereof shall not be used in any manner to advertise any commercial product or services.

4.6 Contractor's care of the Works

The Contractor shall bear full risk in, and take full responsibility for, the care of the Works, and of the Materials, goods and equipment for incorporation therein, from the Appointed Date until the date of Completion Certificate, save and except to the extent that any such loss or damage shall have arisen from any willful default or gross neglect of the Authority.

4.7 Electricity, water and other services

The Contractor shall be responsible for procuring of all utilities as may be required, including without limitation, adequate power, water and other services.

4.8 Unforeseeable difficulties

Except as otherwise stated in the Agreement:

- (a) the Contractor accepts complete responsibility for having foreseen all difficulties and costs of successfully completing the Works;
- (b) the Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs; and
- (c) the Scheduled Completion Date shall not be adjusted to take account of any unforeseen difficulties or costs.

4.9 Co-ordination of the Works

- (i) The Contractor acknowledges that in addition to the Agreement, it is also aware of terms of the other Project contracts and other agreements the Authority has negotiated and entered into for performance of its obligations under the Agreement (copies of other contracts and other agreements are made available to the Contractor from time to time) and that the Contractor is fully aware of the consequences to the Authority which would or are likely to result from a breach by the Contractor of its obligations under the Agreement. In the event the actions of the Contractor result in the breach by the Authority of any or all of the other Project contracts and such breach imposes any liability on the Authority, the Contractor shall: (a) undertake all steps as may be possible

to mitigate or neutralize the liability that has arisen, and (b) indemnify the Authority against any such liability and compensate the Authority to that extent.

- (ii) The Contractor shall be responsible for the co-ordination and proper provision of the Works, including co-ordination of other Contractors or Sub-contractors for the Project. The Contractor shall co-operate with the Authority in the co-ordination of the Works with the works under the other Project contracts. The Contractor shall provide all reasonable support for carrying out their work to:
 - (a) any other contractors employed by the Authority;
 - (b) the workmen of the Authority;
 - (c) the workmen of any Governmental Instrumentality who may be employed in the execution of work on or near the Site; and
 - (d) such other persons as is required in the opinion of the Authority for successful completion of the Project.

4.10 Environmental Measures

- (i) The Contractor agrees to conduct its activities in connection with the Agreement in such a manner so as to comply with the environmental requirements which includes, *inter alia*, all the conditions required to be satisfied under the environmental clearances and applicable law, and assumes full responsibility for measures which are required to be taken to ensure such compliance.

4.11 Site Data

- (i) The Contractor shall be deemed to have inspected and examined the Site and its surroundings and to have satisfied himself before entering into the Agreement in all material respects including but not limited to:
 - (a) the form and nature of the Site (including, inter-alia, the surface and sub- surface conditions and geo-technical factors);
 - (b) the hydrological and climatic conditions;
 - (c) the extent and nature of the works already completed and Materials necessary for the execution and completion of the Works and the remedying of any defects that includes already executed part also.
 - (d) the suitability and the adequacy of the Site for the execution of the Works;
 - (e) the means of access to the Site and the accommodation the Contractor may require;
 - (f) arranging permits as required as per [.] of the Agreement.
 - (g) the requirements of operation and maintenance; and
 - (h) all other factors and circumstances affecting the Contractor's rights and obligations under the Agreement, the Contract Price and Time for Completion.

4.12 Sufficiency of Contract Price

The Contractor shall have satisfied itself as to the correctness and sufficiency of the Contract Price. The Contract Price shall cover all its obligations under the Agreement, in addition to all risks the Contractor has agreed to undertake under the Agreement, including those associated with the performance of its obligations under the Agreement and all things necessary for the provision of the Works in a manner satisfactory to the Authority and in accordance with this Agreement.

4.13 Clearance of the Site

During the provision of the Works, and as a pre-condition to the issue of the Taking-Over Certificate, the Contractor shall clear away and remove from the Site, all Contractor's equipment, surplus material, wreckage, rubbish and temporary Works, and shall keep the Site free from all unnecessary obstructions, and shall not store or dispose of any Contractor's equipment or surplus materials on the Site. The Contractor shall promptly clear away and remove from the Site any wreckage, rubbish or temporary Works no longer required and leave the Site and the Works in a clean and safe condition to the sole satisfaction of the Authority.

Article 5

Representations and Warranties

5.1 Representations and warranties of the Contractor

- (i) The Contractor 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/or other actions under Applicable Laws to authorize the execution and delivery of this Agreement and to validly exercise its rights and perform its obligations under this Agreement;
 - (c) 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 against it in accordance with the terms hereof;
 - (d) 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 thereunder including any obligation, liability or responsibility hereunder;
 - (e) the information furnished in the Bid, Request for Qualification and Request for Proposals or otherwise 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;
 - (f) the execution, delivery and performance of this Agreement will not conflict with, or result in the breach of, or constitute a default under, or accelerate performance required by any of the terms of its memorandum and articles of association 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;
 - (g) 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;
 - (h) it has no knowledge of any violation or default with respect to any order, writ, injunction or decree of any court or any legally binding order of any 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;

- (i) 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;
 - (j) 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;
 - (k) 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 contract or entering into this Agreement or for influencing or attempting to influence any officer or employee of the Authority in connection therewith;
 - (l) nothing contained in this Agreement shall create any contractual relationship or obligation between the Authority and any Sub- contractors, designers, consultants or agents of the Contractor;
 - (m) it is adequately financed has the requisite knowledge, expertise, technical knowhow, experience, resources, infrastructure, licenses, patents, copy rights, for designing, supplying/ procuring the goods and materials, and for providing the installation and construction services required for completing the construction of the Project Facilities; and
- (ii) it represents the Authority that:
- (a) it owns or has the right to use all **“Intellectual Property”** necessary to perform the contractual obligations and to carry on the Works without conflict with the right of others;
 - (b) All intellectual property rights necessary to perform the contractual obligations and to carry on the Works are in full force and effect and are vested in, and beneficially owned by the Contractor, and are free from encumbrances.
 - (c) None of the intellectual property rights is being used, claimed, or posed or attacked by any other person, nor does the use of such intellectual property rights or any part of them infringe the intellectual property rights owned or enjoyed by any third party.
 - (d) None of the intellectual property rights owned or used by the Contractor is the subject of any claim, opposition, attack, assertion or other arrangement of whatsoever nature which does or may impinge upon their use, validity, enforceability or ownership by the Parties, and there are no grounds or other circumstances which may give rise to the same.
 - (e) No licenses or registered user or other rights have been granted or agreed to be granted to any third party in respect of such intellectual property rights.
 - (f) No act has been done or has been omitted to be done to entitle any authority or person to cancel, forfeit or modify any intellectual property rights.

- (g) The Contractor shall notify the Authority of any adverse use of the intellectual property rights or confusingly or deceptively similar to the intellectual property rights.
- (h) The Contractor shall recognize the Authority's ownership and title to the intellectual property rights and shall not at any time, either directly or indirectly, put to issue the validity or ownership of the intellectual property rights and it will not do any act or thing, either directly or indirectly, which in anyway impairs the validity and ownership of the intellectual property rights.
- (i) The Contractor shall, promptly execute, acknowledge and deliver all documents which are requested by Authority to record with appropriate governmental agencies and authorities the fact that the Authority has the right to the use of the said intellectual property rights.
- (j) The Contractor shall not, for any reason, object to, or interfere in any way with the ownership, registration or use of the intellectual property rights by the Authority (or its licensee or assigns) for any purpose whatsoever.
- (iii) The Contractor is fully aware that the Agreement is inter linked with the other Project contracts and the non-performance or deficient performance or default by the Contractor and/or any of the Contractor's personnel or Subcontractors under one among the said contracts will have bearing on the other contracts and the evaluation of the Contractor's performance under the Agreement and the Project itself.
- (iv) If at any time during the Defects Liability Period any item of the Works or Project Facilities or any part thereof, do not conform to the Authority requirements and Specifications and Standards, on being so notified by the Authority, the Contractor shall promptly rectify/remedy such nonconformity to the satisfaction of the Authority solely at the Contractor's expense; failing which the Authority may reject or revoke Taking-Over Certificate, and the Authority may proceed to correct the Contractor's nonconforming Work by the most expeditious means available, the costs of which shall be to the Contractor's account; or the Authority may retain the non-conforming Work and an equitable adjustment reducing the total Contract Price to reflect the diminished value of such non-conforming Work will be made by written amendment.
- (v) In addition to the other warranties, the Contractor represents and warrants as follows:
 - (a) The Contractor has (or, if the technology does not currently exist, will have granted at the time of passing to The Employer) in and to the technology used in the equipment, materials, goods, Works, Contractor's documents, Drawings and Manuals ("**Technology**") -
 - i. all right, title and interest free of any lien, claim or restriction; and
 - ii. right to grant to the Authority the right to use the Technology for the purpose of this contract, free of any lien, claim or restriction and on the terms of license as required.
 - (b) The Contractor has granted (or, if the technology does not currently exist, will grant at the time of passing to the Authority the property and title in and to the

equipment, materials, goods, Works, spares, Contractor's documents, Drawings and Manuals in which it is used) to the Authority the right to use the Technology, free of any lien, claim or restriction.

- (vi) In addition to the other Warranties, the Contractor represents and warrants as follows:
- (a) No Technology contains any worm (i.e., a program that travels from one computer to another computer but does not attach itself to the operating system of the computer it enters), virus (i.e., a program that travels from one computer to another computer that attaches itself to the operating system it enters) or self-destruct capability.
 - (b) The Technology will not abnormally end or provide invalid or incorrect results as a result of date-dependent data.
 - (c) The Technology can accurately recognize, manage, accommodate, and manipulate date-dependent data, including single and multi-century formulas and leap years.
- (vii) No criminal proceedings instituted against any of the employees or Directors of the Contractor.
- (viii) Till date the services of the Contractor has not been terminated by any person for any breach or non-performance or negligence by the Contractor.

5.2 Representations and warranties of the Authority

The Authority represents and warrants to the Contractor 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 the Applicable Laws to authorise 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 good and valid right to the Site and has the power and authority to grant the Right of Way in respect thereof to the Contractor; and

- (h) it has procured Right of Way and environment clearances such that the Contractor can commence construction forthwith on 90% (ninety per cent) of the total length of the Project Highway.

5.3 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 obligation of either Party under this Agreement.

Article 6

Disclaimer

6.1 Disclaimer

- (i) The Contractor acknowledges that prior to the execution of this Agreement, the Contractor has, after a complete and careful examination, made an independent evaluation of the Request for Proposal, Scope of the Project, Specifications and Standards of design, construction and maintenance, Site, local conditions, physical qualities of ground, subsoil and geology, traffic volumes, suitability and availability of access routes to the Site 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. Save as provided in Clause 3.1 and Clause 5.2, 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 Contractor confirms that it shall have no claim whatsoever against the Authority in this regard.
- (ii) The Contractor acknowledges and hereby accepts to have satisfied itself as to the correctness and sufficiency of the Contract Price.
- (iii) The Contractor acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth in Clause 6.1 (i) above and hereby acknowledges and agrees that the Authority shall not be liable for the same in any manner whatsoever to the Contractor, or any person claiming through or under any of them, and shall not lead to any adjustment of Contract Price or Scheduled Completion Date.
- (iv) The Parties agree that any mistake or error in or relating to any of the matters set forth in Clause 6.1 (i) above shall not vitiate this Agreement, or render it voidable.
- (v) In the event that either Party becomes aware of any mistake or error relating to any of the matters set forth in Clause 6.1 (i) above, that Party shall immediately notify the other Party, specifying the mistake or error.
- (vi) Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Contractor; and the Authority shall not be liable in any manner for such risks or the consequences thereof.

Part III

Construction and Maintenance

Article 7

Performance Security

7.1 Performance Security

- (i) (A) Within 30 (thirty) days of receipt of Letter of Acceptance, the selected Bidder shall furnish to the Authority an irrevocable and unconditional guarantee from a Bank in the form set forth in Annex-I of Schedule-G (the “**Performance Security**”) for an amount equal to 5% (five percent) of its Bid Price. In case of bids mentioned below, the Selected Bidder, along with the Performance Security, shall also furnish to the Authority an irrevocable and unconditional guarantee from a Bank in the same form given at Annex-I of Schedule-G towards an Additional Performance Security (the “**Additional Performance Security**”) for an amount calculated as under:
- (a) If the Bid Price offered by the Selected Bidder is lower than 10% but upto 20% of the estimated Project Cost, then the Additional Performance Security shall be calculated @20% of the difference in the (i) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (ii) the Bid Price offered by the selected Bidder.
 - (b) If the Bid Price offered by the Selected Bidder is lower than 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @ 30% of the difference in the (i) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (ii) the Bid Price offered by the Selected Bidder.
 - (c) This Additional Performance Security shall be treated as part of the Performance Security.
- (B) The Performance Security shall be valid until 60(sixty) days after the Defects Liability Period. The Additional Performance Security shall be valid until 28 (twenty eight) days after Project Completion Date.
- (ii) The Selected Bidder has the option to provide 50% of the Performance Security and 50% of the Additional Performance Security, if any, within 30 (thirty) days of receipt of Letter of Acceptance, in any case before signing of the Contract Agreement and the remaining Performance Security and Additional Performance Security, if any, shall be submitted within 30 days of signing of this agreement.
- (iii) In the event the Selected Bidder fails to provide the remaining Performance Security and Additional Performance Security, if any, as prescribed herein, it may seek extension of time for a further period upto 60 days by paying the Damages upfront along with the request letter seeking the extension. The Damages shall be the sum calculated at the rate of 0.01% (zero point zero one per cent) of the Bid Price offered by the Selected Bidder for each day until the Performance Security and Additional Performance Security, if any, is provided in full as prescribed herein. The damages at full rate as given above shall be applicable even if a part of the Performance Security and the Additional Performance Security is provided.

- (iv) For avoidance of any doubt, in case of failure of submission of Performance Security and Additional Performance Security, if any, within the additional 60 days' time period, the award shall be deemed to be cancelled/ withdrawn and the Bid Security shall be encashed and the proceeds thereof appropriated by the Authority. Thereupon all rights, privileges, claims and entitlements of the Contractor under or arising out of the Award shall be deemed to have been waived by, and to have ceased with the concurrence of the Contractor, and the Award shall be deemed to have been withdrawn by the Authority.

7.2 Extension of Performance Security and Additional Performance Security

The Contractor may initially provide the Performance Security for a period of 2 (two) years; provided that it shall procure the extension of the validity of the Performance Security, as necessary, at least 2 (two) months prior to the date of expiry thereof. Upon the Contractor providing an extended Performance Security, the previous Performance Security shall be deemed to be released and the Authority shall return the same to the Contractor within a period of 7 (seven) business days from the date of submission of the extended Performance Security.

7.3 Appropriation of Performance Security

- (i) Upon occurrence of a Contractor's Default, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate the relevant amounts from the Performance Security as Damages for such Contractor's Default.
- (ii) Upon such encashment and appropriation from the Performance Security, the Contractor shall, within 30 (thirty) days thereof, replenish, in case of partial appropriation, to its original level the Performance Security, and in case of appropriation of the entire Performance Security provide a fresh Performance Security, as the case may be, and the Contractor shall, within the time so granted, replenish or furnish fresh Performance Security as aforesaid failing which the Authority shall be entitled to terminate the Agreement in accordance with Article 23. Upon replenishment or furnishing of a fresh Performance Security, as the case may be, as aforesaid, the Contractor shall be entitled to an additional Cure Period of 30 (thirty) days for remedying the Contractor's Default, and in the event of the Contractor 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 23.

7.4 Release of Performance Security

- (i) The Authority shall return the Performance Security to the Contractor within 60 (sixty) days of the expiry of the Maintenance Period or the Defects Liability Period, whichever is later, under this Agreement. Notwithstanding the aforesaid, the Parties agree that the Authority shall not be obliged to release the Performance Security until all Defects identified during the Defects Liability Period have been rectified.

- (ii) The Authority shall return the Additional Performance Security to the Contractor within 28 (twenty eight) days from the date of issue of Completion Certificate under Article 12 of this Agreement.
- (iii) The Authority shall be liable to pay interest @ 9% (nine per cent) per annum for any delay in the return of Performance Security and Additional Performance Security, if any, beyond the period prescribed above for the period of delay.

7.5 Retention Money

- (i) From every payment for Works due to the Contractor in accordance with the provisions of Clause 19.5, the Authority shall deduct 6% (six per cent) thereof as guarantee money for performance of the obligations of the Contractor during the Construction Period (the “**Retention Money**”) subject to the condition that the maximum amount of Retention Money shall not exceed 5% (five per cent) of the Contract Price.
- (ii) Upon occurrence of a Contractor’s Default, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to appropriate the relevant amounts from the Retention Money as Damages for such Contractor’s Default.
- (iii) Within 15 (fifteen) days of the date of issue of the Completion Certificate, the Authority shall refund the balance of Retention Money remaining with the Authority after adjusting the amounts appropriated under the provisions of Clause 7.5 (ii).
- (iv) The Parties agree that in the event of Termination of this Agreement, the Retention Money specified in this Clause 7.5 shall be treated as if they are Performance Security and shall be reckoned as such for the purposes of Termination Payment under Clause 23.6.

Article 8

Right of Way

8.1 The Site

The site of the Project Highway (the “**Site**”) shall comprise the site described in Schedule-A in respect of which the Right of Way shall be provided by the Authority to the Contractor. The Authority shall be responsible for:

- (a) acquiring and providing Right of Way on the Site in accordance with the alignment finalized by the Authority, free from all encroachments and encumbrances, and free access thereto for the execution of this Agreement; and
- (b) obtaining licenses and permits for environment clearance for the Project Highway.

8.2 Procurement of the Site

- (i) The Authority Representative, the Contractor and Authority’s Engineer shall, within 10 (ten) days of the date of this Agreement, inspect the Site and prepare a detailed 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 (hereinafter referred to as the “**Handover Memorandum**”). Subject to the provisions of Clause 8.2 (iii), the Handover 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 given to the Contractor along with details of hindrances in the Construction Zone. For sake of clarity the Handover Memorandum shall clearly specify the parts of Site where work can be executed. Signing of the Handover Memorandum, in three counterparts (each of which shall constitute an original), by the authorized representatives of the Authority, Contractor and Authority’s Engineer shall be deemed to constitute a valid evidence of giving the Right of Way to the Contractor for discharging its obligations under and in accordance with the provisions of this Agreement and for no other purpose whatsoever.
- (ii) Whenever the Authority is ready to hand over any part or parts of the Site included in the Appendix, it shall inform the Contractor, by notice, of the proposed date and time such of hand over. The Authority Representative and the Contractor shall, on the date so notified, inspect the specified parts of the Site, and prepare a memorandum containing an inventory of the vacant and unencumbered land, buildings, structures, road works, trees and any other immovable property on or attached to the Site so handed over. The signing of the memorandum, in three (3) counterparts (each of which shall constitute an original), by the authorized representatives of the Parties shall be deemed to constitute a valid evidence of giving the relevant Right of Way to the Contractor.
If the contractor fails to join for site inspection or disputes the parts of the site available for work, the Authority’s Engineer shall decide the parts of the site where work can be executed and notify to both the parties within 3 days of the proposed date of inspection.

The parties agree that such notification of the Authority's Engineer as mentioned hereinabove shall be final and binding on the parties.

- (iii) The Authority shall provide the Right of Way to the Contractor in respect of all land included in the Appendix by the date specified in Schedule-A for those parts of the Site referred to therein, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Contractor, it shall pay to the Contractor, Damages in a sum calculated in accordance with Clause 8.3. The Contractor agrees that it shall not be entitled to claim any other damages on account of any such delay by the Authority.
- (iv) Notwithstanding anything to the contrary contained in this Clause 8.2, the Authority shall specify the parts of the Site, if any, for which Right of Way shall be provided to the Contractor on the dates specified in Schedule-A. Such parts shall also be included in the Appendix prepared in pursuance of Clause 8.2 (i).
- (v) 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 the land comprising the Project in the Authority and has taken possession of area for Construction Zone for at least 90% (ninety per cent) of the total length of the Project Highway. The Parties also acknowledge and agree that the conditions specified in this Clause 8.2 (iii) shall not be modified or waived by either Party.
- (vi) For the avoidance of doubt, the Parties expressly agree that the Appendix shall in no event contain sections of the Project Highway the cumulative length of which exceeds 10% (ten percent) of the total length of the Project Highway.
- (vii) Pursuant to signing of Handover Memorandum under clause 8.2 (i), Contractor shall submit to the Authority's Engineer, a monthly land possession report till expiry of 180 (one hundred and eighty) days from Appointed Date, in respect of those parts of the site to which vacant access and right of way was not given to the contractor and included in Appendix to the memorandum signed under clause 8.2 (i), duly specifying the part of the site, if any, for which the right of way is yet to be handed over.

8.3 Damages for delay in handing over the Site

- (i) In the event the Right of Way to any part of the Site is not provided by the Authority on or before the date(s) specified in Clause 8.2 for any reason other than Force Majeure or breach of this Agreement by the Contractor, the Authority shall pay Damages to the Contractor a sum calculated in accordance with the following formula for and in respect of those parts of the Site to which the Right of Way has not been provided:

Amount of Damages in Rs. per day per metre = $0.05 \times C \times 1/L \times 1/N$

Where,

C = the Contract Price;

L = length of the Project Highway in metres; and

N = Completion period in days (Appointed Date to Scheduled Completion Date)

In the event that any Damages are due and payable to the Contractor under the provisions of this Clause 8.3 (i) for delay in providing the Right of Way, the Contractor shall, subject to the provisions of Clause 10.5, be entitled to Time Extension equal to the period for which the Damages have become due and payable under this Clause 8.3 (i), save and except that:

- (a) if any delays involve time overlaps, the overlaps shall not be additive; and
- (b) such Time Extension shall be restricted only to the Works which are affected by the delay in providing the Right of Way.

For the avoidance of doubt, the Parties expressly agree that the Damages specified hereunder and the Time Extension specified in Clause 10.5 shall be restricted only to failure of the Authority to provide the Right of Way for and in respect of the "Construction Zone" which shall comprise the following components:

- Main in carriageway
 - Median (for 4 lane carriageway or more)
 - Paved and earthen shoulders
 - Area for Structures including ROB/RUBs.
 - Safety measures including Roadside Drains and Furniture.
 - A parallel working space for accommodating slopes/retaining structures etc.
- (ii) Notwithstanding anything to the contrary contained in this Agreement, the Contractor expressly agrees that Works on all parts of the Site for which Right of Way of Construction Zone is granted on the Appointed Date, or with respect to the parts of the Site provided in Schedule-A, no later than the date(s) specified therein, as the case may be, shall be completed before the Scheduled Completion Date and shall not qualify for any Time Extension under the provisions of Clause 8.3 (iii).
- (iii) (a) Notwithstanding anything to the contrary contained in this Agreement, unless covered under the deemed de-scoping in terms of sub-clause 8.3 (iii) (b), the Authority may at any time withdraw any Works forming part of this Agreement, subject to such Works not exceeding an aggregate value, such value to be determined in accordance with Schedule-H, equal to 10 (ten) percent of the Contract Price.
- (b) Provided that if any Works cannot be undertaken within the municipal limits of a town or within any area falling in a reserved forest or wildlife sanctuary or the stretches where vacant access and Right of Way could not be handed over, as the case may be, because the requisite clearances or approvals or affected land parcels for commencing construction of Works therein have not been given within 180 (one hundred and eighty) days of the Appointed date, the affected Works shall be deemed to be withdrawn under the provisions of this Clause 8.3.3. Such Works shall not be computed for the purposes of the aforesaid ceiling of 10% (ten per cent) hereunder.

- (c) Provided further that in case such stretches (as mentioned in Sub-Clause (b) above) can be handed over to the Contractor before the expiry of the original Scheduled Construction Period of the Project Highway, and the Contractor agrees to take up the work, the same may be allowed to be executed by him with corresponding Extension of Time, subject to the condition that the Contractor shall not be entitled to raise any claims on account of prolongation costs in this behalf.
- (iv) In the event of withdrawal of Works under Clause 8.3 (iii) (a), the Contract Price shall be reduced by an amount equal to 90 (ninety) per cent of the value of the Works withdrawn and the Contractor shall not be entitled to any other compensation or Damages for the withdrawal of Works.

Provided that if any Works are withdrawn after commencement of the Construction of such works, the Authority shall pay to the Contractor 110% (one hundred and ten per cent) of the fair value of the work done, as assessed by the Authority' Engineer.

The parties expressly agree that the value of the Works withdrawn shall be determined from the details available in Schedule-H. In the event that it is impossible to determine the value from Schedule-H, then the value shall be determined in accordance with the provisions of Clause 13.2 (iii).

8.4 Site to be free from Encumbrances

Subject to the provisions of Clause 8.2, the Site shall be made available by the Authority to the Contractor pursuant hereto free from all Encumbrances and occupations and without the Contractor being required to make any payment to the Authority because of any costs, compensation, expenses and charges for the acquisition and use of such Site for the duration of the Project Completion Schedule. For the avoidance of doubt, it is agreed that the existing rights of way, easements, privileges, liberties and appurtenances to the Site shall not be deemed to be Encumbrances. It is further agreed that, unless otherwise specified in this Agreement, the Contractor accepts and undertakes to bear any and all risks arising out of the inadequacy or physical condition of the Site.

8.5 Protection of Site from encroachments

On and after signing the memorandum and/or subsequent memorandum referred to in Clause 8.2, and until the issue of the Completion Certificate, the Contractor shall maintain a round-the-clock vigil over the Site and shall ensure and procure that no encroachment takes place thereon. During the Construction Period, the Contractor shall protect the Site from any and all occupations, encroachments or Encumbrances, and shall not place or create nor permit any Sub-contractor or other person claiming through or under the Agreement to place or create any Encumbrance or security threat over all or any part of the Site or the Project Assets, or on any rights of the Contractor therein or under this Agreement, save and except as otherwise expressly set forth in this Agreement. In the event of any encroachment or occupation on any part of the Site, the Contractor shall report such encroachment or occupation forthwith to the Authority and undertake its removal at its own cost and expenses.

8.6 Special/ temporary Right of Way

The Contractor 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 Contractor shall obtain at its cost such facilities on or outside the Site as may be required by it for the purposes of the Project Highway and the performance of its obligations under this Agreement.

8.7 Access to the Authority and the Authority's Engineer

- (i) The Right of Way given to the Contractor hereunder shall always be subject to the right of access of the Authority and the Authority's Engineer and their employees and agents for inspection, viewing and exercise of their rights and performance of their obligations under this Agreement.
- (ii) The Contractor shall ensure, subject to all relevant safety procedures, that the Authority has un-restricted access to the Site during any emergency situation, as decided by the Authority's Engineer.

8.8 Geological and archaeological finds

It is expressly agreed that mining, geological or archaeological rights do not form part of this Agreement with the Contractor for the Works, and the Contractor 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 Contractor 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 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 Contractor 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.

Article 9 Utilities and Trees

9.1 Existing utilities and roads

Notwithstanding anything to the contrary contained herein, it shall be the responsibility of the Contractor to ensure that the respective entities owning the existing roads, right of way, level crossings, structures, or utilities on, under or above the Site are enabled by it to keep them in continuous satisfactory use, if necessary, by providing suitable temporary diversions with the authority of the controlling body of that road, right of way or utility.

9.2 Shifting of obstructing utilities

The Contractor shall, in accordance with Applicable Laws and with assistance of the Authority, undertake the work of shifting of any utility (including electric lines, water pipes, gas pipelines 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. The cost of such shifting, as per estimates prepared by the entity owning the utility and approved by the Authority, shall be reimbursed by the Authority to the Contractor. The scope of work of such shifting of Utilities shall be as indicated in Schedule-B-1. In the event of any delay of such shifting on the part of the contractor, no extension of time for completion of the project and no claims, in any manner, shall be admissible on this account against the Authority.

The work of shifting of Utilities can be taken up by the Contractor any time after signing of the Agreement.

9.3 New utilities

- (i) The Contractor shall allow, subject to the permission from the Authority and such conditions as the Authority may specify, access to, and use of the Site for laying telephone lines, water pipes, electricity lines/ cables or other public utilities. Where such access or use causes any financial loss to the Contractor, 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 9.3 shall not in any manner relieve the Contractor of its obligation to construct and maintain the Project Highway in accordance with this Agreement and any damage caused by such use shall be restored forthwith at the cost of the Authority.
- (ii) The Authority may, by notice, require the Contractor to connect any adjoining road to the Project Highway, and the connecting portion thereof falling within the Site shall be constructed by the Contractor at the Authority's cost in accordance with Article 10.
- (iii) The Authority may by notice require the Contractor to connect, through a paved road, any adjoining service station, hotel, motel or any other public facility or amenity to the Project Highway, whereupon the connecting portion thereof that falls within the Site shall be constructed by the Contractor on payment of the cost. The cost to be paid by the Authority to the Contractor shall be determined by the Authority's Engineer. For the

avoidance of doubt, in the event such road is to be constructed for the benefit of any entity, the Authority may require such entity to make an advance deposit with the Contractor or the Authority, as the case may be, of an amount equal to the estimated cost as determined by the Authority's Engineer and such advance shall be adjusted against the cost of construction as determined by the Authority's Engineer hereunder.

- (iv) In the event construction of any Works is affected by a new utility or works undertaken in accordance with this Clause 9.3, the Contractor shall be entitled to a reasonable Time Extension as determined by the Authority's Engineer.

9.4 Felling of trees

The Authority shall assist the Contractor in obtaining the Applicable Permits for felling of trees in non-forest area to be identified by the Authority for this purpose if, and only if, such trees cause a Material Adverse Effect on the construction or maintenance of the Project Highway. The Contractor shall fell these trees as per the Permits obtained. 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 Contractor; 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. 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. For the avoidance of doubt, the Parties agree that if any felling of trees hereunder is in a forest area, the Applicable Permit thereof shall be procured by the Authority within the time specified in the Agreement.

9.5 Dismantling of structures

The Contractor shall at its own cost dismantle the structures in the acquired lands including those on patta lands, abadi lands, assigned lands, etc. the compensation for which, was paid by the Authority to the land owners and the lands were handed over to the Contractor as per Schedule B-1. The Contractor shall, at its own cost, dispose of the dismantled material in its sole discretion as deemed appropriate, while complying with all environmental guidelines and regulations and clear the Site for undertaking construction. In the event of any delay in dismantling of structures thereof for reasons beyond the control of the Contractor, the Contractor shall be entitled to Damages in a sum calculated in accordance with the formula specified in Clause 8.3 (i) for the period of delay, and to the Time Extension in accordance with Clause 10.5 for and in respect of the part(s) of the Works affected by such delay; provided that if the delays involve any time overlaps, the overlaps shall not be additive.

9.6 Development Period

The Contractor may commence pre-construction activities like utility shifting, boundary wall construction or any other activity assigned to the Contractor by the Authority to enable construction of the Project Highway immediately after signing of the Agreement, to the extent that such work is ready for execution. The Parties agree that these works may be taken up and completed to the extent feasible by the Contractor, before declaration of the Appointed Date, but no claim against the Authority for delay shall

survive during this period and that the undertaking of these works by the Contractor shall not count towards the Scheduled Construction Period of the project which starts counting only from the Appointed Date. No construction activity of the Project Highway shall be undertaken during the development period.

Article 10

Design and Construction of the Project Highway

10.1 Obligations prior to commencement of Works

- (i) Within 20 (twenty) days of the Appointed Date, the Contractor shall:
 - (a) 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;
 - (b) appoint a design director (the “**Design Director**”) who will head the Contractor’s design unit and shall be responsible for surveys, investigations, collection of data, and preparation of preliminary and detailed designs;
 - (c) undertake and perform all such acts, deeds and things as may be necessary or required before commencement of Works under and in accordance with this Agreement, the Applicable Laws and Applicable Permits; and
 - (d) make its own arrangements for quarrying of materials needed for the Project Highway under and in accordance with the Applicable Laws and Applicable Permits.
- (ii) The Authority shall, appoint an engineer (the “**Authority’s Engineer**”) before the Appointed Date to discharge the functions and duties specified in this Agreement, and shall notify to the Contractor the name, address and the date of appointment of the Authority’s Engineer forthwith.
- (iii) **Work Programme:**
 - (A) Within 30 (thirty) days of the Appointed Date, the Contractor shall submit to the Authority and the Authority’s Engineer a work programme (the “**Programme**”) for organising and carrying out whole of the Works, developed using computerized Critical Path Method (CPM) networking techniques, using the Precedence Diagramming Method (PDM) and shall be present in bar chart and time-scaled network diagram format to a weekly or monthly time scale for review and consent of the Engineer, giving the following details :
 - (a) **Part I:** Contractor’s organisation for the Project, the general methods and arrangements for design and construction, environmental management plan, Quality Assurance Plan including design quality plan, traffic management and safety plan covering safety of users and workers during construction (including use of ‘ROBOTS’ for diversion and control of traffic), Contractor’s key personnel and equipment.
 - (b) **Part II:** Programme for completion of all stages of construction given in Schedule-H and Project Milestones of the Works as specified in Project

Completion Schedule set forth in Schedule-J. The Programme shall include:

- (i) Project Milestone Dates,
- (ii) the order in which the Contractor intends to carry out all physical work to be undertaken in the performance of the Contract obligations, including the anticipated timing of design and stages of Works,
- (iii) procurement of major materials and the delivery and/or partial delivery date on-Site of principal items of Contractor's Equipment/Machinery,
- (iv) any off-site work such as production or pre-fabrication of components,
- (v) installation of temporary construction facilities,
- (vi) construction activities of sub-contractors,
- (vii) the periods for reviews under Clause 10.2
- (viii) the sequence and timing of inspections and tests specified in this Agreement
- (ix) the particulars for the pre-construction reviews and for any other submissions, approvals and consents specified in the Agreement.
- (x) any outside influence which will or may affect the Works.

(c) **Part III :** Monthly cash flow forecast.

(B) The Works Programme shall show achievement of all Milestone Dates and shall be organised in a logical work-breakdown-structure including work stages and phases, and shall clearly indicate the critical path(s).

(C) Each activity in the Works Programme shall be coded to indicate :

- (a) Activity ID and Activity Code.
- (b) The Authority's Engineer may request additional activity coding to the extent available without restraint to the Contractor's utilisation of the programme software. When requested the Contractor shall add the required additional coding to the Programme. The Contractor shall use additional code fields as requested to comply with the requirements and for the use of the Contractor.
- (c) Activity duration shall not exceed two (2) weeks, unless otherwise consented to by the Engineer, except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment and concrete curing. The Contractor shall submit a Programme/Project Calendar cross reference clearly indicating the allowance for holidays.

(D) Baseline Physical Progress 'S' Curve

The Contractor shall also submit a forecast Cumulative Physical Progress 'S' curve based on the time-phased distribution of cost in the CPM Network Logic Diagram, expressed in

percentage terms. This 'S' curve shall be generated from the computerised CPM Network Logic Diagram.

(E) Baseline Resource Charts

The Contractor shall also submit a Resource Charts, generated from the Contractor's CPM Network Diagram, showing the anticipated manpower and main Construction Equipment usage during the execution of the Project.

(F) Works Programme Revisions

- (a) The Contractor shall immediately notify the Authority's Engineer in writing of the need for any changes in the Works Programme, whether due to a change of intention or of circumstances or for any other reason. Where such proposed change affects timely completion of the Works or any Project Milestone Date. The proposed revised Works Programme shall show the sequence of operations of any and all works related to the change and the impact of changed work or changed conditions.
- (b) If at any time the Authority's Engineer considers the actual or anticipated progress of the work reflects a significant deviation from the Works Programme, he may request the Contractor to submit a proposed revised Programme. The proposed revised Works Programme shall show the sequence of operations of any and all work related to the change and the impact of changed work or changed conditions.

(G) Three Month Rolling Programme

- (1) The Three Month Rolling Programme shall be an expansion of the approved Works Programme, covering sequential periods of three months. The Three Month Rolling Programme shall provide more detail of the Contractor's plan, organisation and execution of the work within these periods. In particular, the Contractor shall expand each activity planned to occur during the next three(3) month period, if necessary to a daily level of detail.
- (2) The Three Month Rolling Programme shall be developed as a Critical Path Method (CPM) network, and shall be presented in bar chart and time-scaled network diagram format. Bar charts shall be presented on an A4 and time-scaled networks diagrams on an A1 size reproducible media. Tasks in the programme shall be derivatives of and directly related to tasks in the approved Works Programme.

(H) Programming Personnel and Software

The Contractor shall submit, as part of its Staff Organisation Plan, the names and required information for the staff to be employed on Works Programming. The principal Works Programmer shall hold reputable professional qualifications acceptable to the Authority's Engineer including at least five (5) years relevant experience in programming civil engineering works. Others in the group shall have at least three (3) years experience in such work. The programmers shall be employed by the Contractor full time on the Contract until the completion or such earlier time the Engineer may give his consent. Also the Contractor shall provide licenced copy of software used to develop Works Programme to the Authority and Authority's Engineer.

- (iv) The Contractor shall compute, on the basis of the Drawings prepared in accordance with Clause 10.2 (iv), and provide to the Authority's Engineer, the length, area and numbers, as the case may be, in respect of the various items of work specified in Schedule-H and comprising the Scope of the Project. The Parties expressly agree that these details shall form the basis for estimating the interim payments for the Works in accordance with the provisions of Clause 19.3. For the avoidance of doubt, the sum of payments to be computed in respect of all the items of work shall not exceed the Contract Price, as may be adjusted in accordance with the provisions of this Agreement.
- (v) The Contractor shall appoint a safety consultant (the "**Safety Consultant**") to carry out a safety audit at the design stage of the Project Highway in accordance with the Applicable Laws and Good Industry Practice. The Safety Consultant shall be appointed after proposing to the Authority a panel of three (3) names of qualified and experienced firms from which the Authority may choose one (1) to be the Safety Consultant. Provided, however, that if the panel is not acceptable to the Authority and the reasons for the same are furnished to the Contractor, the Contractor shall propose to the Authority a revised panel of three (3) names from the firms empanelled as safety consultants by the [Ministry of Road Transport and Highways] for obtaining the consent of the Authority. The Contractor shall also obtain the consent of the Authority for the key personnel of the Safety Consultant who shall have adequate experience and qualifications in safety audit of the highway projects. The Authority shall, within 15 (fifteen) days of receiving a proposal from the Contractor hereunder, convey its decision, with reasons, to the Contractor, and if no such decision is conveyed within the said period, the Contractor may proceed with engaging of the Safety Consultant.
- (vi) The safety audit pursuant to Clause 10.1 (v) shall be carried out by the Safety Consultant in respect of all such design details that have a bearing on safety of Users as well as pedestrians and animals involved in or associated with accidents. The recommendations of the Safety Consultant shall be incorporated in the design of the Project Highway and the Contractor shall forward to the Authority's Engineer a certificate to this effect together with the recommendations of the Safety Consultant. In the event that any works required by the Safety Consultant shall fall beyond the scope of Schedule-B, Schedule-C or Schedule-D, the Contractor shall make a report thereon and seek the instructions of the Authority for Change in Scope. For the avoidance of doubt, the Safety Consultant to be engaged by the Contractor shall be independent of the design and implementation team of the Contractor.

10.2 Design and Drawings

- (i) Design and Drawings shall be developed in conformity with the Specifications and Standards set forth in Schedule-D. In the event, the Contractor requires any relaxation in design standards due to restricted Right of Way in any section, the alternative design criteria for such section shall be provided for review and approval of the Authority's Engineer.
- (ii) The Contractor shall appoint a proof check consultant (the "**Proof Consultant**") after proposing to the Authority a panel of three (3) names of qualified and experienced

firms from whom the Authority may choose one (1) to be the Proof Consultant. Provided, however, that if the panel is not acceptable to the Authority and the reasons for the same are furnished to the Contractor, the Contractor shall propose to the Authority a revised panel of three (3) names from the firms empanelled as proof consultants by the [Ministry of Road Transport and Highways] for obtaining the consent of the Authority. The Contractor shall also obtain the consent of the Authority for two (2) key personnel of the Proof Consultant who shall have adequate experience and qualifications in highways and bridges respectively. The Authority shall, within 15 (fifteen) days of receiving a proposal from the Contractor hereunder, convey its decision, with reasons, to the Contractor, and if no such decision is conveyed within the said period, the Contractor may proceed with engaging of the Proof Consultant.

(iii) The Proof Consultant shall:

- (a) evolve a systems approach with the Design Director so as to minimise the time required for final designs and construction drawings; and
- (b) proof check the detailed calculations, drawings and designs, which have been approved by the Design Director.

(iv) In respect of the Contractor's obligations with respect to the design and Drawings of the Project Highway as set forth in Schedule-I, the following shall apply:

- (a) The Contractor shall prepare and submit, with reasonable promptness and in such sequence as is consistent with the Project Completion Schedule, three (3) copies each of the design and Drawings, duly certified by the Proof Consultant, to the Authority's Engineer for its approval. Provided, however, that in respect of Major Bridges and Structures, the Authority's Engineer may require additional drawings for approval in accordance with Good Industry Practice.
- (b) by submitting the Drawings for review and approval to the Authority's Engineer, the Contractor shall be deemed to have represented that it has determined and verified that the design and engineering, including field construction criteria related thereto, are in conformity with the Scope of the Project, the Specifications and Standards and the Applicable Laws;
- (c) within 15 (fifteen) days of the receipt of the Drawings, the Authority's Engineer shall review the same and convey its approval/observations to the Contractor with particular reference to their conformity or otherwise with the Scope of the Project and the Specifications and Standards. Provided, however that in case of a major bridge or structure, the aforesaid period of 15 (fifteen) days may be extended up to 30 (thirty) days;
- (d) if the aforesaid observations of the Authority's 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 Contractor in conformity with the provisions of this Agreement and resubmitted to the Authority's Engineer for review and approval. The Authority's Engineer shall give its observations, if any, within 10 (ten) days of receipt of the revised Drawings. In the event the Contractor fails to revise and resubmit such Drawings

- to the Authority's Engineer for review/approval as aforesaid, the Authority's Engineer may withhold the payment for the affected works in accordance with the provisions of Clause 19.5 (iv). If the Contractor disputes any decision, direction or determination of the Authority's Engineer hereunder, the Dispute shall be resolved in accordance with the Dispute Resolution Procedure;
- (e) no review/approval and/or observation of the Authority's Engineer and/or its failure to review/approval and/or convey its observations on any Drawings shall relieve the Contractor of its obligations and liabilities under this Agreement in any manner nor shall the Authority's Engineer or the Authority be liable for the same in any manner; and if errors, omissions, ambiguities, inconsistencies, inadequacies or other Defects are found in the Drawings, they and the construction works shall be corrected at the Contractor's cost, notwithstanding any approval under this Article 10;
 - (f) the Contractor shall be responsible for delays in submitting the Drawing as set forth in Schedule-I caused by reason of delays in surveys and field investigations, and shall not be entitled to seek any relief in that regard from the Authority; and
 - (g) the Contractor warrants that its designers, including any third parties engaged by it, shall have the required experience and capability in accordance with Good Industry Practice and it shall indemnify the Authority against any damage, expense, liability, loss or claim, which the Authority might incur, sustain or be subject to arising from any breach of the Contractor's design responsibility and/or warranty set out in this Clause.
 - (h) the Contractor shall ensure that all the designs and drawings shall be approved from the Authority's Engineer within 90 days (ninety) from the Appointed Date.
 - (i) The Contractor shall ensure that only controlled copies of drawings reviewed & approved by Authority Engineer is released to site. If the unapproved drawings are found to be released to site, a non refundable penalty of Rs 1,00,000/- shall be levied to the contractor for each incidence.
- (v) Any cost or delay in construction arising from review/approval by the Authority's Engineer shall be borne by the Contractor.
 - (vi) Works shall be executed in accordance with the Drawings provided by the Contractor in accordance with the provisions of this Clause 10.2 and the approval of the Authority's Engineer thereon as communicated pursuant to the provisions of sub-Clause (c) & (d) of Clause 10.2 (iv). Such Drawings shall not be amended or altered without prior written notice to the Authority's Engineer. If a Party becomes aware of an error or defect of a technical nature in the design or Drawings, that Party shall promptly give notice to the other Party of such error or defect.
 - (vii) Within 90 (ninety) days of the Project Completion Date, the Contractor shall furnish to the Authority and the Authority's Engineer a complete set of as- built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the Authority, reflecting the Project Highway as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Highway

and setback lines, if any, of the buildings and structures forming part of Project Facilities.

10.3 Construction of the Project Highway

- (i) The Contractor shall construct the Project Highway as specified in Schedule- B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall rectify any error in the positions, levels, dimensions or alignment of the Works. The [913th (Nine Hundred Thirteen) day] from the Appointed Date shall be the scheduled completion date (the “**Scheduled Completion Date**”) and the Contractor agrees and undertakes that the construction shall be completed on or before the Scheduled Completion Date, including any extension thereof.
- (ii) The Contractor shall construct the Project Highway in accordance with the Project Completion Schedule set forth in Schedule-J. In the event that the Contractor fails to achieve any Project Milestone or the Scheduled Completion Date within a period of 30 (thirty) days from the date set forth in Schedule-J, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority of a sum calculated at the rate of 0.05% (zero point zero five percent) of the Contract Price for delay of each day reckoned from the date specified in Schedule –J and until such Project Milestone is achieved or the Project Highway is completed; provided that if the period for any or all Project Milestones or the Scheduled Completion Date is extended in accordance with the provisions of this Agreement, the dates set forth in Schedule-J shall be deemed to be modified accordingly and the provisions of this Agreement shall apply as if Schedule-J has been amended as above; provided further that in the event the Project Highway is completed within or before the Scheduled Completion Date including any Time Extension, applicable for that work or section, the Damages paid under this Clause 10.3 (ii) shall be refunded by the Authority to the Contractor, but without any interest thereon.

The Parties agree that for determining achievement or delays in completion of the Project Milestones or the Project on the due date, the works affected due to delay in providing the site for which time extension has been granted beyond the Scheduled Completion Date will be excluded. For example on the due date to achieve the Project Milestone-I (i.e., Stage Payments of 10% (ten percent) of Contract Price on 180th (one hundred and eighty) day from the Appointed Date), if 5% (five percent) of the project length corresponding to the Project Milestone-I is not handed over or lately handed over resulting in the extension of completion of this 5% (five percent) length beyond Scheduled Completion Date, Stage Payment of $10\% \times 0.95 = 9.5\%$ only is to be achieved by 180th (one hundred and eighty) day.

For the avoidance of doubt, it is agreed that recovery of Damages under this Clause 10.3 (ii) shall be without prejudice to the rights of the Authority under this Agreement including the right of Termination thereof. The Parties further agree that Time Extension hereunder shall only be reckoned for and in respect of the affected Works as specified in Clause 10.5 (ii).

- (iii) The Authority shall notify the Contractor of its decision to impose Damages in pursuance with the provisions of this Clause 10.3. Provided that no deduction on account of Damages shall be effected by the Authority without notifying the Contractor of its decision to impose the Damages, and taking into consideration the representation, if any, made by the Contractor within 20 (twenty) days of such notice. The Parties expressly agree that the total amount of Damages under Clause 10.3 (ii) shall not exceed 10% (ten percent) of the Contract Price. If the damages exceed 10% (ten percent) of the Contract Price, the Contractor shall be deemed to be in default of this agreement having no cure and the Authority shall be entitled to terminate this Agreement by issuing a Termination Notice in accordance with the provisions of Clause 23.1 (ii).
- (iv) In the event that the Contractor fails to achieve the Project Completion within a period of 90 (ninety) days from the Schedule Completion Date set forth in Schedule-J, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, the contractor shall be deemed to be ineligible for bidding any future projects of the Authority, both as the sole party or as one of the parties of Joint Venture/ Consortium during the period from Scheduled Completion Date to issuance of Completion Certificate. This restriction is applicable if the contract value of the delayed project is not less than Rs. 300 Crore.

10.4 Maintenance during Construction Period

- (i) During the Construction Period, the Contractor shall maintain, at its cost, the existing lane(s) of the Project Highway which falls under their scope of work so that the traffic worthiness and safety thereof are at no time materially inferior as compared to their condition on Appointed Date, and shall undertake the necessary repair and maintenance works for this purpose; provided that the Contractor may, at its cost, interrupt and divert the flow of traffic if such interruption and diversion is necessary for the efficient progress of Works and conforms to Good Industry Practice; provided further that such interruption and diversion shall be undertaken by the Contractor only with the prior written approval of the Authority's Engineer which approval shall not be unreasonably withheld. For the avoidance of doubt, it is agreed that the Contractor shall at all times be responsible for ensuring safe operation of the Project Highway. It is further agreed that in the event the Project includes construction of a bypass or tunnel and realignment of the existing carriageway, the Contractor shall maintain the existing highway in such sections until the new Works are open to traffic.
- (ii) Notwithstanding anything to the contrary contained in this Agreement, in the event of default by the Contractor in discharging the obligations specified in Clause 10.4 (i) above, the Authority shall get these maintenance works completed in the manner recommended by the Authority's Engineer to avoid public inconvenience at the risk and cost of the Contractor in order to keep the road in traffic worthy condition.

10.5 Extension of time for completion

- (i) Without prejudice to any other provision of this Agreement for and in respect of extension of time, the Contractor shall be entitled to extension of time in the Project

Completion Schedule (the “**Time Extension**”) to the extent that completion of any Project Milestone is or will be delayed by any of the following, namely:

- (a) delay in providing the Right of Way of Construction Zone, environmental clearances or approval of railway authorities, specified in Clause 3.1 (iv);
 - (b) Change of Scope (unless an adjustment to the Scheduled Completion Date has been agreed under Article 13);
 - (c) occurrence of a Force Majeure Event;
 - (d) any delay, impediment or prevention caused by or attributable to the Authority, the Authority's personnel or the Authority's other contractors on the Site; and
 - (e) any other cause or delay which entitles the Contractor to Time Extension in accordance with the provisions of this Agreement.
- (ii) The Contractor shall, no later than 15 (fifteen) business days from the occurrence of an event or circumstance specified in Clause 10.5 (i), inform the Authority's Engineer by notice in writing, with a copy to the Authority, stating in reasonable detail with supporting particulars, the event or circumstances giving rise to the claim for Time Extension in accordance with the provisions of this Agreement. Provided that the period of 15 (fifteen) business days shall be calculated from the date on which the Contractor became aware, or should have become aware, of the occurrence of such an event or circumstance.
- Provided further that notwithstanding anything to the contrary contained in this Agreement, Time Extension shall be due and applicable only for the Works which are affected by the aforesaid events or circumstances and shall not in any manner affect the Project Completion Schedule for and in respect of the Works which are not affected hereunder.
- (iii) On the failure of the Contractor to issue to the Authority's Engineer a notice in accordance with the provisions of Clause 10.5 (ii) within the time specified therein, the Contractor shall not be entitled to any Time Extension and shall forfeit its right for any such claims in future. For the avoidance of doubt, in the event of failure of the Contractor to issue notice as specified in this clause 10.5 (iii), the Authority shall be discharged from all liability in connection with the claim.
- (iv) The Authority's Engineer shall, on receipt of the claim in accordance with the provisions of Clause 10.5 (ii), examine the claim expeditiously within the time frame specified herein. In the event the Authority's Engineer requires any clarifications to examine the claim, the Authority's Engineer shall seek the same within 15 (fifteen) days from the date of receiving the claim. The Contractor shall, on receipt of the communication of the Authority's Engineer requesting for clarification, furnish the same to the Authority's Engineer within 10 (ten) days thereof. The Authority's Engineer shall, within a period of 30 (thirty) days from the date of receipt of such clarifications, forward in writing to the Contractor its determination of Time Extension.

Provided that when determining each extension of time under this Clause 10.5, the Authority's Engineer shall review previous determinations and may increase, but shall not decrease, the total Time Extension.

- (v) If the event or circumstance giving rise to the notice has a continuing effect:
- (a) a fully detailed claim shall be considered as interim;
 - (b) the Contractor shall, no later than 10 (ten) days after the close of each month, send further interim claims specifying the accumulated delay, the extension of time claimed, and such further particulars as the Authority's Engineer may reasonably require; and
 - (c) the Contractor shall send a final claim within 30 (thirty) days after the effect of the event or the circumstance ceases.

Upon receipt of the claim hereunder, the Authority's Engineer shall examine the same in accordance with the provisions of Clause 10.5 (iv) within a period of 30 (thirty) days of the receipt thereof

10.6 Incomplete Works

In the event the Contractor fails to complete the Works in accordance with the Project Completion Schedule, including any Time Extension granted under this Agreement, the Contractor shall endeavour to complete the balance work expeditiously and shall pay Damages to the Authority in accordance with the provisions of Clause 10.3 (ii) for delay of each day until the Works are completed in accordance with the provisions of this Agreement. Recovery of Damages under this Clause shall be without prejudice to the rights of the Authority under this Agreement including the right to termination under Clause 23.1.

10.7 Maintenance Manual

No later than 60 (sixty) days prior to the Project Completion Date, the Contractor shall, in consultation with the Authority's Engineer, evolve a maintenance manual (the "**Maintenance Manual**") for the regular and preventive maintenance of the Project Highway in conformity with the Specifications and Standards, safety requirements and Good Industry Practice, and shall provide 5 (five) copies thereof to the Authority's Engineer. The Authority's Engineer shall review the Maintenance Manual within 15 (fifteen) days of its receipt and communicate its comments to the Contractor for necessary modifications, if any.

10.8 As-Built Records

The Contractor shall prepare, and keep up-to-date, a complete set of as built records of the execution of the Works, showing the exact as built locations, sizes and details on the Works as executed with cross references to all relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purpose of

this Sub-Clause 10.8. The Contractor shall provide 2 (two) copies of as built records to the Authority prior to the commencement of the Tests on Completion.

10.9 Contractor's Use of Authority's Documents

Intellectual property in the Authority's requirements and Specifications and Standards and all other documents and materials issued by the Authority or the Authority's Representative to the Contractor shall (as between the parties) remain the property of the Authority. The Contractor may, at its cost, copy, use and communicate any such documents for the purposes of the Contract. They shall not, without the consent of the Authority, be used, copied or communicated to a third party by the Contractor, except as necessary for the purposes of the Works under the Agreement.

Article 11

Quality Assurance, Monitoring and Supervision

11.1 Quality of Materials and workmanship

The Contractor shall ensure that the Construction, Materials and workmanship are in accordance with the requirements specified in this Agreement, Specifications and Standards and Good Industry Practice.

11.2 Quality control system

- (i) The Contractor shall establish a quality control mechanism to ensure compliance with the provisions of this Agreement (the “**Quality Assurance Plan**” or “**QAP**”).
- (ii) The Contractor shall, within 30 (thirty) days of the Appointed Date, submit to the Authority’s Engineer its Quality Assurance Plan which shall include the following:
 - (a) organization, duties and responsibilities, procedures, inspections and documentation;
 - (b) quality control mechanism including sampling and testing of Materials, test frequencies, standards, acceptance criteria, testing facilities, reporting, recording and interpretation of test results, approvals, check list for site activities, and proforma for testing and calibration in accordance with the Specifications for Road and Bridge Works issued by MORTH, relevant IRC specifications and Good Industry Practice; and
 - (c) internal quality audit system.

The Authority’s Engineer shall convey its approval to the Contractor within a period of 21 (twenty-one) days of receipt of the QAP stating the modifications, if any, required, and the Contractor shall incorporate those in the QAP to the extent required for conforming with the provisions of this Clause 11.2.

- (iii) The Contractor shall procure all documents, apparatus and instruments, fuel, consumables, water, electricity, labour, Materials, samples, and qualified personnel as are necessary for examining and testing the Project Assets and workmanship in accordance with the Quality Assurance Plan.
- (iv) The cost of testing of Construction, Materials and workmanship under this Article 11 shall be borne by the Contractor.

11.3 Methodology

The Contractor shall, at least 15 (fifteen) days prior to the commencement of the construction, submit to the Authority’s Engineer for review and consent the methodology proposed to be adopted for executing the Works, giving details of equipment to be deployed, traffic management and measures for ensuring safety. The Authority’s Engineer

shall complete the review and convey its consent to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

11.4 Inspection and technical audit by the Authority

The Authority or any representative authorized by the Authority in this behalf may inspect and review the progress and quality of the construction of Project Highway and issue appropriate directions to the Authority's Engineer and the Contractor for taking remedial action in the event the Works are not in accordance with the provisions of this Agreement.

11.5 External technical audit

- (i) At any time during construction, the Authority may appoint an external technical auditor to conduct an audit of the quality of the Works. The Auditor in the presence of the representatives of the Contractor and the Authority's Engineer shall carry out the tests and/ or collect samples for testing in the laboratory. The timing, the testing equipment and the sample size of this audit shall be as decided by the Authority. The findings of the audit, to the extent accepted by the Authority, shall be notified to the Contractor and the Authority's Engineer for taking remedial action in accordance with this Agreement.
- (ii) After completion of the remedial measures by the Contractor, the Auditor shall undertake a closure audit and this process will continue till the remedial measures have brought the works into compliance with the Specifications and Standards. The Contractor shall provide all assistance as may be required by the auditor in the conduct of its audit hereunder. Notwithstanding anything contained in this Clause 11.5, the external technical audit shall not affect any obligations of the Contractor or the Authority's Engineer under this Agreement.

11.6 Inspection of construction records

The Authority shall have the right to inspect the records of the Contractor relating to the Works.

11.7 Monthly progress reports

During the Construction Period, the Contractor shall, no later than 10 (ten) days after the close of each month, furnish to the Authority and the Authority's Engineer a monthly report on progress of the Works and shall promptly give such other relevant information as may be required by the Authority's Engineer.

The Contractor agrees that reporting under this Clause 11.7 shall continue until the date of the completion of the Works. Each report shall include:

- (a) an executive summary;
- (b) charts showing the status of Contractor's documents, construction and manufacturing and environmental works;

- (c) details of work subcontracted and the performance of Sub-contractors;
- (d) for the construction of each main part of the Works, the extent of progress (both quantity and percentage of the whole), the actual or expected dates of commencement, anticipated completion date of the activity, Contractor's inspections and tests;
- (e) records of manpower and Contractor's equipment on the Site;
- (f) copies for that month of quality assurance documents, test results and certificates;
- (g) safety statistics, accident data collection including details of any hazardous incidents and activities relating to environmental aspects and public relations;
- (h) comparisons of actual and planned progress, with details of any aspects which may jeopardize the completion in accordance with the Agreement, and the measures being (or to be) adopted to overcome such aspects;
- (i) details of any unresolved disputes or claims, in relation to the Project;
- (j) details of any revision to the cash flow estimate, together with a copy of the revised cash flow estimate;
- (k) status of various Applicable Permits and compliance of conditions therein;
- (l) details of various royalty payment and insurances required to be taken by the Contractor; and
- (m) such other reports as may be required by the Authority for enabling the Authority to comply with its obligations under the other Project contracts.
- (n) details of defects by the Authority;
- (o) change in emission of any sewage or effluent of any nature whatsoever, whether qualitatively or quantitatively;
- (p) any Material Adverse Effect;
- (q) declaration towards compliance with Applicable Laws including but not limited to environmental and labour legislations;
- (r) declaration specifying compliance with all Manuals provided to the Contractor; and
- (s) any change in the flow of traffic in the existing Project Highway.

11.8 Inspection

- (i) The Authority's Engineer and its authorized representative shall at all reasonable times:
 - (a) have full access to all parts of the Site and to all places from which natural Materials are being obtained for use in the Works; and

(b)during production, manufacture and construction at the Site and at the place of production, be entitled to examine, inspect, measure and test the Materials and workmanship, and to check the progress of manufacture of Materials.

- (ii) The Contractor shall give the Authority's Engineer and its authorized agents access, facilities and safety equipment for carrying out their obligations under this Agreement.
- (iii) The Authority's Engineer shall submit a monthly inspection report (the "**Inspection Report**") to the Authority and the Contractor bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. For the avoidance of doubt, such inspection or submission of Inspection Report by the Authority's Engineer shall not relieve or absolve the Contractor of its obligations and liabilities under this Agreement in any manner whatsoever.

11.9 Samples

The Contractor shall submit the following samples of Materials and relevant information to the Authority's Engineer for pre-construction review:

- (a) manufacturer's test reports and standard samples of manufactured Materials; and
- (b) samples of such other Materials as the Authority's Engineer may require.

11.10 Tests

- (i) For determining that the Works conform to the Specifications and Standards, the Authority's Engineer shall require the Contractor to carry out or cause to be carried out tests, at such time and frequency and in such manner as specified in this Agreement, and in accordance with Good Industry Practice for quality assurance. The test checks by the Authority's Engineer shall comprise at least 50% (fifty percent) of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.
- (ii) In the event that results of any tests conducted under this Clause 11.10 establish any Defects or deficiencies in the Works, the Contractor shall carry out remedial measures and furnish a report to the Authority's Engineer in this behalf. The Authority's Engineer shall require the Contractor to carry out or cause to be carried out tests to determine that such remedial measures have brought the Works into compliance with the Specifications and Standards, and the procedure shall be repeated until such Works conform to the Specifications and Standards. For the avoidance of doubt, the cost of such tests and remedial measures in pursuance thereof shall be solely borne by the Contractor.

11.11 Examination of work before covering up

In respect of the work which the Authority's Engineer is entitled to examine, inspect, measure and/or test before it is covered up or put out of view or any part of the work is

placed thereon, the Contractor shall give notice to the Authority's Engineer whenever any such work is ready and before it is covered up. The Authority's Engineer shall then either carry out the examination, inspection or testing without unreasonable delay, or promptly give notice to the Contractor that the Authority's Engineer does not require to do so. Provided, however, that if any work is of a continuous nature where it is not possible or prudent to keep it uncovered or incomplete, the Contractor shall notify the schedule of carrying out such work to give sufficient opportunity, not being less than 3 (three) business days' notice, to the Authority's Engineer to conduct its inspection, measurement or test while the work is continuing. Provided further that in the event the Contractor receives no response from the Authority's Engineer within a period of 3 (three) business days from the date on which the Contractor's notice hereunder is delivered to the Authority's Engineer, the Contractor shall be entitled to assume that the Authority's Engineer would not undertake the said inspection.

11.12 Rejection

If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, design or workmanship is found to be defective or otherwise not in accordance with the provisions of this Agreement, the Authority's Engineer shall reject the Plant, Materials, design or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the Defect and ensure that the rejected item complies with the requirements of this Agreement.

If the Authority's Engineer requires the Plant, Materials, design or workmanship to be retested, the tests shall be repeated under the same terms and conditions, as applicable in each case. If the rejection and retesting cause the Authority to incur any additional costs, such cost shall be recoverable by the Authority from the Contractor; and may be deducted by the Authority from any monies due to be paid to the Contractor.

11.13 Remedial work

- (i) Notwithstanding any previous test or certification, the Authority's Engineer may instruct the Contractor to:
 - (a) remove from the Site and replace any Plant or Materials which are not in accordance with the provisions of this Agreement;
 - (b) remove and re-execute any work which is not in accordance with the provisions of this Agreement and the Specification and Standards; and
 - (c) execute any work which is urgently required for the safety of the Project Highway, whether because of an accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.
- (ii) If the Contractor fails to comply with the instructions issued by the Authority's Engineer under Clause 11.13 (i), within the time specified in the Authority's Engineer's notice or as mutually agreed, the Authority's Engineer may advise the Authority to have the work executed by another agency. The cost so incurred by the Authority for

undertaking such work shall, without prejudice to the rights of the Authority to recover Damages in accordance with the provisions of this Agreement, be recoverable from the Contractor and may be deducted by the Authority from any monies due to be paid to the Contractor.

11.14 Delays during construction

Without prejudice to the provisions of Clause 10.3 (ii), in the event the Contractor does not achieve any of the Project Milestones or the Authority's Engineer shall have reasonably determined that the rate of progress of Works is such that Completion of the Project Highway is not likely to be achieved by the end of the Scheduled Completion Date, it shall notify the same to the Contractor, and the Contractor shall, within 15 (fifteen) days of such notice, by a communication inform the Authority's Engineer in reasonable detail about the steps it proposes to take to expedite progress and the period within which it shall achieve the Project Completion Date.

11.15 Quality control records and Documents

The Contractor shall hand over a copy of all its quality control records and documents to the Authority's Engineer before the Completion Certificate is issued pursuant to Clause 12.2. The Contractor shall submit Road Signage Plans to the Authority Engineer for approval at least 6 (six) months prior to expected completion of Project Highway.

11.16 Video recording

During the Construction Period, the Contractor shall provide to the Authority for every calendar quarter, a video recording, which will be compiled into a 3 (three)- hour compact disc or digital video disc, as the case may be, covering the status and progress of Works in that quarter. The video recording shall be provided to the Authority no later than 15 (fifteen) days after the close of each quarter after the Appointed Date.

11.17 Suspension of unsafe Construction Works

- (i) Upon recommendation of the Authority's Engineer to this effect, the Authority may by notice require the Contractor to suspend forthwith the whole or any part of the Works if, in the reasonable opinion of the Authority's Engineer, such work threatens the safety of the Users and pedestrians.
- (ii) The Contractor shall, pursuant to the notice under Clause 11.17 (i), suspend the 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, the Users and pedestrians. The Contractor may by notice require the Authority's 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 Authority's Engineer, the Authority shall either revoke such suspension or instruct the Contractor 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 11.17 shall be repeated until the suspension hereunder is revoked.

- (iii) Subject to the provisions of Clause 21.6, all reasonable costs incurred for maintaining and protecting the Works or part thereof during the period of suspension (the “**Preservation Costs**”), shall be borne by the Contractor; 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.
- (iv) If suspension of Works is for reasons not attributable to the Contractor, the Authority's Engineer shall determine any Time Extension to which the Contractor is reasonably entitled.

11.18 Staff and Labour

(i) Engagement of Staff and Labour

- (a) The Contractor shall make its own arrangements for the engagement of all personnel and labour, local or otherwise, and for their payment, housing, feeding and transport.
- (b) The Contractor has verified/ shall verify the identity and address of all its employees and officials related to the Works by collecting necessary documentary proof.
- (c) The Contractor shall seek a self-declaration from its employees that they have not been convicted of any criminal offence by any court and if any criminal proceedings/charge-sheets have been pending/filed against them. The Contractor shall not employ persons with criminal track record on the project. In cases where it comes to notice later that the employee concerned has concealed any such fact in his self-declaration or commits a criminal offence during the course of his employment, the Contractor shall remove such person from the project
- (d) deleted.
- (e) The employees and personnel of the Contractor shall work under the supervision, control and direction of the Contractor and the Contractor shall be solely responsible for all negotiations with its employees and personnel relating to their salaries and benefits, and shall be responsible for assessments and monitoring of performance and for all disciplinary matters. All employees / personnel, executives engaged by the Contractor shall be in sole employment of the Contractor and the Contractor shall be solely responsible for their salaries, wages, statutory payments, etc and under no circumstances the personnel shall be deemed to be the employees of the Authority. Under no circumstances the Authority shall be liable for any payment or claim or compensation of any nature to the employees and personnel of the Contractor.
- (f) All the payments to the staff and labour of the Contractor working on the project shall be made directly to their bank account.

(ii) Returns of Labour

- (a) The Contractor shall deliver to the Authority a detailed return in such form and at such intervals as the Authority may prescribe, showing the details including

names, payment details and terms of appointment of the several classes of labour employed by the Contractor from time to time for the Works. The Contractor shall, in its returns certify that all dues of the workers or labour have been fully paid.

- (b) The Authority is entitled to witness labour payments made or to be made by the Contractor. If the Contractor defaults in its obligations for making any payments under the labour laws, the Employer may make the relevant payments. Any sum equal to any amount paid by the Employer under this Sub-Sub-Clause 9.2 shall be immediately due as a debt from the Contractor to the Employer and until payment/ set off shall carry interest at 18% per annum. For this purpose it is agreed between the parties that debt due aforesaid shall be set off immediately out the running account bills of the Contractor under this Agreement.

(iii) Persons in the Service of Others

The Contractor shall not recruit, or attempt to recruit from amongst persons in the service of the Authority.

(iv) Labour Laws

- (a) The Contractor shall obtain all relevant labour registrations and comply with all relevant labour laws applying to its employees, and shall duly pay them and afford to them all their legal rights.
- (b) The Contractor shall make all deductions of tax at source and all contributions to the Payment of Gratuity, Provident Fund (including Employees' contribution) and Employees' State Insurance Scheme as may be required by Applicable Laws and deposit the aforesaid contributed amount with the appropriate authority/(s).
- (c) The Contractor shall require all personnel engaged in the Works to obey all Applicable Laws and regulations. The Contractor shall permit Authority to witness labour payments for the Contractors direct labour, or the Subcontractors labour. The Contractor shall ensure that all its Subcontractors strictly comply with all labour laws.
- (d) Documentary evidence confirming compliance with Sub-Clause 12.4, as may be required from time to time, shall be provided to the Employer's Representative.
- (e) The Employer shall not be liable for any delay/default of the Contractor in compliance of the labour laws.

(v) Facilities for Staff and Labour

The Contractor shall provide and maintain all necessary accommodation and welfare facilities for personnel engaged for the Works. The Contractor shall not permit any personnel engaged for the Works to maintain any temporary or permanent living quarters within the structures forming part of the Works.

(vi) Health And Safety

All necessary precautions shall be taken by the Contractor to ensure the health and safety of staff and labour engaged for the Works. The Contractor shall, in collaboration with and to the requirements of the local health authorities, ensure that para-medical staff, first aid facilities, ambulance service are available on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The Contractor shall appoint a safety officer to be responsible for the safety of personnel on the Site. This safety officer shall be qualified for his work and shall have the authority to issue instructions concerning safety and take protective measures to prevent accidents. The Contractor shall maintain records and make reports concerning health, safety and welfare of personnel, and damage to property, in such manner as the Authority may reasonably require.

(vii) Contractor's Personnel

The Contractor shall employ only personnel who are appropriately qualified, skilled and experienced in their respective trades or occupations. The Authority may require the Contractor to remove any personnel engaged for the Works, who in the opinion of the Authority:

- (a) has engaged in any misconduct;
- (b) is incompetent or negligent in the performance of his duties;
- (c) fails to conform with any provisions of the Contract;
- (d) engages in any conduct which is prejudicial to safety, health, or the protection of the environment; or
- (e) makes errors in the discharge of his functions.

If appropriate and required by the Employer, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.

(viii) Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst its personnel, and to preserve peace and protection of people and property in the neighborhood of the Works.

Article 12

Completion Certificate

12.1 Tests on Completion

- (i) At least 30 (thirty) days prior to the likely completion of the Project Highway, or a Section thereof, the Contractor shall notify the Authority's Engineer of its intent to subject the Project Highway or a Section thereof, to Tests. The date and time of each of the Tests shall be determined by the Authority's Engineer in consultation with the Contractor, and notified to the Authority who may designate its representative to witness the Tests. The Contractor shall either conduct the Tests as directed by the Authority's Engineer or provide such assistance as the Authority's Engineer may reasonably require for conducting the Tests. In the event of the Contractor and the Authority's Engineer failing to mutually agree on the dates for conducting the Tests, the Contractor shall fix the dates by giving not less than 10 (ten) days' notice to the Authority's Engineer.
- (ii) All Tests shall be conducted in accordance with Schedule-K. The Authority's Engineer shall either conduct or observe, monitor and review the Tests conducted by the Contractor, as the case may be, and review the results of the Tests to determine compliance of the Project Highway or a Section thereof, with Specifications and Standards and if it is reasonably anticipated or determined by the Authority's Engineer during the course of any Test that the performance of the Project Highway or Section 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 Contractor to remedy and rectify the Defect or deficiencies. Upon completion of each Test, the Authority's Engineer shall provide to the Contractor and the Authority copies of all Test data including detailed Test results. For the avoidance of doubt, it is expressly agreed that the Authority's Engineer may require the Contractor to carry out or cause to be carried out additional Tests, in accordance with Good Industry Practice, for determining the compliance of the Project Highway or Section thereof with the Specifications and Standards.

12.2 Completion Certificate

- (i) Upon completion of all Works forming part of the Project Highway, and the Authority's Engineer determining the Tests to be successful and after the receipt of notarized true copies of the certificate(s) of insurance, copies of insurance policies and premium payment receipts in respect of the insurance defined in Article 20 and Schedule P of this Agreement, it shall, at the request of the Contractor forthwith issue to the Contractor and the Authority a certificate substantially in the form set forth in Schedule-L (the "Completion Certificate").
- (ii) Upon receiving the Completion Certificate, the Contractor shall remove its equipment, materials, debris and temporary works from the Site within a period of 30 (thirty) days thereof, failing which the Authority may remove or cause to be removed, such equipment, materials, debris and temporary works and recover from the Contractor an

amount equal to 120% (one hundred and twenty per cent) of the actual cost of removal incurred by the Authority.

- (iii) Without prejudice to the obligations of the Contractor specified in Articles 14 and 17, the property and ownership of all the completed Works forming part of the Project Highway shall vest in the Authority.

12.3 Rescheduling of Tests

If the Authority's Engineer certifies to the Authority and the Contractor that it is unable to issue the Completion 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 Contractor shall be entitled to re-schedule the Tests and hold the same as soon as reasonably practicable.

Article 13

Change of Scope

13.1 Change of Scope

- (i) The Authority may, notwithstanding anything to the contrary contained in this Agreement, require the Contractor to make modifications/ alterations to the Works (**"Change of Scope"**) within a period of six months counted from the Appointed Date. Upon the Authority making its intention known to the Contractor for the specific Change of Scope, be it positive or negative, the Contractor shall submit his proposal for the said Change of Scope involving additional cost or reduction in cost. Any such Change of Scope shall be made and valued in accordance with the provisions of this Article 13.
- (ii) Provided that any such Change of Scope, excluding major structures (e.g. Major Bridge/ ROB/ RUB/ Flyover/ elevated road of more than 50 m length) may be required and agreed to be executed between the parties beyond the period of six months of the Appointed Date but before expiry of 50% of the original Scheduled Construction Period of the Project Highway, subject to the condition that it shall not entail any claims (e.g. Extension of Time/ Prolongation related claims), against the Authority.
- (iii) The Change of Scope shall mean the following:
 - (a) change in specifications of any item of Works;
 - (b) omission of any work from the Scope of the Project except under Clause 8.3 (iii); provided that, subject to Clause 13.5, the Authority shall not omit any Work under this Clause in order to get it executed by any other authority; and / or
 - (c) any additional Work, Plant, Materials or services which are not included in the Scope of the Project, including any associated Tests on completion of construction.

13.2 Procedure for Change of Scope

- (i) In the event of the Authority determining that a Change of Scope is necessary, it may direct the Authority's Engineer to issue to the Contractor a notice specifying in reasonable detail the Works and services contemplated thereunder (the **"Change of Scope Notice"**). The Contractor shall submit a detailed proposal as per Clause 13.2 (iii) within 15 days from the receipt of Change of Scope Notice.
- (ii) If the Contractor determines, not later than 90 days from the Appointed Date, that a Change of Scope to the Works is required, it shall prepare a proposal with relevant details as per Clause 13.2 (iii) at its own cost and shall submit to the Authority to consider such Change of Scope (the **"Change of Scope Request"**).
- (iii) Upon receipt of a Change of Scope Notice, the Contractor shall, with due diligence, provide to the Authority and the Authority's Engineer such information as is necessary, together with detailed proposal 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 the following details:
 - i. break-up of the quantities, unit rates and cost for different items of work; and
 - ii. proposed design for the Change of Scope;
 - iii. proposed modifications, if any, to the Project Completion Schedule of the Project Highway.

For the avoidance of doubt, the Parties expressly agree that, subject to the provisions of Clause 13.4 (ii), the Contract Price shall be increased or decreased, as the case may be, on account of any such Change of Scope.

- (iv) The parties agree that costs and time for implementation of the proposed Change of Scope shall be determined as per the following:
 - (a) For works where Schedule of Rates (SOR) of concerned circle of State's Public Works Department are applicable at the Base Date are available, the same shall be applicable for determination of costs. In case of non-availability of Schedule of Rates at the Base Date, the available Schedule of Rates shall be applied by updating the same based on WPI. In case the Contract Price is lower/ higher than the Estimated Project Cost as per RFP, then the SOR rates shall be reduced/ increased in the same proportion accordingly.
 - (b) For item of Works not included in Schedule of Rates as mentioned in sub-para (a) of Clause 13.2 (iv) above, the cost of same shall be derived on the basis of MORTH Standard Data Book and the Authority's Engineer shall determine the prevailing market rates and discount the same considering WPI to achieve the prevailing rate at the Base Date, and for any item in respect of which MORTH Standard Data Book does not provide the requisite details, the Authority's Engineer shall determine the rate in accordance with Good Industry Practice.

For the avoidance of doubt, in case the cost as determined by the Contractor and the Authority reveals a difference of more than 10% (ten per cent), the cost as determined by the Authority shall be considered as final and binding on the Contractor.
 - (c) The design charges shall be considered only for new works or items (i.e. the Works or items not similar to the works or items in the original scope) @ 1% (one per cent) of cost of such new works or items.
 - (d) The costs of existing works or items, which are being changed/ omitted shall also be valued as per above procedure and only net cost shall be considered.
 - (e) The reasonable time for completion of works to be taken under Change of Scope shall be determined by the Authority's Engineer on the basis of Good Industry

Practice and if such time exceeds the Scheduled Completion Date, the issue of Completion Certificate shall not be affected or delayed on account of construction of Change of Scope items/ works remaining incomplete on the date of Tests.

- (v) Upon consideration of the detailed proposal submitted by the Contractor under the Clause 13.2 (iii), the Authority, within 15 (fifteen) days of receipt of such proposal, may in its sole discretion either accept such Change of Scope with modifications, if any, and initiate proceedings thereof in accordance with this Article 13 or reject the proposal and inform the Contractor of its decision and shall issue an order (the “**Change of Scope Order**”) requiring the Contractor to proceed with the performance thereof.

For the avoidance of doubt, the Parties agree that the Contractor shall not undertake any Change of Scope without the express consent of the Authority, save and except any works necessary for meeting any Emergency, that too with verbal approval of Authority which shall be confirmed in writing in next 3 (three) days. In the event that the Parties are unable to agree, the Authority may:

- (a) issue a Change of Scope Order requiring the Contractor to proceed with the performance thereof at the rates and conditions approved by the Authority till the matter is resolved in accordance with Article 26;
 - or
 - (b) proceed in accordance with Clause 13.5.
- (vi) The provisions of this Agreement, insofar as they relate to Works and Tests, shall apply *mutatis mutandis* to the Works undertaken by the Contractor under this Article 13.

13.3 Payment for Change of Scope

Payment for Change of Scope shall be made in accordance with the payment schedule specified in the Change of Scope Order.

13.4 Restrictions on Change of Scope

- (i) No Change of Scope shall be executed unless the Authority has issued the Change of Scope Order save and except any Works necessary for meeting any Emergency.
- (ii) The total value of all Change of Scope Orders shall not exceed 10% (ten per cent) of the Contract Price.
- (iii) Notwithstanding anything to the contrary in this Article 13, if any change is necessitated because of any default of the Contractor in the performance of its obligations under this Agreement, the same shall not be deemed to be Change of Scope, and shall not result in any adjustment of the Contract Price or the Project Completion Schedule.

13.5 Power of the Authority to undertake Works

- (i) In the event the Parties are unable to agree to the proposed Change of Scope Orders in accordance with Clause 13.2, the Authority may, after giving notice to the Contractor and considering its reply thereto, award such Works or services to any person or agency on the basis of open competitive bidding. It is also agreed that the Contractor shall provide assistance and cooperation to the person or agency who undertakes the works or services hereunder. The Contractor shall not be responsible for rectification of any Defects, but the Contractor shall carry out maintenance of such works after completion of Defect Liability Period of work by other person or agency during the remaining period of this agreement without any extra payment.
- (ii) The Works undertaken in accordance with this Clause 13.5 shall conform to the Specifications and Standards and shall be carried out in a manner that minimises the disruption in operation of the Project Highway. The provisions of this Agreement, insofar as they relate to Works and Tests, shall apply *mutatis mutandis* to the Works carried out under this Clause 13.5.

Article 14

Maintenance

14.1 Maintenance obligations of the Contractor

- (i) The Contractor shall maintain the Project Highway for a period of [5 (five) / 10 (ten)] years, corresponding to the Defects Liability Period, commencing from the date of the Completion Certificate (the “**Maintenance Period**”). For the performance of its Maintenance obligations, the Contractor shall be paid:
- (a) For flexible pavement with 5 years Maintenance Period including structures: no maintenance charges shall be paid for the first year; 0.50% of the Contract Price each for the second, third and fourth year; and 1% of the Contract Price for the fifth year
 - (b) For rigid pavement with 10 years Maintenance Period including structures: 0.25% of the Contract Price each for the first, second and third year, 0.5% of the Contract Price each for fourth, fifth, sixth and seventh year, and 0.75% of the Contract Price each for eighth, ninth and tenth year.
 - (c) For flexible perpetual pavement with 10 years maintenance period including structures: no maintenance charges shall be paid for the first year; 0.5% of the Contract Price each for the second, third and fourth year; 0.75% of the Contract Price each for the subsequent years till laying of the renewal layer or end of maintenance 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 Contractor based on the principles defined under clause 13.2(iii). After laying of the renewal layer, the Contractor shall be paid @ 0.5% of the original Contract Price each for the remaining years till the end of maintenance period.
 - (d) For stand-alone Bridge/ Tunnel works: the contractor shall be paid @ 0.25% of the Contract Price each for the first five years and @ 0.50% of the Contract Price each for the remaining period of five years.

Above amount for the performance of Contractors’ Maintenance obligations shall be, inclusive of all taxes. The amount payable for maintenance shall be adjusted to reflect any increase or decrease arising out of variation in WPI to be determined in accordance with the provisions of Clause 19.12. It is further agreed that the Contract Price hereunder shall be reckoned with reference to the amount specified in Clause 19.1 (i), which shall be adjusted to the extent of Change of Scope and the works withdrawn under the provisions of Clause 8.3 (iii), but shall not include any price adjustments in pursuance of Clause 19.10.

- (ii) During the Maintenance Period, the Authority shall provide to the Contractor access to the Site for Maintenance in accordance with this Agreement. The obligations of the Contractor hereunder shall include:

- (a) permitting safe, smooth and uninterrupted flow of traffic on the Project Highway;
 - (b) undertaking routine maintenance including prompt repairs of potholes, cracks, joints, drains, embankments, structures, pavement markings, lighting, road signs and other traffic control devices. For the avoidance of doubt, the electricity charges for operation of electrical infrastructure installed along the project length, except the infrastructure being used by the Contractor for its own use, shall be borne by the Authority;
 - (c) undertaking repairs to structures;
 - (d) informing the Authority of any unauthorized use of the Project Highway;
 - (e) informing the Authority of any encroachments on the Project Highway; and
 - (f) operation and maintenance of all communication, patrolling, and administrative systems necessary for the efficient maintenance of the Project Highway in accordance with the provisions of this Agreement.
- (iii) In respect of any Defect or deficiency not specified in Schedule-E, the Contractor shall, at its own cost, undertake repair or rectification in accordance with Good Industry Practice, save and except to the extent that such Defect or deficiency shall have arisen on account of any wilful default or neglect of the Authority or a Force Majeure Event.
- (iv) The Contractor shall remove promptly from the Project Highway any waste materials (including hazardous materials and waste water), rubbish and other debris (including, without limitation, accident debris) and keep the Project Highway in a clean, tidy and orderly condition, and in conformity with the Applicable Laws, Applicable Permits and Good Industry Practice.

14.2 Maintenance Requirements

The Contractor shall ensure and procure that at all times during the Maintenance Period, the Project Highway conforms to the maintenance requirements set forth in Schedule-E (the “**Maintenance Requirements**”).

14.3 Maintenance Programme

- (i) The Contractor shall prepare a monthly maintenance programme (the “**Maintenance Programme**”) in consultation with the Authority’s Engineer and submit the same to the Authority’s Engineer not later than 10 (ten) days prior to the commencement of the month in which the Maintenance is to be carried out. For this purpose a joint monthly inspection by the Contractor and the Authority’s Engineer shall be undertaken. The Maintenance Programme shall contain the following:
- (a) The condition of the road in the format prescribed by the Authority’s Engineer;
 - (b) the proposed maintenance Works; and
 - (c) deployment of resources for maintenance Works.

14.4 Safety, vehicle breakdowns and accidents

- (i) The Contractor shall ensure safe conditions for the Users, and in the event of unsafe conditions, lane closures, diversions, vehicle breakdowns and accidents, it shall follow the relevant operating procedures for 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.
- (ii) The Contractor shall maintain and operate a round-the-clock vehicle rescue post with 1 (one) mobile crane having the capacity to lift a truck with a Gross Vehicle Weight of 30,000 (thirty thousand) kilograms; and such post shall be located at [****]. The Contractor shall promptly remove any damaged vehicles and debris from the Project Highway to enable safe movement of traffic and shall report all accidents to the police forthwith.

14.5 Lane closure

- (i) The Contractor shall not close any lane of the Project Highway for undertaking maintenance works except with the prior written approval of the Authority's Engineer. Such approval shall be sought by the Contractor through a written request to be made at least 10 (ten) days before the proposed closure of lane and shall be accompanied by particulars thereof. Within 5 (five) business days of receiving such request, the Authority's Engineer shall grant permission with such modifications as it may deem necessary and a copy of such permission shall be sent to the Authority.
- (ii) Upon receiving the permission pursuant to Clause 14.5 (i), the Contractor shall be entitled to close the designated lane for the period specified therein, and for all lane closures extending a continuous period of 48 (forty-eight) hours, the Contractor shall, in the event of any delay in re-opening such lane, for every stretch of 250 (two hundred and fifty) metres, or part thereof, pay Damages to the Authority calculated at the rate of 0.1% (zero point one per cent) of the monthly maintenance payment for each day of delay until the lane has been re-opened for traffic. In the event of any delay in reopening such lanes or in the event of emergency decommissioning and closure to traffic of the whole or any part of the Project Highway due to failure of the Contractor, the Contractor shall pay damages to the Authority at double the above rate, without prejudice the rights of the Authority under this Agreement including Termination thereof.

14.6 Reduction of payment for non-performance of Maintenance obligations

- (i) In the event that the Contractor fails to repair or rectify any Defect or deficiency set forth in Schedule-E within the period specified therein, it shall be deemed as failure of performance of Maintenance obligations by the Contractor and the Authority shall be entitled to effect reduction in monthly lump sum payment for maintenance in accordance with Clause 19.7 and Schedule-M, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.
- (ii) If the nature and extent of any Defect justifies more time for its repair or rectification than the time specified in Schedule-E, the Contractor shall be entitled to additional time

in conformity with Good Industry Practice. Such additional time shall be determined by the Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof.

14.7 Authority's right to take remedial measures

In the event the Contractor does not maintain and/or repair the Project Highway or any part thereof in conformity with the Maintenance Requirements, the Maintenance Manual or the Maintenance Programme, as the case may be, and fails to commence remedial works within 15 (fifteen) days of receipt of the Maintenance Inspection Report under Clause 15.2 or a notice in this behalf from the Authority or the Authority's 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 cost of the Contractor, and to recover its cost from the Contractor. In addition to recovery of the aforesaid cost, a sum equal to 20% (twenty per cent) of such cost shall be paid by the Contractor to the Authority as Damages.

14.8 Restoration of loss or damage to Project Highway

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

14.9 Overriding powers of the Authority

- (i) If in the reasonable opinion of the Authority, the Contractor 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 and pedestrians, the Authority may, without prejudice to any of its rights under this Agreement including Termination thereof, by notice require the Contractor to take reasonable measures immediately for rectifying or removing such hardship or danger, as the case may be.
- (ii) In the event that the Contractor, upon notice under Clause 14.9 (i), fails to rectify or remove any hardship or danger within a reasonable period, the Authority may exercise overriding powers under this Clause 14.9 (ii) and take over the performance of any or all the obligations of the Contractor 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 recovered by the Authority from the Contractor, and the Authority shall be entitled to deduct any such costs and expenses incurred from the payments due to the Contractor under Clause 19.7 for the performance of its Maintenance obligations.

- (iii) In the event of a national emergency, civil commotion or any other circumstances specified in Clause 21.3, the Authority may take over the performance of any or all the obligations of the Contractor to the extent deemed necessary by it, and exercise such control over the Project Highway or give such directions to the Contractor 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 21. It is also agreed that the Contractor shall comply with such instructions as the Authority may issue in pursuance of the provisions of this Clause 14.9 (iii), and shall provide assistance and cooperation to the Authority, on a best effort basis, for performance of its obligations hereunder.

14.10 Taking over Certificate

The Maintenance Requirements set forth in Schedule-E having been duly carried out, Maintenance Period as set forth in Clause 14.1 (i) having been expired and Authority's Engineer determining the Tests on Completion of Maintenance to be successful in accordance with Schedule-Q, the Authority will issue Taking Over Certificate to the Contractor substantially in the format set forth in Schedule-R.

Article 15

Supervision and Monitoring during Maintenance

15.1 Inspection by the Contractor

- (i) The Authority's Engineer shall undertake regular inspections to evaluate continuously the compliance with the Maintenance Requirements.
- (ii) The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system in accordance with the guidelines contained in IRC: SP35. Report of this inspection together with details of proposed maintenance works as required shall be conveyed to the Authority's Engineer forthwith. The Contractor shall complete the proposed maintenance works before the onset of the monsoon and send a compliance report to the Authority's Engineer. Post monsoon inspection shall be undertaken by the Contractor and the inspection report together with details of any damages observed and proposed action to remedy the same shall be conveyed to the Authority's Engineer forthwith.

15.2 Inspection and payments

- (i) The Authority's Engineer may inspect the Project Highway at any time, but at least once every month, to ensure compliance with the Maintenance Requirements. It shall make a report of such inspection ("**Maintenance Inspection Report**") stating in reasonable detail the Defects or deficiencies, if any, with particular reference to the Maintenance Requirements, the Maintenance Manual, and the Maintenance Programme, and send a copy thereof to the Authority and the Contractor within 10 (ten) days of such inspection.
- (ii) After the Contractor submits to the Authority's Engineer the Monthly Maintenance Statement for the Project Highway pursuant to Clause 19.6, the Authority's Engineer shall carry out an inspection within 10 (ten) days to certify the amount payable to the Contractor. The Authority's Engineer shall inform the Contractor of its intention to carry out the inspection at least 3 (three) business days in advance of such inspection. The Contractor shall assist the Authority's Engineer in verifying compliance with the Maintenance Requirements.
- (iii) For each case of non-compliance of Maintenance Requirements as specified in the inspection report of the Authority's Engineer, the Authority's Engineer shall calculate the amount of reduction in payment in accordance with the formula specified in Schedule-M.
- (iv) Any deduction made on account of non-compliance will not be paid subsequently even after establishing the compliance thereof. Such deductions will continue to be made every month until the compliance is procured.

15.3 Tests

For determining that the Project Highway conforms to the Maintenance Requirements, the Authority's Engineer shall require the Contractor to carry out, or cause to be carried

out, Tests specified by it in accordance with Good Industry Practice. The Contractor shall, with due diligence, carry out or cause to be carried out all such Tests in accordance with the instructions of the Authority's Engineer and furnish the results of such Tests forthwith to the Authority's Engineer.

At any time during Maintenance Period, the Authority may appoint an external technical auditor to conduct an audit of the quality of the Works. The Auditor in the presence of the representatives of the Contractor and the Authority's Engineer shall carry out the Tests and/ or collect samples for testing in the laboratory. The timing, the testing equipment and the sample size of this audit shall be as decided by the Authority. The findings of the audit, to the extent accepted by the Authority, shall be notified to the Contractor and the Authority's Engineer for taking remedial measures. After completion of the remedial measures by the Contractor, the auditor shall undertake a closure audit and this process will continue till the remedial measures have brought the maintenance works into compliance with the Specifications and Standards. The Contractor shall provide all assistance as may be required by the auditor in the conduct of its audit hereunder. Notwithstanding anything contained in this Clause 15.3, the external technical audit shall not affect any obligations of the Contractor or the Authority's Engineer under this Agreement.

15.4 Reports of unusual occurrence

The Contractor shall, during the Maintenance Period, prior to the close of each day, send to the Authority and the Authority's Engineer, by facsimile or e- mail, a report stating accidents and unusual occurrences on the Project Highway relating to the safety and security of the Users and Project Highway. A monthly summary of such reports shall also be sent within 3 (three) business days of the closing of month. For the purposes of this Clause 15.4, accidents and unusual occurrences on the Project Highway shall include:

- (a) accident, death or severe injury to any person;
- (b) damaged or dislodged fixed equipment;
- (c) flooding of Project Highway; and
- (d) any other unusual occurrence.

Article 16

Traffic Regulation

16.1 Traffic regulation by the Contractor

- (i) The Contractor shall take all the required measures and make arrangements for the safety of Users during the Construction and Maintenance of the Project Highway or a Section thereof in accordance with the provisions of MORTH Specifications. It shall provide, erect and maintain all such barricades, signs, markings, flags, and lights as may be required by Good Industry Practice for the safety of the traffic passing through the Section under construction or maintenance.
- (ii) All works shall be carried out in a manner creating least interference to traffic passing through the Project Highway or a Section thereof. In sections where construction or maintenance Works on the carriageway are taken up, the Contractor shall ensure that proper passage is provided for the traffic. Where it is not possible or safe to allow traffic on part width of the carriageway, a temporary diversion of proper specifications shall be constructed by the Contractor at its own cost. 'ROBOTS' may be used for diversion and control of traffic during Construction. The Contractor shall take prior approval of the Authority's Engineer for any proposed arrangement for traffic regulation during Construction and Maintenance, which approval shall not be unreasonably withheld.

Article 17

Defects Liability

17.1 Defects Liability Period

- (i) The Contractor shall be responsible for all the Defects and deficiencies, except usual wear and tear in the Project Highway or any Section thereof, till the expiry of a period of commencing from the date of Completion Certificate (the “**Defects Liability Period**”) as specified below:
- (a) 5 (five) years from the date of completion in case of a road being constructed with flexible pavement;
 - (b) 10 (ten) years from the date of completion in case of road being constructed with rigid pavement;
 - (c) 10 (ten) years from the date of completion in case of road being constructed with flexible pavement using perpetual design;
 - (d) 10 (ten) years from the date of completion in case of all stand-alone structures, e.g. Major Bridges/ and Tunnels;
 - (e) 10 (ten) years from the date of completion for the stretches where new technology/ material has been/ is proposed to be used.
 - (f) 3 (three) years from the date of completion for stretches requiring renewal of Bituminous Concrete (BC) layer through either using hot-in-place recycling of the entire BC layer or providing a fresh layer of BC with 40mm thickness.
 - (g) 3 (three) years from the date of completion for stretches requiring improvement to riding quality, in cases other than those mentioned in para (f) above, through laying a layer of BM/DBM and BC.

The Defects Liability Period shall commence from the date of the Completion Certificate. For the avoidance of any doubt, any repairs or restoration because of usual wear or tear in the Project Highway or any Section thereof shall form a part of the Maintenance obligations of the Contractor as specified in Article 14.

17.2 Remedying Defects

Save and except as provided in Clause 14.1 (iii), the Contractor shall repair or rectify all Defects and deficiencies observed by the Authority or Authority’s Engineer during the Defects Liability Period within a period of 15 (fifteen) days from the date of notice issued by the Authority or Authority’s Engineer in this behalf, or within such reasonable period as may be determined by the Authority or Authority’s Engineer at the request of the Contractor, in accordance with Good Industry Practice.

17.3 Cost of remedying Defects

Any repair or rectification undertaken in accordance with the provisions of Clause 17.2, including any additional testing, shall be carried out by the Contractor at its own risk and cost, to the extent that such rectification or repair is attributable to:

- (a) the design of the Project;

- (b) Plant, Materials or workmanship not being in accordance with this Agreement and the Specifications and Standards;
- (c) improper maintenance during construction of the Project Highway by the Contractor; and/ or
- (d) failure by the Contractor to comply with any other obligation under this Agreement.

17.4 Contractor's failure to rectify Defects

If the Contractor fails to repair or rectify such Defect or deficiency within the period specified in Clause 17.2, the Authority shall be entitled to get the same repaired, rectified or remedied at the Contractor's cost to make the Project Highway conform to the Specifications and Standards and the provisions of this Agreement. All costs consequent thereon shall, after due consultation with the Authority and the Contractor, be determined by the Authority's Engineer. The cost so determined and an amount equal to 20% (twenty percent) of the cost as Damages shall be recoverable by the Authority from the Contractor and may be deducted by the Authority from any monies due to the Contractor.

17.5 Extension of Defects Liability Period

The Defects Liability Period shall be deemed to be extended till the identified Defects under Clause 17.2 have been remedied or rectified.

Article 18

Authority's Engineer

18.1 Appointment of the Authority's Engineer

- (i) The Authority shall appoint a firm of Consulting Engineers or a Project Monitoring Committee (PMC) substantially in accordance with the selection criteria set forth in Schedule-N, to be the engineer under this Agreement (the "**Authority's Engineer**"). In unavoidable circumstances, Authority may appoint an officer to act as Authority's Engineer until appointment of a Consulting Engineering firm/ Supervision Consultant/ PMC.
- (ii) The officer in-charge of the Authority (e.g. GM/ED/Director in the case of NHIDCL) is responsible for the overall supervision and monitoring of the execution of project as the representative of the owner of the project. The Authority's Engineer is appointed to assist the Authority for carrying out the functions as detailed under clause 18.2. As such, an officer of the Authority is vested with all such powers and responsibilities as are enjoined upon the Authority's Engineer and is fully competent to issue any instructions for proper monitoring and supervision of the project, either by himself or through the Authority's Engineer. Instructions issued by the concerned officer of the Authority shall have the same effect as that of the Authority's Engineer in terms of this Agreement. Wherever such concerned officer issues any instructions or notice to the Contractor, he shall endorse a copy thereof to the Authority's Engineer.
- (iii) The Authority's Engineer should be appointed within 10 days from the date of this Agreement or before declaration of Appointed Date, whichever is earlier. The Authority shall notify the appointment or replacement of the Authority's Engineer to the Contractor.
- (iv) The staff of the Authority's Engineer shall include suitably qualified engineers and other professionals who are competent to assist the Authority's Engineer to carry out its duties.

18.2 Duties and authority of the Authority's Engineer

- (i) The Authority's Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement and substantially in accordance with the terms of reference ("**Terms of Reference**" or "**TOR**") set forth in Annexure-I of Schedule N, but subject to obtaining prior written approval of the Authority before determining:
 - (a) any Time Extension;
 - (b) any additional cost to be paid by the Authority to the Contractor;
 - (c) the Termination Payment;

- (d) issuance of Completion Certificate; or
 - (e) any other matter which is not specified in (a), (b), (c) or (d) above and which creates financial liability on either Party.
- (ii) No decision or communication of the Authority's Engineer shall be effective or valid unless it is accompanied by an attested true copy of the approval of the Authority for and in respect of any matter specified in Clause 18.2 (i).
- (iii) The Authority's Engineer shall submit regular periodic reports, at least once every month, to the Authority in respect of its duties and functions under this Agreement. Such reports shall be submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month. For the avoidance of doubt, the Authority's Engineer shall include in its report, compliance of the recommendations of the Safety Consultant.

18.3 Delegation by the Authority's Engineer

- (i) The Authority's Engineer may, by order in writing, delegate any of his duties and responsibilities to suitably qualified and experienced personnel who are accountable to Authority's Engineer, or may revoke any such delegation, under intimation to the Authority and the Contractor. Provided, however, that the Authority's Engineer shall be responsible and liable for all actions and omissions of such personnel.
- (ii) Any failure of the Authority's Engineer to disapprove any work, Plant or Materials shall not constitute approval, and shall, therefore, not prejudice the right of the Authority to reject the work, Plant or Materials, which is not in accordance with the provisions of this Agreement and the Specifications and Standards.
- (iii) Notwithstanding anything stated in Clause 18.3 (i) above, the Authority's Engineer shall not delegate the authority to refer any matter for the Authority's prior approval wherever required in accordance with the provisions of Clause 18.2.

18.4 Instructions of the Authority's Engineer

- (i) The Authority's Engineer may issue instructions for remedying any Defect(s) to the Contractor. The Contractor shall take such instructions from the Authority's Engineer, or from an assistant to whom appropriate authority has been delegated under Clause 18.3.
- (ii) The instructions issued by the Authority's Engineer shall be in writing. However, if the Authority's Engineer issues any oral instructions to the Contractor, it shall confirm the oral instructions in writing within 2 (two) working days of issuing them.
- (iii) In case the Contractor does not receive the confirmation of the oral instructions within the time specified in Clause 18.4 (ii), the Contractor shall seek the written confirmation of the oral instructions from the Authority's Engineer. The Contractor shall obtain acknowledgement from the Authority's Engineer of the communication seeking written confirmation. In case of failure of the Authority's Engineer or its delegated

assistant to reply to the Contractor within 2 (two) days of the receipt of the communication from the Contractor, the Contractor may not carry out the instructions.

- (iv) In case of any dispute on any of the instructions issued by the delegated assistant, the Contractor may refer the dispute to the Authority's Engineer, who shall then confirm, reverse or vary the instructions within 3 (three) business days of the dispute being referred.

18.5 Determination by the Authority's Engineer

- (i) The Authority's Engineer shall consult with each Party in an endeavour to reach agreement wherever this Agreement provides for the determination of any matter by the Authority's Engineer. If such agreement is not achieved, the Authority's Engineer shall make a fair determination in accordance with this Agreement having due regard to all relevant circumstances. The Authority's Engineer shall give notice to both the Parties of each agreement or determination, with supporting particulars.
- (ii) Each Party shall give effect to each agreement or determination made by the Authority's Engineer in accordance with the provisions of this Agreement. Provided, however, that if any Party disputes any instruction, decision, direction or determination of the Authority's Engineer, the Dispute shall be resolved in accordance with the Dispute Resolution Procedure.

18.6 Remuneration of the Authority's Engineer

The remuneration, costs and expenses of the Authority's Engineer shall be paid by the Authority.

18.7 Termination of the Authority's Engineer

- (i) The Authority may, in its discretion, replace the Authority's Engineer at any time. However, the Authority shall ensure that alternative arrangements for appointment of another Authority's Engineer or designation of its own officer as the Authority Engineer for the intervening period are made simultaneously.
- (ii) If the Contractor has reasons to believe that the Authority's Engineer is not discharging its duties and functions in accordance with the provisions of this Agreement, it may make a written representation to the Authority and seek termination of the appointment of the Authority's Engineer. Upon receipt of such representation, the Authority shall hold a tripartite meeting with the Contractor and the Authority's Engineer and make best efforts for an amicable resolution of the representation. In the event that the appointment of the Authority's Engineer is terminated hereunder, the Authority shall appoint forthwith another Authority's Engineer in accordance with Clause 18.1 and 18.7 (i).

Part IV

Financial Covenants

Article 19

Payments

19.1 Contract Price

- (i) The Authority shall make payments to the Contractor for the Works on the basis of the lump sum price accepted by the Authority in consideration of the obligations specified in this Agreement for an amount of INR Rs. _____ (INR _____) (the “**Contract Price**”), which shall be subject to adjustments in accordance with the provisions of this Agreement. For the avoidance of doubt, the Parties expressly agree that the Contract Price shall not include the cost of Maintenance, which shall be paid separately in accordance with the provisions of Clause 19.7. The Parties further agree that save and except as provided in this Agreement, the Contract Price shall be valid and effective until issue of Completion Certificate.
- (ii) The Contract Price includes all duties, taxes, royalty, cess, charges, and fees that may be levied in accordance with the laws and regulations in force as on the Base Date on the Contractor's equipment, Plant, Materials and supplies acquired for the purpose of this Agreement and on the services performed under this Agreement. Nothing in this Agreement shall relieve the Contractor from its responsibility to pay any tax including any tax that may be levied in India on profits made by it in respect of this Agreement.
- (iii) The Contract Price shall not be adjusted for any change in costs stated in Clause 19.1 (ii) above, except as stated in Clauses 19.10 and 19.17.
- (iv) The Contract Price shall not be adjusted to take account of any unforeseen difficulties or costs, unless otherwise provided for in this Agreement.
- (v) Unless otherwise stated in this Agreement, the Contract Price covers all the Contractor's obligations for the Works under this Agreement and all things necessary for the Construction and the remedying of any Defects in the Project Highway.
- (vi) All payments under this Agreement shall be made in Indian Rupees.

19.2 Advance Payment

- (i) The Authority shall make an interest-bearing advance payment (the “**Advance Payment**”) @ “**Bank Rate + 3%**”, equal to 10 % (ten percent) of the Contract Price, exclusively for mobilization expenses. The Advance Payment for mobilization expenses shall be made in two instalments each equal to 5% (five percent) of the Contract Price. The second 5% (five percent) mobilization advance would be released after submission of utilization certificate by the Contractor for the first 5% (five per cent) advance already released earlier.
- (ii) In addition to above, the Authority shall make an additional interest-bearing Advance Payment against newly purchased key Construction equipment required for the works as per agreed Construction programme and brought to the site, if so requested by the Contractor subject to the same terms and conditions specified for Advance Payment for

mobilization expenses in this Agreement. The maximum of such advance shall be 5% (five per cent) of the Contract Price against Bank Guarantee. This advance shall be further subject to the condition that:

- (a) such new equipment are considered by the Authority's Engineer to be necessary for the works and
- (b) these new equipment should be procured in the name of Contractor and is verified by Authority's Engineer to have been brought to site.

The Advance Payment for mobilization expenses and for acquisition of key new Construction equipment would be deemed as interest bearing advance at the applicable interest rate (@ "Bank rate + 3%"), to be compounded annually on a reducing balance basis. The interest would be recovered along with the recovery of mobilization Advance Payment as per provision laid down for the mobilization advance recovery.

- (iii) The Contractor may apply to the Authority for the first instalment of the Advance Payment at any time after the Appointed Date, along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.
- (iv) At any time, after 60 (sixty) days from the Appointed Date, the Contractor may apply to the Authority for the second instalment of the Advance Payment along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.

The Contractor has the option of splitting the Bank Guarantee against Advance Payment for mobilization expenses into parts, each not less than 2.75% (two point seven five per cent) of the Contract Price. Each part of the guarantee shall remain effective till full repayment of such part advance corresponding to this bank guarantee. Such part of Bank Guarantee shall be returned to the Contractor on recovery under the Agreement of the full amount of such part guarantee within 30 (thirty) days of the said recovery.

- (v) The Advance Payment shall be paid by the Authority to the Contractor within 15 (fifteen) days of the receipt of its respective requests in accordance with the provisions of this Clause 19.2.
- (vi) The Advance Payment shall be repaid through percentage deductions from the stage payments determined by the Authority's Engineer in accordance with Clause 19.5, as follows:
 - (a) deductions shall commence in the first Stage Payment Statement;
 - (b) deductions shall be made at the rate of 15% (fifteen percent) of each Stage Payment Statement until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 80% (eighty percent) of the Schedule Construction Period is over;

- (c) if total certified stage payments (excluding the Advance Payment and deductions and repayments of retention) does not exceed 20% (twenty percent) of the Contract Price within [50% of the Scheduled Construction Period] from the Appointed Date then the Advance Payment including interest shall be recovered by encashment of the Bank Guarantee for the Advance Payment.
- (vii) If the Advance Payment has not been fully repaid prior to Termination under Clause 21.7 or Article 23, as the case may be, the whole of the balance then outstanding shall immediately become due and payable by the Contractor to the Authority. Without prejudice to the provisions of Clause 19.2 (vi), in the event of Termination for Contractor Default, the Advance Payment shall be deemed to carry interest @ “Bank Rate+5%” per annum from the date of Advance Payment to the date of recovery by encashment of the Bank Guarantee for the Advance Payment. For the avoidance of doubt, the aforesaid interest shall be payable on the unrecovered balance.

19.3 Procedure for estimating the payment for the Works

- (i) The Authority shall make interim payments to the Contractor as certified by the Authority’s Engineer on completion of a stage, in a length, number or area as specified and valued in accordance with the proportion of the Contract Price assigned to each item and its stage in Schedule-H.
- (ii) The Contractor shall base its claim for interim payment for the stages completed till the end of the month for which the payment is claimed, valued in accordance with Clause 19.3 (i), supported with necessary particulars and documents in accordance with this Agreement.
- (iii) Any reduction in the Contract Price arising out of Change of Scope or the works withdrawn under Clause 8.3 shall not affect the amounts payable for the items or stage payments thereof which are not affected by such Change of Scope or withdrawal. For avoidance of doubt and by way of illustration, the Parties agree that if the amount assigned to Major Bridges is reduced from Rs. 100 crore to Rs. 80 crore owing to Change of Scope or withdrawal of work, the reduction in payment shall be restricted to relevant payments for Major Bridges only and the payment due in respect of all other stage payments under the item Major Bridges shall not be affected in any manner. The Parties further agree that the adjustments arising out of the aforesaid modifications shall be carried out in a manner that the impact of such modifications is restricted to the said Change of Scope or withdrawal, as the case may be, and does not alter the payments due for and in respect of items or stage payments which do not form part of such Change of Scope or withdrawal.

19.4 Stage Payment Statement for Works

The Contractor shall submit a statement (the “**Stage Payment Statement**”), in 3 (three) copies, by the 7th (seventh) day of the month to the Authority’s Engineer in the form set forth in Schedule-O, showing the amount calculated in accordance with Clause 19.3 to which the Contractor considers himself entitled for completed stage(s) of the Works. The

Stage Payment Statement shall be accompanied with the progress reports and any other supporting documents. The Contractor shall not submit any claim for payment of incomplete stages of work.

19.5 Stage Payment for Works

- (i) Within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, the Authority's Engineer shall broadly determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment against the Stage Payment Statement, pending issue of the Interim Payment Certificate by the Authority's Engineer. Within 10 (ten) days of the receipt of recommendation of the Authority's Engineer, the Authority shall make electronic payment directly to the Contractor's bank account.
- (ii) Within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, the Authority's Engineer shall determine and shall deliver to the Authority and the Contractor an IPC certifying the amount due and payable to the Contractor, after adjusting the payments already released to the Contractor against the said statement. For the avoidance of doubt, the Parties agree that the IPC shall specify all the amounts that have been deducted from the Stage Payment Statement and the reasons therefor.
- (iii) In cases where there is a difference of opinion as to the value of any stage, the Authority's Engineer's view shall prevail and interim payments shall be made to the Contractor on this basis; provided that the foregoing shall be without prejudice to the Contractor's right to raise a Dispute.
- (iv) The Authority's Engineer may, for reasons to be recorded, withhold from payment:
 - (a) the estimated value of work or obligation that the Contractor has failed to perform in accordance with this Agreement and the Authority's Engineer had notified the Contractor; and
 - (b) the estimated cost of rectification of work done being not in accordance with this Agreement.
- (v) Payment by the Authority shall not be deemed to indicate the Authority's acceptance, approval, consent or satisfaction with the work done.

19.6 Monthly Maintenance Statement of the Project Highway

- (i) The Contractor shall submit to the Authority's Engineer a monthly maintenance statement ("**Monthly Maintenance Statement**") in 3 (three) copies by the 7th(seventh) day of each month in the format set forth in Schedule-O for the Maintenance of the Project Highway during the previous month.
- (ii) The monthly lump sum amount payable for Maintenance shall be 1/12th (one- twelfth) of the annual cost of Maintenance as specified in Clause 14.1 (i).

19.7 Payment for Maintenance of the Project Highway

- (i) Within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, the Authority's Engineer shall verify the Contractor's monthly maintenance statement and certify the amount to be paid to the Contractor taking into account:
 - (a) Compliance with the Maintenance Requirements; and
 - (b) reduction for non-compliance with the Maintenance Requirement in accordance with Clause 19.7 (ii).

The Authority's Engineer shall deliver to the Authority an IPC approving or amending the monthly maintenance statement to reflect the amount due to the Contractor in accordance with this Agreement.
- (ii) Maintenance shall be measured in units of one kilometre each; provided, however, that payment thereof shall be made in fixed monthly amounts in accordance with this Agreement. If the Maintenance Requirements set forth in Schedule-E are not met, reduction in payments shall be made in accordance with the provisions of Schedule-M. The reductions for non-compliance with the Maintenance Requirements shall be applied on the basis of monthly inspections by the Authority's Engineer.
- (iii) The deduction made on account of non-compliance with the Maintenance Requirements shall not be subsequently considered for payment after the compliance is achieved by repair or rectification.
- (iv) The Authority shall pay to the Contractor every quarter any amount due under any IPC under this Clause 19.7. The payment shall be made no later than 30 (thirty) days from the date of submission of the last IPC for the relevant quarter.

19.8 Payment of Damages

- (i) The Contractor may claim Damages due and payable to it in accordance with the provisions of this Agreement.
- (ii) The Authority's Engineer shall issue the IPC within 15 (fifteen) days of the receipt of the claim under Clause 19.8 (i), after making adjustments in accordance with the provisions of this Agreement. The Authority shall pay to the Contractor the amount due under any IPC within a period of 30 (thirty) days from the date of the submission of the claim under this Clause 19.8. In the event of the failure of the Authority to make payment to the Contractor within the specified time, the Authority shall be liable to pay to the Contractor interest thereon and the provisions of Clause 19.9 shall apply mutatis mutandis thereto.

19.9 Time of payment and interest

- (i) The Authority shall pay to the Contractor any amount due under any payment certificate issued by the Authority's Engineer in accordance with the provisions of this Article 19, or in accordance with any other clause of this Agreement as follows:

- (a) payment shall be made no later than 30 (thirty) days from the date of submission of the Stage Payment Statement by the Contractor to the Authority's Engineer for certification in accordance with the provisions of Clause 19.4 for an IPC; provided that, in the event the IPC is not issued by the Authority's Engineer within the aforesaid period of 30 (thirty) days, the Authority shall pay the amount shown in the Contractor's Stage Payment Statement and any discrepancy therein shall be added to, or deducted from, the next payment certificate issued to the Contractor; and
 - (b) payment shall be made no later than 30 (thirty) days from the date of submission of the Final Payment Certificate for Works along with the discharge submitted to the Authority's Engineer in accordance with the provisions of Clause 19.15 for certification.
- (ii) In the event of the failure of the Authority to make payment to the Contractor within the time period stated in this Clause 19.9, the Authority shall be liable to pay to the Contractor interest @ Bank Rate + 3% per annum, on all sums remaining unpaid from the date on which the same should have been paid, calculated in accordance with the provisions of sub-Clauses (a) and (b) of Clause 19.9 (i) and till the date of actual payment.

19.10 Price adjustment for the Works

- (i) The amounts payable to the Contractor for Works shall be adjusted in accordance with the provisions of this Clause 19.10
- (ii) Subject to the provisions of Clause 19.10 (iii), the amounts payable to the Contractor for Works, shall be adjusted in the IPC issued by the Authority's Engineer for the increase or decrease in the index cost of inputs for the Works, by the addition or subtraction of the amounts determined by the formulae prescribed in Clause 19.10 (iv).
- (iii) To the extent that full compensation for any increase or decrease in costs to the Contractor is not covered by the provisions of this or other Clauses in this Agreement, the costs and prices payable under this Agreement shall be deemed to include the amounts required to cover the contingency of such other increase or decrease of costs and prices.
- (iv) The Contract Price shall be adjusted for increase or decrease in rates and price of labour, cement, steel, Plant, machinery and spares, bitumen, fuel and lubricants, and other material inputs in accordance with the principles, procedures and formulae specified below:
 - (a) Price adjustment shall be applied on completion of the specified stage of the respective item of work in accordance with Schedule-H;
 - (b) Adjustment for each item of work/stage shall be made separately;
 - (c) The following expressions and meanings are assigned to the value of the work done:

RW= Value of work done for the completion of a stage under the following items of Schedule-H:

- i. Road works; and
- ii. Other works

BR = Value of work done for the completion of a stage under the items Major Bridges and Structures (Schedule-H)

(d) Price adjustment for changes in cost shall be paid in accordance with the following formulae:

$$(i) \text{ VRW} = 0.85 \text{ RW} \times [\text{PL} \times (\text{LI} - \text{LO})/\text{LO} + \text{PA} \times (\text{AI} - \text{AO})/\text{AO} + \text{PF} \times (\text{FI} - \text{FO})/\text{FO} + \text{PB} \times (\text{BI} - \text{BO})/\text{BO} + \text{PM} \times (\text{MI} - \text{MO})/\text{MO} + \text{PC} \times (\text{CI} - \text{CO})/\text{CO} + \text{PS} \times (\text{SI} - \text{SO})/\text{SO}]$$

$$(ii) \text{ VBR} = 0.85 \text{ BR} \times [\text{PL} \times (\text{LI} - \text{LO})/\text{LO} + \text{PA} \times (\text{AI} - \text{AO})/\text{AO} + \text{PF} \times (\text{FI} - \text{FO})/\text{FO} + \text{PM} \times (\text{MI} - \text{MO})/\text{MO} + \text{PC} \times (\text{CI} - \text{CO})/\text{CO} + \text{PS} \times (\text{SI} - \text{SO})/\text{SO}]$$

Where,

VRW = Increase or decrease in the cost of road works/other works during the period under consideration due to changes in the rates for relevant components as stated in subparagraph (e).

VBR = Increase or decrease in the cost of Major Bridges and Structures during the period under consideration due to changes in the rates for relevant components as stated in subparagraph (e).

PB, PC, PL, PM, and PS are the percentages of bitumen, cement, labour, other materials, and steel/components (including strands and cables) respectively for the relevant item as stated in sub-paragraph (e).

PA is the percentage of Plant, machinery and spares component for the relevant item as stated in sub-paragraph (e).

PF is the percentage of fuel and lubricants for the relevant items as stated in subparagraph (e).

A₀ = The wholesale price index as published by the Ministry of Commerce & Industry, Government of India (hereinafter called "WPI") for "Manufacture of machinery for mining, quarrying and construction" for the month of the Base Date.

A_t = The WPI for construction machinery for the month three months prior to the month to which the IPC relates.

B₀ = The official retail price of bitumen at the nearest refinery at [Panipat] on the Base Date.

B_t = The official retail price of bitumen at nearest refinery at [Panipat], on the first day of the month three months prior to the month to which the IPC relates.

C₀ = The WPI for Ordinary Portland Cement for the month of the Base Date.

- C_t = The WPI for Ordinary Portland Cement for the month three months prior to the month to which the IPC relates.
- F_0 = The official retail price of high speed diesel (HSD) oil at the existing consumer pumps of Indian Oil Corporation ("IOC") in the State of [Jammu & Kashmir] on the Base Date.
- F_t = The official retail price of HSD at the existing consumer pumps of IOC in the State of [Jammu & Kashmir] on the first day of the month three months prior to the month to which the IPC relates.
- L_0 = The consumer price index for industrial workers for the [circle applicable to work site], published by Labour Bureau, Ministry of Labour, Government of India, (hereinafter called "CPI") for the month of the Base Date.
- L_t = The CPI for the month three months prior to the month to which the IPC relates.
- M_0 = The WPI for all commodities for the month of the Base Date.
- M_t = The WPI for all commodities for the month three months prior to the month to which the IPC relates.
- S_0 = The WPI for Mild Steel –Long Products for the month of the Base Date.
- S_t = The WPI for Mild Steel –Long Products for the month three months prior to the month to which the IPC relates.

e) The following percentages shall govern the price adjustment of the Contract Price:

Component	Item				
	Road Works				Major Bridges and Structures
	Earthwork, Granular work, and Other works	Bituminous work	Cement Concrete Pavement	Culverts, minor bridges and other structures	
Labour (PL)	[20%]	[20%]	[20%]	[15%]	[15%]
Cement (PC)	[5%]	Nil	[20%]	[15%]	[15%]
Steel (PS)	Nil	Nil	Nil	[15%]	[20%]
Bitumen (PB)	Nil	[15%]	Nil	Nil	Nil
Fuel and lubricants (PF)	[10%]	[10%]	[10%]	[10%]	[10%]
Other Materials (PM)	[50%]	[40%]	[35%]	[30%]	[25%]
Plant, machinery and spares.	[15%]	[15%]	[15%]	[15%]	[15%]
Total	100%	100%	100%	100%	100%

19.11 Restrictions on price adjustment

Price adjustment shall be due and payable only in respect of the stages of Works for which the Stage Payment Statement has been submitted by the Contractor no later than 30 (thirty) days from the date of the applicable Project Milestone or the Scheduled Completion Date, as the case may be, including any Time Extension granted therefor in accordance with the provisions of this Agreement. For the avoidance of doubt, in the event of submission of any Stage Payment Statement after the period specified herein, price adjustment shall be applicable until the date of the respective Project Milestone or the Scheduled Completion Date, as the case may be.

19.12 Price adjustment for Maintenance of Project Highway

Lump sum payment for Maintenance shall be adjusted every quarter for changes in rates and prices of various inputs in accordance with the formula given below:

$$V = P \times (W_I - W_O) / W_O$$

Where

V= Increase or decrease in the quarterly lump sum payment

P= Quarterly lump sum payment due to the Contractor after adjusting any reduction in payment for non-compliance of the Maintenance Requirements

W0=The wholesale price index (all commodities) for the month of the Base Date.

WI= The wholesale price index (all commodities) for the first day of the quarter under consideration for determining the price adjustment.

19.13 Final Payment Statement

- (i) Within 60 (sixty) days after receiving the Completion Certificate under Clause 12.2, the Contractor shall submit to the Authority's Engineer for consideration 6 (six) copies of a Final Payment Statement (the "**Final Payment Statement**") for Works, with supporting documents showing in detail, in the form prescribed by the Authority's Engineer:

- (a) the summary of Contractor's Stage Payment claims for Works as submitted in accordance with Clause 19.4;
- (b) the amounts received from the Authority against each claim; and
- (c) any further sums which the Contractor considers due to it from the Authority.

If the Authority's Engineer disagrees with or cannot verify any part of the Final Payment Statement, the Contractor shall submit such further information as the Authority's Engineer may reasonably require. The Authority's Engineer shall deliver to the Authority:

- i. an IPC for those parts of the Final Payment Statement which are not in dispute, along with a list of disputed items which shall then be settled in accordance with the provisions of Article 26; or
 - ii. a Final Payment Certificate in accordance with Clause 19.15 if there are no disputed items.
- (ii) If the Authority's Engineer does not prescribe the form referred to in Clause 19.13 (i) within 15 (fifteen) of the date of issue of the Completion Certificate, the Contractor shall submit the statement in such form as it deems fit.

19.14 Discharge

Upon submission of the Final Payment Statement for Works under Clause 19.13, the Contractor shall give to the Authority, with a copy to the Authority's Engineer, a written discharge confirming that the total of the Final Payment Statement represents full and final settlement of all monies due to the Contractor in respect of this Agreement for all the Works arising out of this Agreement, except for any monies due to either Party on account of any Defect. Provided that such discharge shall become effective only after the payment due has been made in accordance with the Final Payment Certificate issued pursuant to Clause 19.15.

19.15 Final Payment Certificate

- (i) Within 30 (thirty) days after receipt of the Final Payment Statement for Works under Clause 19.13, and the written discharge under Clause 19.14, and there being no disputed items of claim, the Authority's Engineer shall deliver to the Authority, with a copy to the Contractor, a final payment certificate (the **"Final Payment Certificate"**) stating the amount which, in the opinion of the Authority's Engineer, is finally due under this Agreement or otherwise. For the avoidance of doubt, before issuing the Final Payment Certificate, the Authority's Engineer shall ascertain from the Authority all amounts previously paid by the Authority and for all sums to which the Authority is entitled, the balance, if any, due from the Authority to the Contractor or from the Contractor to the Authority, as the case may be.
- (ii) The Authority shall, in accordance with the provisions of Clause 19.9, pay to the Contractor the amount which is stated as being finally due in the Final Payment Certificate.

19.16 Final payment statement for Maintenance

- (i) Within 30 (thirty) days after completion of the Maintenance Period, the Contractor shall submit to the Authority's Engineer 6 (six) copies of the final payment statement for Maintenance of the Project Highway, with supporting documents showing the details set forth below in the form prescribed by the Authority's Engineer:
 - (a) the total amount claimed in accordance with clause 19.7 (i) and
 - (b) any sums which the Contractor considers to be due to it, with supporting documents.
- (ii) The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance under Clause 19.16 (i), segregating the items of amount payable from the items of amount disallowed. The Authority shall make payment on the basis of the final payment authorized by the Authority's Engineer within a period of 30 (thirty) days of the receipt of the Final Payment Statement from the Authority's Engineer.
- (iii) If the Authority's Engineer does not prescribe the form within 15 (fifteen) days of the date of issue of the Completion Certificate, the Contractor shall submit the statement in such form as it deems fit.

19.17 Change in law

- (i) If as a result of Change in Law, the Contractor suffers any additional costs in the execution of the Works or in relation to the performance of its other obligations under this Agreement, the Contractor shall, within 15 (fifteen) days from the date it becomes reasonably aware of such addition in cost, notify the Authority with a copy to the Authority's Engineer of such additional cost due to Change in Law.

- (ii) If as a result of Change in Law, the Contractor benefits from any reduction in costs for the execution of this Agreement or in accordance with the provisions of this Agreement, either Party shall, within 15 (fifteen) days from the date it becomes reasonably aware of such reduction in cost, notify the other Party with a copy to the Authority's Engineer of such reduction in cost due to Change in Law.
- (iii) The Authority's Engineer shall, within 15 (fifteen) days from the date of receipt of the notice from the Contractor or the Authority, determine any addition or reduction to the Contract Price, as the case may be, due to the Change in Law.

19.18 Correction of Interim Payment Certificates

The Authority's Engineer may by an Interim Payment Certificate make any correction or modification in any previous Interim Payment Certificate issued by the Authority's Engineer.

19.19 Authority's claims

If the Authority considers itself to be entitled to any payment from the Contractor under any Clause of this Agreement, it shall give notice and particulars to the Contractor 20 (twenty) days before making the recovery from any amount due to the Contractor, and shall take into consideration the representation, if any, made by the Contractor in this behalf, before making such recovery.

19.20 Bonus for early completion

In the event that the Project Completion Date occurs prior to the Scheduled Completion Date, the Contractor shall be entitled to receive a payment of bonus equivalent to 0.03% (zero point zero three per cent) of the Contract Price for each day by which the Project Completion Date precedes the Scheduled Completion Date, but subject to a maximum of 5% (five per cent) of the Contract Price. Provided, however, that the payment of bonus, if any, shall be made only after the issue of the Completion Certificate. For the avoidance of the doubt, the Parties agree that for the purpose of determining the bonus payable hereunder, the works shall always be deemed to be as specified in this Contract Agreement but excluding the works deemed to be deleted from the scope of work under clause 8.3 of this Contract Agreement and the Contract Price shall always be deemed to be the amount specified in Clause 19.1 (i) after excluding the Contract Price of the Works deemed to be deleted from the Scope of Work under clause 8.3 of this Contract Agreement, and shall exclude any revision thereof for any reason. The Parties also agree that bonus shall be payable only if each work for which Time Extension has been granted is completed within respective Extended Time.

Article 20

Insurance

20.1 Insurance for Works and Maintenance

- (i) The Contractor shall effect and maintain at its own cost the insurances specified in Schedule-P and as per the requirements under the Applicable Laws.
- (ii) Subject to the provisions of Clause 21.6, the Authority and the Contractor shall, in accordance with its obligations as provided for in this Agreement, be liable to bear the cost of any loss or damage that does not fall within the scope of this Article 20 or cannot be recovered from the insurers.
- (iii) Subject to the exceptions specified in Clause 20.1 (iv) below, the Contractor shall, save and except as provided for in this Agreement, fully indemnify, hold harmless and defend the Authority from and against any and all losses, damages, costs, charges and/or claims with respect to:
 - (a) the death of or injury to any person; or
 - (b) the loss of or damage to any property (other than the Works);that may arise out of or in consequence of any breach by the Contractor of this Agreement during the execution of the Works or the remedying of any Defects therein.
- (iv) Notwithstanding anything stated above in Clause 20.1 (iii), the Authority shall fully indemnify the Contractor from and against any and all losses, damages, costs, charges, proceedings and/or claims arising out of or with respect to:
 - (a) the use or occupation of land or any part thereof by the Authority;
 - (b) the right of the Authority to execute the Works, or any part thereof, on, over, under, in or through any land;
 - (c) the damage to property which is the unavoidable result of the execution and completion of the Works, or the remedying of any Defects therein, in accordance with this Agreement; and
 - (d) the death of or injury to persons or loss of or damage to property resulting from any act or neglect of the Authority, its agents, servants or other contractors, not being employed by the Contractor.

Provided that, in the event of any injury or damage as a result of the contributory negligence of the Contractor, the Authority shall be liable to indemnify the Contractor from and against any and all losses, damages, costs, charges, proceedings and/or claims to the extent as may be proportionately determined to be the liability of the Authority, its servants or agents or other contractors not associated with the Contractor in such injury or damage.

- (v) Without prejudice to the obligations of the Parties as specified under Clauses 20.1 (iii) and 20.1 (iv), the Contractor shall maintain or effect such third party insurances as may be required under the Applicable Laws.
- (vi) The Contractor shall provide to the Authority, within 30 days of the Appointed Date, evidence of professional liability insurance maintained by its Design Director and/or consultants to cover the risk of professional negligence in the design of Works. The professional liability coverage shall be for a sum of not less than [3% (three per cent)] of the Contract Price and shall be maintained until the end of the Defects Liability Period.

20.2 Notice to the Authority

No later than 15 (fifteen) days after the date of this Agreement, the Contractor 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 20. Within 15 (fifteen) days of receipt of such notice, the Authority may require the Contractor 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.

20.3 Evidence of Insurance Cover

- (i) All insurances obtained by the Contractor in accordance with this Article 20 shall be maintained with insurers on terms consistent with Good Industry Practice. Within 10 (ten) days from the Appointed Date, the Contractor shall furnish to the Authority notarized true copies of the certificate(s) of insurance, copies of insurance policies and premia 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 Contractor to the Authority. The Contractor shall act in accordance with the directions of the Authority. Provided that the Contractor shall produce to the Authority the insurance policies in force and the receipts for payment of the current premia.
- (ii) The Contractor shall ensure the adequacy of the insurances at all times in accordance with the provisions of this Agreement.

20.4 Remedy for failure to insure

If the Contractor 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 premia and recover the costs thereof from the Contractor, 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 Contractor.

20.5 Waiver of subrogation

All insurance policies in respect of the insurance obtained by the Contractor pursuant to this Article 20 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.

20.6 Contractor's waiver

The Contractor 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 Contractor 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 Contractor 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.

20.7 Cross liabilities

Any such insurance maintained or effected in pursuance of this Article 20 shall include a cross liability clause such that the insurance shall apply to the Contractor and to the Authority as separately insured.

20.8 Accident or injury to workmen

Notwithstanding anything stated in this Agreement, it is hereby expressly agreed between the Parties that the Authority shall not be liable for or in respect of any damages or compensation payable to any workman or other person in the employment of the Contractor or Sub-contractor, save and except as for death or injury resulting from any act, omission or wilful default of the Authority, its agents or servants. The Contractor shall indemnify and keep indemnified the Authority from and against all such claims, proceedings, damages, costs, charges, and expenses whatsoever in respect of the above save and except for those acts, omissions or wilful defaults for which the Authority shall be liable.

20.9 Insurance against accident to workmen

The Contractor shall effect and maintain during the Agreement such insurances as may be required to insure the Contractor's personnel and any other persons employed by it on the Project Highway from and against any liability incurred in pursuance of this Article 20. Provided that for the purposes of this Clause 20.9, the Contractor's personnel/any person employed by the Contractor shall include the Subcontractor and its personnel. It is further provided that, in respect of any persons employed by any

Sub-contractor, the Contractor's obligations to insure as aforesaid under this Clause 20.9 shall be discharged if the Sub-contractor shall have insured against any liability in respect of such persons in such manner that the Authority is indemnified under the policy. The Contractor shall require such Sub-contractor to produce before the Authority, when required, such policy of insurance and the receipt for payment of the current premium within 10 (ten) days of such demand being made by the Authority

20.10 Application of insurance proceeds

The proceeds from all insurance claims, except for life and injury, shall be applied for any necessary repair, reconstruction, reinstatement, replacement, improvement, delivery or installation of the Project Highway and the provisions of this Agreement in respect of construction of works shall apply *mutatis mutandis* to the works undertaken out of the proceeds of insurance.

20.11 Compliance with policy conditions

Each Party hereby expressly agrees to fully indemnify the other Party from and against all losses and claims arising from its failure to comply with conditions imposed by the insurance policies effected in accordance with this Agreement.

20.12 General Requirements of Insurance Policies

The Contractor must:

- (a) immediately deposit copies of the policies or certificates of any insurance which it is required to effect under the Contract, together with receipts for the premiums;
- (b) effect all insurances for which the Contractor is responsible with an insurer approved by the Authority;
- (c) make no material changes to the terms of any insurance without the Authority's approval;
- (d) in all respects comply with any conditions stipulated in the insurance policies which the Contractor is required to effect under the Agreement or which the Authority has effected in relation to the Facility and notified to the Contractor; and shall provide all assistance to the Authority in the application for, and finalization of, such comprehensive insurance package;
- (e) regardless of the extent of settlement of claims by the underwriters or the time taken for settlement of claims, the Contractor shall make good any loss, or damage at its own cost promptly;
- (f) provide all assistance to the Authority in the application for, and finalization of, such comprehensive insurance package;
- (g) pay the Contractor's share of the insurance premiums for insurance premiums allocated under such comprehensive insurance package policy to the insurances directly to the insurance provider promptly on demand. In case the Contractor fails to make such payment in time, the Authority may elect to pay

the Contractor's share and adjust it against amounts payable to the Contractor under this Agreement

- (h) in the case of occurrence of any event leading to an insurance claim, promptly follow the procedures specified by the insurance provider, and provide full cooperation and access to the insurance provider or its representative, to settle the claim expeditiously;
- (i) require all the Sub-Contractors providing equipment and materials or services to the Contractor or the Authority to obtain, maintain and keep in force during the time in which they are involved in the performance of the Works hereunder insurance coverage consistent with the Contractor's insurance obligations hereunder and the Contractor shall also be responsible for fulfillment of this requirement; and
- (j) the required insurance coverage and the Contractor's obligations-referred to shall in no way affect or limit the Contractor's liability with respect to its performance of the Works. Nothing in this Section shall limit or relieve the Contractor of its liabilities and obligations under this Agreement.

Part V

Force Majeure and Termination

Article 21

Force Majeure

21.1 Force Majeure

As used in this Agreement, the expression “**Force Majeure**” or “**Force Majeure Event**” shall mean occurrence in India of any or all of Non-Political Event, Indirect Political Event and Political Event, as defined in Clauses 21.2, 21.3 and 21.4 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 (i) is beyond the reasonable control of the Affected Party, and (ii) the Affected Party could not have prevented or overcome by exercise of due diligence and following Good Industry Practice, and (iii) has Material Adverse Effect on the Affected Party.

21.2 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 ionising 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 Contractor, Sub- contractors or their respective employees/ representatives, or attributable to any act or omission of any of them) interrupting supplies and services to the Project Highway for a continuous period of 24 (twenty-four) hours and an aggregate period exceeding 10 (ten) days in an Accounting Year, and not being an Indirect Political Event set forth in Clause 21.3;
- (c) any failure or delay of a Sub-contractor but only to the extent caused by another Non-Political Event;
- (d) any judgement or order of any court of competent jurisdiction or statutory authority made against the Contractor in any proceedings for reasons other than (i) failure of the Contractor 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.

21.3 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) industry-wide or State-wide strikes or industrial action for a continuous period of 24 (twenty-four) hours and exceeding an aggregate period of 10 (ten) days in an Accounting Year;
- (c) any civil commotion, boycott or political agitation which prevents construction of the Project Highway by the Contractor for an aggregate period exceeding 10 (ten) days in an Accounting Year;
- (d) any failure or delay of a Sub-contractor to the extent caused by any Indirect Political Event;
- (e) any Indirect Political Event that causes a Non-Political Event; or
- (f) any event or circumstances of a nature analogous to any of the foregoing.

21.4 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 Clause 19.17;
- (b) compulsory acquisition in national interest or expropriation of any Project Assets or rights of the Contractor or of the Sub-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 Contractor or any of the Sub-contractors to perform their respective obligations under this Agreement; provided that such delay, modification, denial, refusal or revocation did not result from the Contractor's or any Subcontractor'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 Sub-contractor but only to the extent caused by another Political Event; or
- (e) any event or circumstances of a nature analogous to any of the foregoing.

21.5 Duty to report Force Majeure Event

- (i) 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 21 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; and
 - (d) any other information relevant to the Affected Party's claim.
- (ii) 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 10 (ten) 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.
- (iii) 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 21.5 (i), and such other information as the other Party may reasonably request the Affected Party to provide.

21.6 Effect of Force Majeure Event on the Agreement

- (i) Upon the occurrence of any Force Majeure after the Appointed Date, the costs incurred and attributable to such event and directly relating to this Agreement (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 Contractor, 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 Contractor for the Force Majeure events; 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 Contractor.
 - (d) For the avoidance of doubt, Force Majeure costs may include costs directly attributable to the Force Majeure Event, but shall not include debt repayment obligations, if any, of the Contractor.
- (ii) Save and except as expressly provided in this Article 21, 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

- (iii) Upon the occurrence of any Force Majeure Event during the Construction Period, the Project Completion Schedule for and in respect of the affected Works shall be extended on a day for day basis for such period as performance of the Contractor's obligations is affected on account of the Force Majeure Event or its subsisting effects.

21.7 Termination Notice for Force Majeure Event

- (i) If a Force Majeure Event subsists for a period of 60 (sixty) days or more within a continuous period of 120 (one hundred and twenty) 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 21, 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) days' 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.

21.8 Termination Payment for Force Majeure Event

- (i) In the event of this Agreement being terminated on account of a Non-Political Event, the Termination Payment shall be an amount equal to the sum payable under Clause 23.5.

Provided that in the event Termination occurs during the Maintenance Period, the Authority's Engineer shall only determine the value of Works associated with Maintenance.

- (ii) If Termination is on account of an Indirect Political Event, the Termination Payment shall include:
 - (a) any sums due and payable under Clause 23.5; and
 - (b) the reasonable cost, as determined by the Authority's Engineer, of the Plant and Materials procured by the Contractor and transferred to the Authority for use in Construction or Maintenance, only if such Plant and Materials are in conformity with the Specifications and Standards;

Provided that in the event Termination occurs during the Maintenance Period, the Authority's Engineer shall only determine the value of Works associated with Maintenance.

- (iii) If Termination is on account of a Political Event, the Authority shall make a Termination Payment to the Contractor in an amount that would be payable under Clause 23.6 (ii) as if it were an Authority Default.

21.9 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.

21.10 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.

Article 22

Suspension of Contractor's Rights

22.1 Suspension upon Contractor Default

Upon occurrence of a Contractor Default, the Authority shall be entitled, without prejudice to its other rights and remedies under this Agreement including its rights of Termination hereunder, to (i) suspend carrying out of the Works or Maintenance or any part thereof, and (ii) carry out such Works or Maintenance itself 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 Contractor and may extend up to a period not exceeding 90 (ninety) days from the date of issue of such notice.

22.2 Authority to act on behalf of Contractor

During the period of Suspension hereunder, all rights and liabilities vested in the Contractor in accordance with the provisions of this Agreement shall continue to vest therein and all things done or actions taken, including expenditure incurred by the Authority for discharging the obligations of the Contractor under and in accordance with this Agreement shall be deemed to have been done or taken for and on behalf of the Contractor and the Contractor undertakes to indemnify the Authority for all costs incurred during such period. The Contractor hereby licenses and sub-licenses respectively, the Authority or any other person authorized by it under Clause 22.1 to use during Suspension, all Intellectual Property belonging to or licensed to the Contractor with respect to the Project Highway and its design, engineering, construction and maintenance, and which is used or created by the Contractor in performing its obligations under the Agreement.

22.3 Revocation of Suspension

- (i) In the event that the Authority shall have rectified or removed the cause of Suspension within a period not exceeding 60 (sixty) days from the date of Suspension, it shall revoke the Suspension forthwith and restore all rights of the Contractor 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.
- (ii) Upon the Contractor having cured the Contractor Default within a period not exceeding 60 (sixty) days from the date of Suspension, the Authority shall revoke the Suspension forthwith and restore all rights of the Contractor under this Agreement.

22.4 Termination

- (i) At any time during the period of Suspension under this Article 22, the Contractor may by notice require the Authority to revoke the Suspension and issue a Termination Notice.

The Authority shall, within 15 (fifteen) days of receipt of such notice, terminate this Agreement under and in accordance with Article 23.

- (ii) Notwithstanding anything to the contrary contained in this Agreement, in the event that Suspension is not revoked within 90 (ninety) days from the date of Suspension hereunder, the 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 Contractor Default.

Article 23

Termination

23.1 Termination for Contractor Default

- (i) Save as otherwise provided in this Agreement, in the event that any of the defaults specified below shall have occurred, and the Contractor 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 Contractor shall be deemed to be in default of this Agreement (the “**Contractor Default**”), unless the default has occurred solely as a result of any breach of this Agreement by the Authority or due to Force Majeure. The defaults referred to herein shall include:
- (a) the Contractor fails to provide, extend or replenish, as the case may be, the Performance Security in accordance with this Agreement;
 - (b) after the replenishment or furnishing of fresh Performance Security in accordance with Clause 7.3, the Contractor fails to cure, within a Cure Period of 30 (thirty) days, the Contractor Default for which the whole or part of the Performance Security was appropriated;
 - (c) the Contractor does not achieve the latest outstanding Project Milestone due in accordance with the provisions of Schedule-J, subject to any Time Extension, and continues to be in default for 45 (forty five) days;
 - (d) the Contractor abandons or manifests intention to abandon the construction or Maintenance of the Project Highway without the prior written consent of the Authority;
 - (e) the Contractor fails to proceed with the Works in accordance with the provisions of Clause 10.1 or stops Works and/or the Maintenance for 30 (thirty) days without reflecting the same in the current programme and such stoppage has not been authorised by the Authority’s Engineer;
 - (f) the Project Completion Date does not occur within the period specified in Schedule-J for the Scheduled Completion Date, or any extension thereof;
 - (g) the Contractor fails to rectify any Defect, the non-rectification of which shall have a Material Adverse Effect on the Project, within the time specified in this Agreement or as directed by the Authority’s Engineer;
 - (h) the Contractor subcontracts the Works or any part thereof in violation of this Agreement or assigns any part of the Works or the Maintenance without the prior approval of the Authority;
 - (i) the Contractor creates any Encumbrance in breach of this Agreement;
 - (j) an execution levied on any of the assets of the Contractor has caused a Material Adverse Effect;
 - (k) the Contractor is adjudged bankrupt or insolvent, or if a trustee or receiver is appointed for the Contractor or for the whole or material part of its assets that

has a material bearing on the Project;

- (l) the Contractor 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;
- (m) a resolution for winding up or insolvency of the Contractor is passed, or any petition for winding up or insolvency of the Contractor is admitted by a court of competent jurisdiction and a provisional liquidator or receiver or interim resolution professional, as the case may be, is appointed and such order has not been set aside within 90 (ninety) days of the date thereof or the Contractor is ordered to be wound up by 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 Contractor are transferred to the amalgamated or reconstructed entity and that the amalgamated or reconstructed entity has unconditionally assumed the obligations of the Contractor under this Agreement; and provided that:
 - i. the amalgamated or reconstructed entity has the capability and experience necessary for the performance of its obligations under this Agreement; and
 - ii. the amalgamated or reconstructed entity has the financial standing to perform its obligations under this Agreement and has a credit worthiness at least as good as that of the Contractor as at the Appointed Date;
- (n) any representation or warranty of the Contractor herein contained which is, as of the date hereof, found to be false or the Contractor is at any time hereafter found to be in breach or non-compliance thereof;
- (o) the Contractor 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;
- (p) the Contractor has failed to fulfil any obligation, for which failure Termination has been specified in this Agreement; or
- (q) the Contractor commits a default in complying with any other provision of this Agreement if such a default causes a Material Adverse Effect on the Project or on the Authority.
- (r) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:
 - i. for doing or forbearing to do any action in relation to the Contract, or
 - ii. for showing or forbearing to show favour or disfavour to any person in relation to the Contract,or if any of the Contractor's personnel, agents or subcontractors gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (s). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination

- (ii) Without prejudice to any other rights or remedies which the Authority may have under this Agreement, upon occurrence of a Contractor Default, the Authority shall be entitled to terminate this Agreement by issuing a Termination Notice to the Contractor; provided that before issuing the Termination Notice, the Authority shall by a notice inform the Contractor of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Contractor to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice.
- (iii) The following shall apply in respect of cure of any of the defaults and/ or breaches of the Agreement:
 - (a) The Cure Period shall commence from the date of the notice by the Authority to the Contractor asking the latter to cure the breach or default specified in such notice;
 - (b) The Cure Period provided in the Agreement shall not relieve the Contractor from liability for Damages caused by its breach or default;
 - (c) The Cure Period shall not in any way be extended by any period of suspension under the Agreement;
 - (d) If the cure of any breach by the Contractor requires any reasonable action by the Contractor that must be approved by the Authority hereunder the applicable Cure Period (and any liability of the Contractor for damages incurred) shall be extended by the period taken by the Authority to accord its required approval.
- (iv) After termination of this Agreement for Contractor Default, the Authority may complete the Works and/or arrange for any other entities to do so. The Authority and these entities may then use any Materials, Plant and equipment, Contractor's documents and other design documents made by or on behalf of the Contractor.

23.2 Termination for Authority Default

- (i) 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 Contractor or due to Force Majeure. The defaults referred to herein shall include:
 - (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 Contractor;
 - (b) the Authority has failed to make payment of any amount due and payable to the Contractor within the period specified in this Agreement;
 - (c) the Authority has failed to provide, within a period of 180 (one hundred and eighty) days from the Appointed Date, the environmental clearances required for construction of the Project Highway;

- (d) the Authority becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with its creditors, or carries on business under a receiver, trustee or manager for the benefit of its creditors, or if any act is done or event occurs which (under Applicable Laws) has a similar effect;
 - (e) 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;
 - (f) the Authority's Engineer fails to issue the relevant Interim Payment Certificate within 60 (sixty) days after receiving a statement and supporting documents; or
 - (g) the whole work is suspended by Authority beyond 120 (one hundred twenty) days for any reason which is not attributed to the Contractor.
- (ii) Without prejudice to any other right or remedy which the Contractor may have under this Agreement, upon occurrence of an Authority Default, the Contractor shall be entitled to terminate this Agreement by issuing a Termination Notice to the Authority; provided that before issuing the Termination Notice, the Contractor 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.

If on the consideration of the Authority's representation or otherwise, the contractor does not issue the Termination Notice on such 15th (fifteenth) day and prefers to continue with the project, it is deemed that the cause of action of the Termination Notice has been condoned by the Contractor and he would be deemed to have waived any claim and forfeited any right to any other remedy on that count or in relation to such action or omission.

23.3 Termination for Authority's convenience

Notwithstanding anything stated hereinabove, the Authority may terminate this Agreement for convenience. The termination shall take effect 30 (thirty) days from the date of notice provided to the Contractor.

23.4 Requirements after Termination

Upon Termination of this Agreement in accordance with the terms of this Article 23, the Contractor shall comply with and conform to the following:

- (a) deliver all relevant records, reports, Intellectual Property and other licences pertaining to the Works, Maintenance, other design documents;
- (b) transfer and/or deliver all Applicable Permits to the extent permissible under Applicable Laws; and
- (c) vacate the Site within 15 (fifteen) days.

23.5 Valuation of Unpaid Works

- (i) Within a period of 45 (forty-five) days after Termination under Clause 23.1, 23.2 or 23.3, as the case may be, has taken effect, the Authority's Engineer shall proceed in accordance with Clause 18.5 to determine as follows the valuation of unpaid Works (the "**Valuation of Unpaid Works**"):
 - (a) value of the completed stage of the Works, less payments already made;
 - (b) reasonable value of the partially completed stages of works as on the date of Termination, only if such works conform with the Specifications and Standards; and
 - (c) value of Maintenance, if any, for completed months, less payments already made, and shall adjust from the sum thereof (i) any other amounts payable or recoverable, as the case may be, in accordance with the provisions of this Agreement; and (ii) all taxes due to be deducted at source.
- (ii) The Valuation of Unpaid Works shall be communicated to the Authority, with a copy to the Contractor, within a period of 30 (thirty) days from the date of Termination.

23.6 Termination Payment

- (i) Upon Termination on account of Contractor's Default under Clause 23.1, the Authority shall:
 - (a) encash and appropriate the Performance Security, Additional Performance Security if any and Retention Money, or in the event the Contractor has failed to replenish or extend the Performance Security and Additional Performance Security if any, claim the amount stipulated in Clause 7.1, as agreed predetermined compensation to the Authority for any losses, delays and cost of completing the Works and Maintenance, if any;
 - (b) encash and appropriate the Bank Guarantee, if any, for and in respect of the outstanding Advance Payment and interest thereon; and
 - (c) pay to the Contractor, by way of Termination Payment, an amount equivalent to the Valuation of Unpaid Works after adjusting any other sums payable or recoverable, as the case may be, in accordance with the provisions of this Agreement.
- (ii) Upon Termination on account of an Authority Default under Clause 23.2 or for Authority's convenience under Clause 23.3, the Authority shall:
 - (a) return the Performance Security, Additional Performance Security and Retention Money forthwith;
 - (b) encash and appropriate the bank guarantee, if any, for and in respect of the outstanding Advance Payment; and
 - (c) pay to the Contractor, by way of Termination Payment, an amount equal to:

- i. Valuation of Unpaid Works;
- ii. the reasonable cost of temporary works, as determined by the Authority's Engineer; and
- iii. 10% (ten per cent) of the cost of the Works and Maintenance that are not commenced or not completed,

and shall adjust from the sum thereof (i) any other amounts payable or recoverable, as the case may be, in accordance with the provisions of this Agreement, and (ii) all taxes due to be deducted at source.

- (iii) Termination Payment shall become due and payable to the Contractor within 30 (thirty) days of a demand being made by the Contractor to the Authority with the necessary particulars, and in the event of any delay, the Authority shall pay interest at Bank Rate + 3% per annum, 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.
- (iv) The Contractor expressly agrees that Termination Payment under this Article 23 shall constitute a full and final settlement of all claims of the Contractor on account of Termination of this Agreement and that it shall not have any further right or claim under any law, treaty, convention, contract or otherwise.

23.7 Other rights and obligations of the Parties

Upon Termination for any reason whatsoever:

- (a) property and ownership in all Materials, Plant and Works and the Project Highway shall, as between the Contractor and the Authority, vest in the Authority in whole; provided that the foregoing shall be without prejudice to Clause 23.6;
- (b) risk of loss or damage to any Materials, Plant or Works and the care and custody thereof shall pass from the Contractor to the Authority; and
- (c) the Authority shall be entitled to restrain the Contractor and any person claiming through or under the Agreement from entering upon the Site or any part of the Project, which have not been vested in the Authority in accordance with the provisions of this Agreement.

23.8 Survival of rights

Notwithstanding anything to the contrary contained in this Agreement 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 Agreement. All rights and obligations of either Party under this Agreement, including Termination Payments, shall survive the Termination to the extent such survival is necessary for giving effect to such rights and obligations.

23.9 Foreclosure with mutual consent

- (i) Without prejudice to any provision of this Agreement, the Authority and Contractor may foreclose this Agreement by mutual consent in circumstances which does not constitute either party's default without any liability or consequential future liability for either party.
- (ii) Should a Party intend to foreclose this Agreement by mutual consent, the intending Party shall issue a notice to the other Party and upon issuance of such notice, the other Party may within 15 days from receipt of such notice either agree to such foreclosure or raise objection(s) to the same by intimating either of the two possible positions to the intending Party in writing.
- (iii) In either case of the other Party agreeing to the proposed foreclosure or otherwise, the Parties may negotiate the proposed foreclosure and sign a Supplementary Agreement for foreclosure to the main Contract Agreement within 30 (thirty) days of the date agreeing by both Parties. Foreclosure shall not come into effect unless and otherwise Supplementary Agreement is signed.
- (iv) Any attempt or endeavor for foreclosure by mutual agreement shall be without prejudice to the rights and obligations of the Parties herein and the factum of such an attempt or exercise shall not stop either of the Parties from discharging their contractual obligations under this Agreement.
- (v) For the avoidance of doubt, it is clarified that such foreclosure will be without prejudice to the Contractor and shall not affect the Contractor in any way if it wishes to bid in future projects of the Authority.

Part VI

Other Provisions

Article 24

Assignment and Charges

24.1 Restrictions on assignment and charges

This Agreement shall not be assigned by the Contractor 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.

24.2 Hypothecation of Materials or Plant

Notwithstanding the provisions of Clause 24.1, the Contractor may pledge or hypothecate to its lenders, any Materials or Plant prior to their incorporation in the Works. Further, the Contractor may, by written notice to the Authority, assign its right to receive payments under this Agreement either absolutely or by way of charge, to any person providing financing to the Contractor in connection with the performance of the Contractor's obligations under this Agreement. The Contractor acknowledges that any such assignment by the Contractor shall not relieve the Contractor from any obligations, duty or responsibility under this Agreement.

Article 25

Liability and Indemnity

25.1 General indemnity

- (i) The Contractor will 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 third party claims for any loss, damage, cost and expense of whatever kind and nature, whether arising out of any breach by the Contractor of any of its obligations under this Agreement or from any negligence under the Agreement, including any errors or deficiencies in the design documents, 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.

25.2 Indemnity by the Contractor

- (i) Without limiting the generality of Clause 25.1, the Contractor 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 Contractor to comply with Applicable Laws and Applicable Permits;
 - (b) payment of taxes required to be made by the Contractor in respect of the income or other taxes of the Sub-contractors, suppliers and representatives; or
 - (c) non-payment of amounts due because of Materials or services furnished to the Contractor or any of its Sub-contractors which are payable by the Contractor or any of its Sub-contractors.
- (ii) Without limiting the generality of the provisions of this Article 25, the Contractor 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 Contractor or by the Sub-contractors in performing the Contractor’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 Contractor 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 Highway, or any part thereof or comprised therein, is held to constitute an infringement and its use is permanently enjoined, the Contractor 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 Contractor is unable to secure such license within a reasonable time, the Contractor 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.

25.3 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 25 (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. If 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.

25.4 Defense of claims

- (i) 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 25, 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.
- (ii) If the Indemnifying Party has exercised its rights under Clause 25.3, 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).
- (iii) If the Indemnifying Party exercises its rights under Clause 25.3, 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; or

- (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; or
- (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 25.4 (iii) 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.

25.5 Survival on Termination

The provisions of this Article 25 shall survive Termination.

Article 26

Dispute Resolution

26.1 Dispute Resolution

- (i) 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”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 26.2.
- (ii) 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 nonprivileged records, information and data pertaining to any Dispute.

26.2 Conciliation

In the event of any Dispute between the Parties, either Party may call upon the Authority’s Engineer, or such other person as the Parties may mutually agree upon (the “**Conciliator**”) to mediate and assist the Parties in arriving at an amicable settlement thereof. Failing mediation by the Conciliator or without the intervention of the Conciliator, either Party may require such Dispute to be referred to the Chairman of the Authority and the Chairman of the Board of Directors of the Contractor for amicable settlement, and upon such reference, the said persons shall meet no later than 7 (seven) business days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 30 (thirty) business day period or the Dispute is not amicably settled within 30 (thirty) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 26.1.1 or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 26.3 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 26.3.

26.3 Arbitration

- (i) Any dispute which remains unresolved between the parties through the mechanisms available/ prescribed in the Agreement, irrespective of any claim value, which has not

been agreed upon/ reached settlement by the parties, will be referred to the Arbitral Tribunal as per the Arbitration and Conciliation Act.

- (ii) Deleted
- (iii) The Arbitral Tribunal shall make a reasoned award (the "Award"). Any Award made in any arbitration held pursuant to this Article 26 shall be final and binding on the Parties as from the date it is made, and the Contractor and the Authority agree and undertake to carry out such Award without delay.
- (iv) The Contractor and the Authority agree that an Award may be enforced against the Contractor and/or the Authority, as the case may be, and their respective assets wherever situated.
- (v) 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.
- (vi) In the event the Party against whom the Award has been granted challenges the Award for any reason in a court of law, it shall make an interim payment to the other Party for an amount equal to 75% (seventy five per cent) of the Award, pending final settlement of the Dispute. The aforesaid amount shall be paid forthwith upon furnishing an irrevocable Bank Guarantee for a sum equal to 120 % (one hundred and twenty per cent) of the aforesaid amount. Upon final settlement of the Dispute, the aforesaid interim payment shall be adjusted and any balance amount due to be paid or returned, as the case may be, shall be paid or returned with interest calculated at the rate of 10% (ten per cent) per annum from the date of interim payment to the date of final settlement of such balance.

26.4 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 Contractor and the Authority, all Disputes arising after such constitution shall, instead of reference to arbitration under Clause 26.3, be adjudicated upon by such regulatory authority, tribunal or commission in accordance with the Applicable Law and all 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 27

Miscellaneous

27.1 Governing law and jurisdiction

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

27.2 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 judgement 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 judgement that may be made or given in connection therewith).

27.3 Delayed payments

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. 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 Base Rate plus 2 (two) percent, calculated at quarterly rests, and recovery thereof shall be without prejudice to the rights of the Parties under this Agreement including Termination thereof.

27.4 Waiver

- (i) 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.
- (ii) 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.

27.5 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 Authority's Engineer of any Document or Drawing submitted by the Contractor nor any observation or inspection of the construction, or maintenance of the Project Highway nor the failure to review, approve, comment, observe or inspect hereunder shall relieve or absolve the Contractor from its obligations, duties and liabilities under this Agreement, the Applicable Laws and Applicable Permits; and
- (b) the Authority shall not be liable to the Contractor by reason of any review, comment, approval, observation or inspection referred to in Sub-clause (a) above.

27.6 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.

27.7 Survival

- (i) Termination shall:
 - (a) not relieve the Contractor 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.

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

27.8 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 Contractor arising from the Request for Qualification or Request for Proposals, as the case may be, shall be deemed to form part of this Agreement and treated as such.

27.9 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 the Dispute Resolution Procedure set forth under this Agreement or otherwise.

27.10 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.

27.11 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.

27.12 Successors and assigns

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

27.13 Notices

Any notice or other communication to be given by any Party to the other Party under or in connection with the matters contemplated by this Agreement shall be in writing and shall:

- (a) in the case of the Contractor, be given by facsimile or e-mail and by letter delivered by hand to the address given and marked for attention of the person set out below or to such other person as the Contractor may from time to time designate by notice to the Authority; provided that notices or other communications to be given to an address outside [Delhi] may, if they are subsequently confirmed by sending a copy thereof by registered acknowledgement due, air mail or by courier, be sent by facsimile or e-mail to the person as the Contractor may from time to time designate by notice to the Authority;[***]
- (b) in the case of the Authority, be given by facsimile or e-mail and by letter delivered by hand and be addressed to the [Chairman] of the Authority 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 Contractor; provided that if the Contractor does not have an office in [Delhi] it may send such notice by facsimile or e-mail and by registered acknowledgement due, air mail or by courier; and
- (c) any notice or communication by a Party to the other Party, given in accordance herewith, shall be deemed to have been delivered when in the normal course of post it ought to have been delivered and in all other cases, it shall be deemed to have been delivered on the actual date and time of delivery; provided that in the case of facsimile or e- mail, it shall be deemed to have been delivered on the working day following the date of its delivery.

27.14 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.

27.15 Counterparts

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

27.16 Confidentiality

The Parties shall treat the details of this Agreement as private and confidential, except to the extent necessary to carry out obligations under it or to comply with Applicable Laws. The Contractor shall not publish, permit to be published, or disclose any particulars of the Works in any trade or technical paper or elsewhere without the previous agreement of the Authority.

27.17 Copyright and Intellectual Property rights

- (i) As between the Parties, the Contractor shall retain the copyright and other Intellectual Property rights in the Contractor's documents and other design documents made by (or on behalf of) the Contractor. The Contractor shall be deemed (by signing this Agreement) to give to the Authority a non-terminable transferable non-exclusive royalty-free license to copy, use and communicate the Contractor's documents, including making and using modifications of them. This license shall:
- (a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works;
 - (b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works; and
 - (c) in the case of Contractor's documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by this Agreement, including replacements of any computers supplied by the Contractor.
- (ii) The Contractor's documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Authority for purposes other than those permitted under this Clause 27.17.
- (iii) As between the Parties, the Authority shall retain the copyright and other intellectual property rights in this Agreement and other documents made by (or on behalf of) the Authority. The Contractor may, at its cost, copy, use, and obtain communication of these documents for the purposes of this Agreement. They shall not, without the Authority's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the contract.

27.18 Limitation of Liability

- (i) Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with this Agreement, save and except as provided under Articles 23 and 25.
- (ii) The total liability of one Party to the other Party under and in accordance with the provisions of this Agreement, save and except as provided in Articles 23 and 25, shall not exceed the Contract Price. For the avoidance of doubt, this Clause shall not limit the liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.

27.19 Care and Supply of Documents

- (i) Each of the Contractor's documents shall be in the custody and care of the Contractor, unless and until taken over by the Authority. Unless otherwise stated in the Agreement,

the Contractor shall supply to the Authority 2 (two) copies of the each of the Contractor's documents.

- (ii) The Contractor shall keep, on the Site, a copy of the Agreement, publication named in the Authority's requirements, the Contractor's documents, and variations and other communications given under the Agreement. The Authority's personnel shall have the right of access to all these documents at all reasonable times.
- (iii) If a Party becomes aware of an error or defect of a technical nature in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other party of such error or defect.

27.20 Authority's Use of Contractor's Documents.

- (i) As between the Parties, the Contractor shall retain the copyright and other Intellectual Property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.
- (ii) The Contractor hereby gives to the Authority a non-terminable transferable nonexclusive royalty-free license to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This license shall:
 - (a) apply through out the actual or intended working life (whichever is longer) of the relevant parts of the Works,
 - (b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and
 - (c) in the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contractor, including replacements of any computers supplied by the Contractor.
- (iii) The Contractor's Documents and other design documents made by or on behalf of the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Authority for purposes other than those permitted under this Sub-Clause.

27.21 Contractor's Use of Authority's Documents

As between the Parties, the Authority shall retain the copyright and other intellectual property rights in the Authority's requirements and other Documents made by (or on behalf of) the Authority. The Contractor may, at its cost copy, use, and obtain communication of these documents for the purpose of the Agreement. They shall not without the Authority's consent, be copied, used or communicating to a third party by the Contractor, except as necessary for the purposes of the Agreement.

27.22 Access to the Site by Others

The Contractor shall, at all times, afford access to the Site to the authorized representatives of the Authority, the Authority's Engineer and anyone else authorized by the Authority to access the site and to the persons duly authorized by any Governmental Agency having jurisdiction over the Project, including those concerned with safety, security or environmental protection to inspect the Project Highway and to investigate any matter within their authority and upon reasonable notice, the Contractor shall provide to such persons reasonable assistance necessary to carry out their respective duties and functions with minimum disruption to the construction, operation and maintenance of the Project Highway consistent with the purpose for which such persons have gained such access to the Site.

27.23 Term

This Agreement shall come into force and effect from the date first hereinabove written and shall remain in force and effect till the Termination Date i.e. the Parties perform all their respective obligations or is terminated by any of the Parties for the reasons and in the manner provided for in the Agreement.

27.24 Amendments

The Agreement may not be supplemented, amended, modified or changed except by an instrument in writing signed by the Contractor and the Authority and expressed to be a supplement, modification or change to the Agreement.

27.25 Representation and Bribes

The Contractor represents and warrants to the Authority that:

- (a) No representation or warranty by the Contractor contained herein or in any other document furnished by it to the Authority, or to any Governmental Instrumentality in relation to Applicable Permits contains or will contain any untrue statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading; and
- (b) It warrants that no sums, in cash or kind, have been paid or will be paid by or on behalf of the Contractor, to any person by way of fees, commission or otherwise for securing or entering into the Contractor for influencing or attempting to influence any officer or employee of the Authority or GOI in connection therewith.

27.26 No Agency

The Agreement does not constitute either Party as the agent, partner or legal representative of the other for any purposes whatsoever, and neither Party shall have any express or implied right or authority to assume or to create any obligation or responsibility on behalf of or in the name of the other Party.

SCHEDULES

Schedule-A

(See Clauses 2.1 and 8.1)

Site of the Project

1 The Site

- i. Project site is located near Nilgrar Village on existing NH-1. This is the part of Srinagar to Leh Highway in the UT of Jammu and Kashmir. The project aims at Construction of Twin Tube Uni directional Tunnel-2 at Nilgrar in between Sonamarg and Baltal on Srinagar-Leh road (NH-1) from Design Ch. 7+150 to Ch. 9+760 having length of 1928/1956 m (Tube-1/Tube-2) of tunnel and Approach Roads having total length 2.61 km. This project is based on EPC mode. Project Highway shall include the land, buildings, structures and road works as described in **Annex-I** of this Schedule-A
- ii. The dates of handing over the Right of Way to the Contractor are specified in Annex-II of this Schedule-A.
- iii. 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 Contractor, and such inventory shall form part of the memorandum referred to in Clause 8.2 (i) of this Agreement.
- iv. The alignment plans of the Project Highway are specified in Annex-III. In the case of sections where no modification in the existing alignment of the Project Highway is contemplated, the alignment plan has not been provided. Alignment plans have only been given for sections where the existing alignment is proposed to be upgraded. The proposed profile of the Project Highways shall be followed by the contractor with minimum FRL as indicated in the alignment plan. The Contractor, however, improve/upgrade the Road Profile as indicated in Annex-III based on site/design requirement.
- v. The status of the environment clearances obtained or awaited is given in Annex-IV.

Annex - I*(Schedule-A)***Site**

[Note: Through suitable drawings and description in words, the land, buildings, structures and road works comprising the Site shall be specified briefly but precisely in this Annex-I. All the chainages/ location referred to in Annex-I to Schedule-A shall be existing chainages.]

1 Site

- 1.1. The project aims at Construction of Twin Tube Uni directional Tunnel-2 at Nilgrar in between Sonamarg and Baltal on Srinagar-Leh road (NH-1) from Design Ch. 7+150 to Ch. 9+760 having length of 1928/1956 m (Tube-1/Tube-2) of tunnel and Approach Roads having total length 2.61 km.

1.2. Description of the Tunnel System**Tunnel**

Description	Tube-1	Tube-2
Length	1928	1956
Western Portal Chainage	7+171	7+175
Western Portal Location	3794626.417 Northing 530558.822 Easting	3794650.843 Northing 530567.268 Easting
Eastern Portal Chainage	9+099	9+131
Eastern Portal Location	3793379.914 Northing 531612.867 Easting	3793384.299 Northing 531638.527 Easting

1.3. Seismicity

India has most tectonically active as well as most stable landmasses. The present site location falls into zone IV according to the probability of the earthquake occurrence. Zone I, II are the least active and zone III, IV and V are the most active.

- 1.4. Project highway shall include the land, buildings, structures and road works as described in Annex-I of this Schedule-A.

The land, carriageway and structures comprising the Site are described below.

1.5. Design Chainage Corresponding to Existing Chainage:

The relationship between the “Existing Chainage” and “Design Chainage” as per field surveys of the location for the “Project Highway” is given below:

Sl.no	Design Chainage	Existing Chainage	Coordinates
1	7+150	-	Easting(X)-530539.234 Northing(Y)-3794633.987
2	9+760	-	Easting(X)-532110.523 Northing(Y)-3792968.503

2. Land

The Site of the Project Highway comprises the land described below:

Sl.no	Existing Chainage (km)	Design Chainage (km)	Existing ROW (m)	Remarks
Nil				

3. Carriageway

The existing carriageway of the Project Highway is 2-Lane with width varying from 7.0 to 8.0 m. The type of the existing pavement is flexible. Pavement condition varies from fair to poor.

Details of Existing Carriageway Width

Sl.no	Existing Chainage (km)	Design Chainage (km)	Existing Carriageway Width (m)	Remarks
Nil				

4. Major Bridges

The Site includes the following Major Bridges:

Sl. No.	Existing Chainage (km)	Type of Structure			No. of spans with span length (m)	Width (m)
		Foundation	Sub-structure	Super structure		
Nil						

5. Road over-bridges (ROB)/ Road under-bridges (RUB)

The Site includes the following ROB/RUB:

Sl. No.	Existing Chainage (km)	Type of Structure			No. of spans with span length (m)	Width (m)
		Foundation	Sub-structure	Super structure		
Nil						

6. Grade separators

The Site includes the following grade separators:

Sl. No.	Existing Chainage (km)	Type of Structure			No. of spans with span length (m)	Width (m)
		Foundation	Sub-structure	Super structure		
Nil						

7. Minor Bridges

The Site includes the following minor bridges:

Sl. No.	Existing Chainage (km)	Type of Structure			No. of spans with span length (m)	Width (m)
		Foundation	Sub-structure	Super structure		
Nil						

8. Railway level crossings

The Site includes the following railway level crossings:

Sl. No.	Location (Existing Chainage in km)	Line	Remarks
NIL			

9. Underpasses (vehicular, non-vehicular)

The Site includes the following underpasses:

Sl. No.	Existing Chainage (km)	Type of Structure	No. of spans with span length (m)	Width (m)
Nil				

10. Culverts

The Site includes the following culverts:

Sl. No.	Existing Chainage	Type of structure	Existing Span Arrangement
Nil			

11. Bus bays

The details of bus bays on the Site are as follows:

Sl. No.	Existing Chainage	Length	Side
Nil			

12. Truck Lay byes

The details of truck lay byes are as follows:

Sl. No.	Existing Chainage	Length	Side
Nil			

13. Road side drains

The details of the roadside drains are as follows:

Sl. no.	From	To	Length	Side	Drain Type
Nil					

14. Major junctions

The details of major junctions are as follows:

S. No.	Existing Chainage (km)	Design Chainage (km)	Type of Junction	Category of Road	Remarks
Nil					

15. Minor junctions

The details of the minor junctions are as follows:

S. No.	Existing Chainage (km)	Design Chainage (km)	Type of Junction	Category of Road	Remarks
Nil					

16. Bypasses

The details of the existing road sections proposed to be bypassed are as follows:

Sl.no	Name of Bypass (Town)	Design Chainage (km)		Length (Km)
		From	To	
Nil				

Annex - II
(As per Clause 8.3 (i))
(Schedule-A)

Dates for providing Right of Way of Construction Zone

The dates on which the Authority shall provide Right of Way to the Contractor on different stretches of the Site are stated below:

Sl. No.	From Km to Km	Length (Km)	Width (m)	Date of Providing Right of Way of Construction Zone*
(1)	(2)	(3)	(4)	(5)
(i) Full Right of Way (Full Width)	7+150 to 9+760	2.61	40-60m	On appointed date
(ii) Part Right of Way (Part Width)	-	-	-	-
(iii) Balance Right of Way (Width)	-	-	-	-

*The dates specified herein shall in no case be beyond 150 (one hundred and fifty) days after the Appointed Date.

Annex - III

(Schedule-A)

Alignment Plans

The existing alignment of the Project Highway shall be modified in the following sections 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 contractor 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 contractor shall, however, improve/upgrade the Road profile as indicated in Annex-III based on site/design requirement.
- (ii) Traffic Signage plan of the Project Highway showing numbers & location of traffic signs is enclosed. The contractor shall, however, improve/upgrade upon the traffic signage plan as indicated in Annex-III based on site/design requirement as per the relevant specifications/IRC Codes/Manual.

Annex – IV

(Schedule-A)

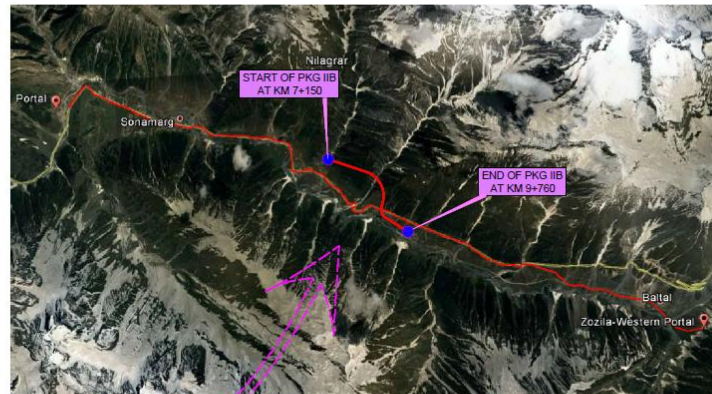
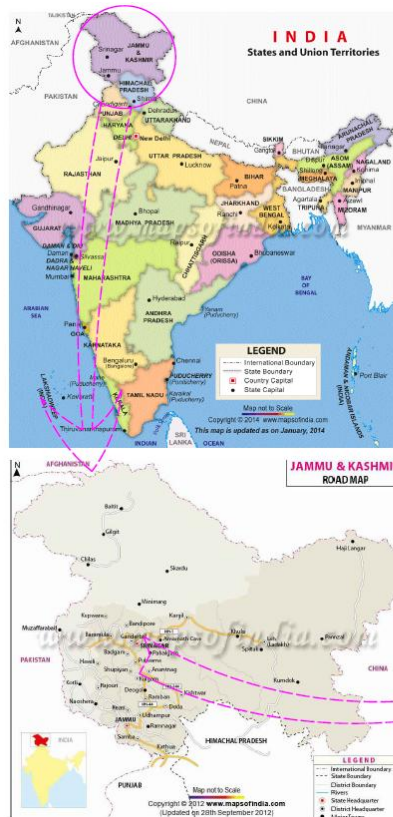
Environment Clearances

The proposed project does not attract conditions of Environment Impact Assessment, 2006 and its subsequent amendments dated 22nd August 2013, Notifications issued by Govt. of India, Ministry of Environment, forest and Climate Change. Hence, Environmental Clearance is not required to be taken under EIA Notification-2006 and its subsequent amendments, for the implementation of the proposed project.

The proposed project corridor is located within 10 km from the notified Thajwas Wildlife Sanctuary under the provision of Wildlife (Protection) Act, 1972, and involves a diversion of nearly 45.0 ha forest land under Forest (Conservation), Act 1980. Therefore, Wildlife Clearance and Forest Clearance will require to be accorded from the competent authority.

Appendix A-1

Location Map



Schedule - B

(See Clause 2.1)

Development of the Project Highway

1 Development of the Project Highway

Development of the Project Highway shall include design and construction of the Project Highway as described in this Schedule-B and in Schedule-C.

2 [Rehabilitation and augmentation]

Rehabilitation and augmentation shall include 2-Laning of the Project Highway as described in Annex-I of this Schedule-B and in Schedule-C.

3 Specifications and Standards

The Project Highway shall be designed and constructed in conformity with the Specifications and Standards specified in Annex-I of Schedule-D.

1.3 Pavement

The road pavement in the tunnel consists of following layers,

- 240mm pavement quality concrete
- 150mm dry lean cement concrete sub-base layer
- 200mm GSB

1.4 Ventilation

Ventilation system shall be provided as per the Guidelines for Road Tunnels IRC: SP:91-2010, NFPA 502 (2017) and PIARC Technical Committee C4 – Road Tunnels: Vehicle Emissions and Air Demand for Ventilation (2011).

1.5 Final Interior Finish

The main traffic tunnel shall have a final interior finish of light coloured fire-resistant paint of suitable surface characteristics as per Contractor's detailed design subject to approval by Authority Engineer.

1.6 Lighting and E&M Facilities

As per Contractor's detailed design subject to approval by the Authority Engineer. Normal Lighting & Emergency Lighting in the Road tunnel shall be designed according to CIE 88:2004 standard "Guide for the Lighting of Road Tunnels and Underpasses" for two-way traffic including Cable & cable laying, Main Electrical panel & Sub Panels, earthing of complete offered system, galvanized supporting structure and all other necessary accessories, etc. as per the design requirement. Also, the Guidelines for Road Tunnels IRC: SP:91-2010 will be considered. The light intensity of the entry and exit zones shall be adapted to the actual outside lighting level according to external conditions (day/night, regulation through measurement of luminous density).

1.7 Drainage and Waterproofing Concept

The tunnel shall be designed as a dry and drained tunnel as per contractor's detailed design. A waterproofing membrane shall be provided as per the drawing of cross section of tunnel. The water is drained along the bottom of the side walls with perforated drainage pipes.

1.8 Cross Passages

The twin tunnels of more than 500 m length shall be connected by a cross passage at an inclination to facilitate diversion of the traffic from one tube to other tube in the event of an incident/accident in one of the tubes at a spacing of 300 m. The cross passage shall be at an angle of 30 degrees with the direction of flow. The cross passage shall have provision for one traffic lane, edge strip of 0.60 m, crash barriers and walkways on either side. In normal conditions the cross passage shall be barricaded.

1.9 Lay Bys

For Tunnel-2, having more than 500 m length provision shall be made for 100 m long and 3.0 m wide emergency lay bye beyond the left most lane at 750 m intervals to facilitate refuge by break down/damaged vehicles and also for maintenance vehicles. Proper transitions, line of sight and informatory signs shall be ensured for such lay-bye.

1.10 Construction Concept

The construction method of the tunnel shall be internationally accepted method as proposed in the Technical proposal maintaining the clear profile with prior approval of NHIDCL in consultation with the Authority Engineer. However, the method of construction is Contractor's choice. However, Tunnel will be constructed from both the tunnel portals.

2. WIDENING OF THE EXISTING HIGHWAY

- 2.1 The project highway shall be new constructed to 2-lane with paved shoulders in the following stretches as shown in the plan and profile and typical cross sections enclosed at Appendices B-1 and B-2 respectively to schedule B. Geometrics deficiencies any, in the existing horizontal and vertical profiles shall be corrected as per the prescribed standards for plain terrain to the extent land is available.

Project Description

Sl. No.	Existing Chainage (km)		Design Chainage		Length (km)	Remarks
	From	To	From	To		
1	-	-	7+150	9+760	2.61	

2.2 Width of Carriageway

Two-Laning with paved shoulders shall be undertaken. The paved carriageway shall be 10 m wide for road section with additional snow storage lane of 1.5m for road section and 7 m wide for tunnel section in accordance with the typical cross section's drawings in the Manual.

3. Geometric Design and General Features**3.1 General**

Geometric design and general features of the Project Highway shall be in accordance with Section 2 of the Manual (IRC: SP: 73-2018, IRC: SP: 91-2010 and IRC: SP: 48-1998).

3.2 Design speed

The design speed shall be as per IRC SP: 73: 2018/ IRC: SP: 48-1998, however in exceptional cases the minimum design speed of 50 kmph.

3.3 Proposed Right of Way

Details of the Right of Way are given in Annex II of Schedule-A.

3.4 Type of shoulders

- (a) In open country/hilly areas, paved shoulders of 1.5 m width with additional snow storage lane of 1.5m shall be provided and 1.0m width earthen shoulder on valley side.
- (b) Design and specifications of paved shoulders and granular material shall conform to the requirements specified in the relevant Manual.

3.5 Lateral and vertical clearances at underpasses

Lateral and vertical clearances at underpasses and provision of guardrails/crash barriers shall be as per paragraph 2.10 of the Manual.

Sl. No.	Location (Chainage) (From - To)	Span / Opening (m)	Remarks
Nil			

3.6 Lateral and vertical clearances at overpasses

Lateral and vertical clearances at overpasses shall be as per paragraph 2.11 of the Manual.

Sl. No.	Location (Chainage) (From - To)	Span / Opening (m)	Remarks
Nil			

3.7 Service roads

Service roads shall be constructed at the locations and for the lengths indicated below:

Sl. No.	Location of service road (Chainage) (From - To)	RHS/ LHS/ Both Sides	Length of Service Road
Nil			

3.8 Grade separated structures

Grade separated structures shall be provided as per provisions of the Manual. The prerequisite particulars are given below:

Sl. No.	Location of Structure (From - To)	Length	Number and length of spans
Nil			

3.9 Cattle and pedestrian underpass /overpass:

Sl. No.	Location	Type of Crossing
	Nil	

3.10 Typical cross-sections of the Project Highway

Following typical cross sections shall be provided for the Project Highway:

Sl. No.	Detail	TCS	Length	
			(m)	Kms
1	Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Hill Side Gabion Wall and Valley Side Retaining Wall	IV	54	0.054
2	High Embankment Section	VI	106	0.106
	Tunnel Approach Section	VII	47	0.047
4	Twin Tube Tunnel	XII	1928	1.928
5	Tunnel Approach Section (High Embankment)	XIII	426	0.426
6	Tunnel Approach Section (Hill Side Gabion Wall and Valley Side RE wall)	XIV	70	0.070
TOTAL DESIGN LENGTH			2610	2.61

The cross section schedule shall be as follows:

Sl. No.	From	To	Length	TCS
1	7150	7171	21	TCS XIII
2	7171/7175	9099/9131	1928/1956 (Tube1/Tube2)	TCS XII
3	9099	9146	47	TCS VII
4	9146	9216	70	TCS XIV
5	9216	9600	384	TCS XIII
6	9600	9706	106	TCS VI
7	9706	9760	54	TCS IV

Note: The extent of cross section type is indicative and shall be reviewed in consultation with the Authority Engineer at the time of construction as per the site condition. The typical cross-section are detailed in figure B1 to B8 respectively.

The alternative cross section of the Project Highway at the cross drainage structures shall follow the typical cross section in consultation with the Authority Engineer at the time of construction.

Figure B1: TCS IV- Two Lane Carriageway With Paved Shoulder In Mountainous Terrain With Hill Side Gabion Wall and Valley Side Retaining Wall

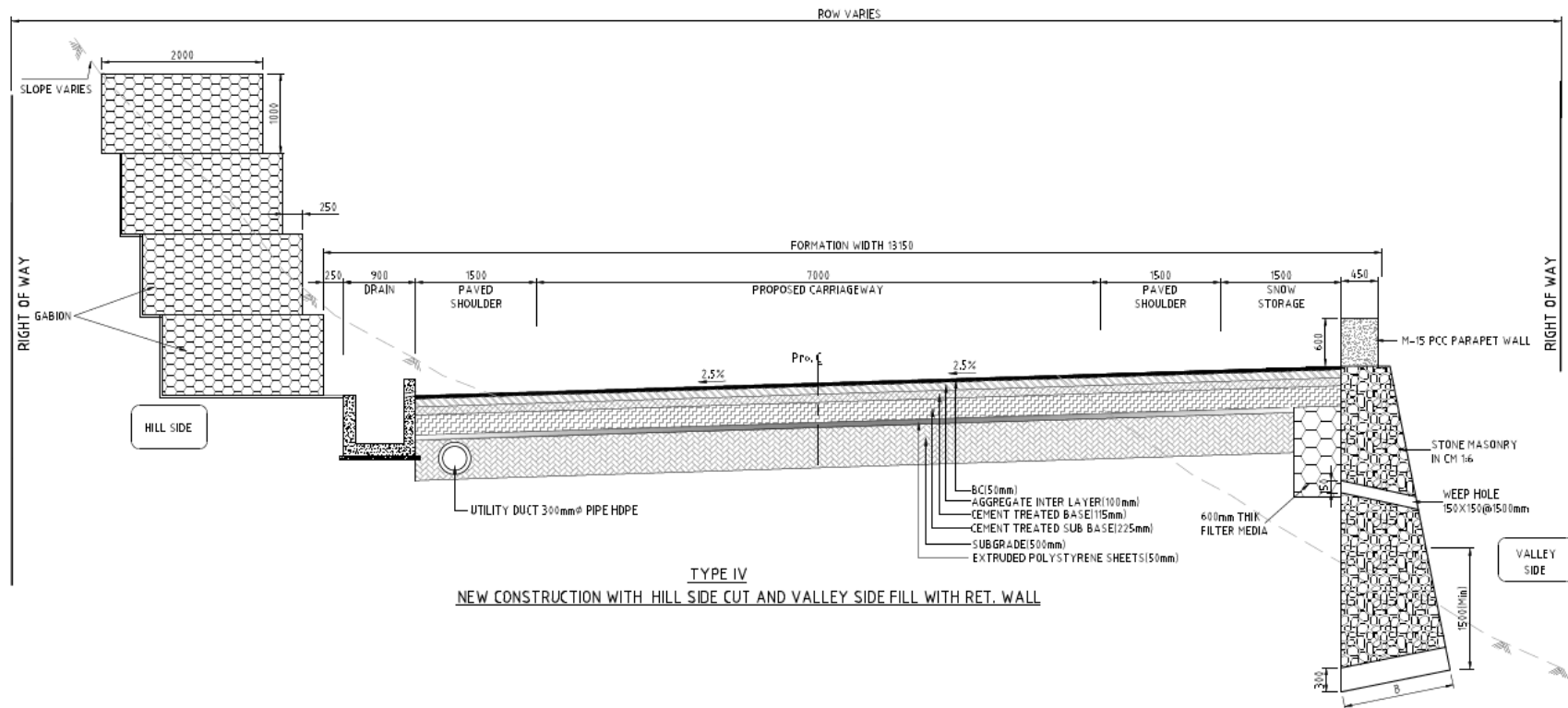


Figure B2: TCS VI- High Embankment Section

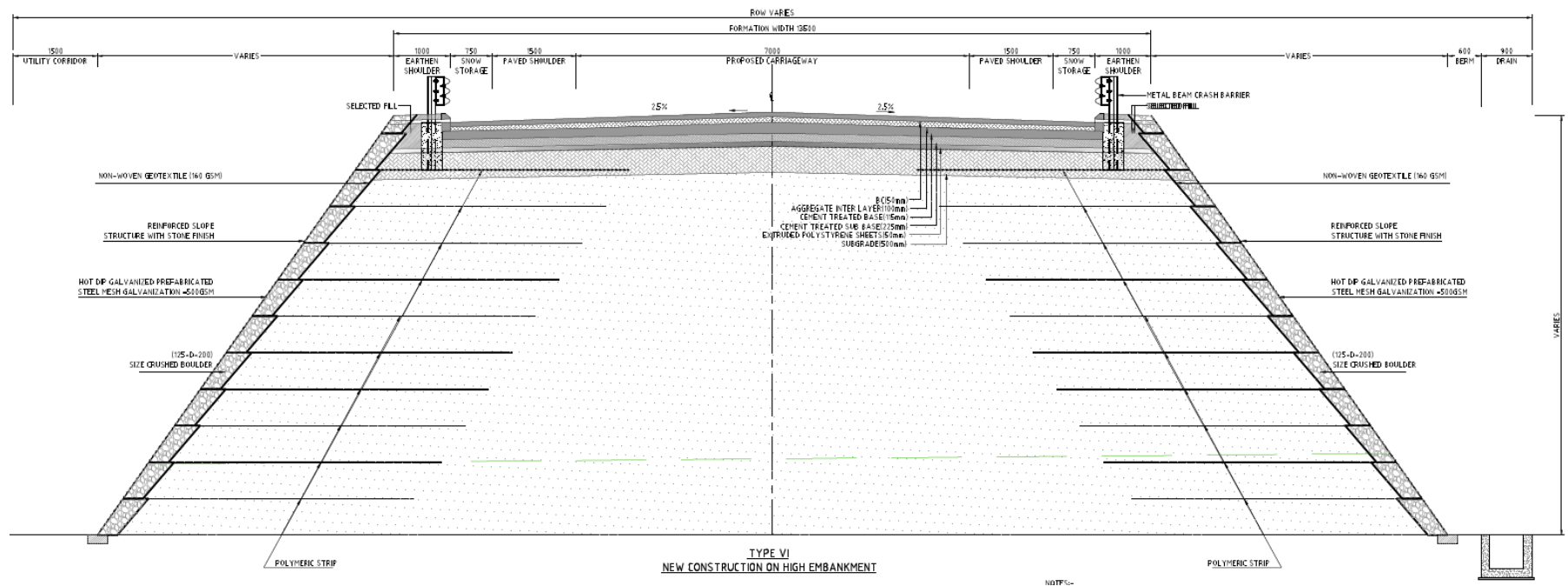


Figure B3: TCS VII- Tunnel Approach Section with Both Side Cut

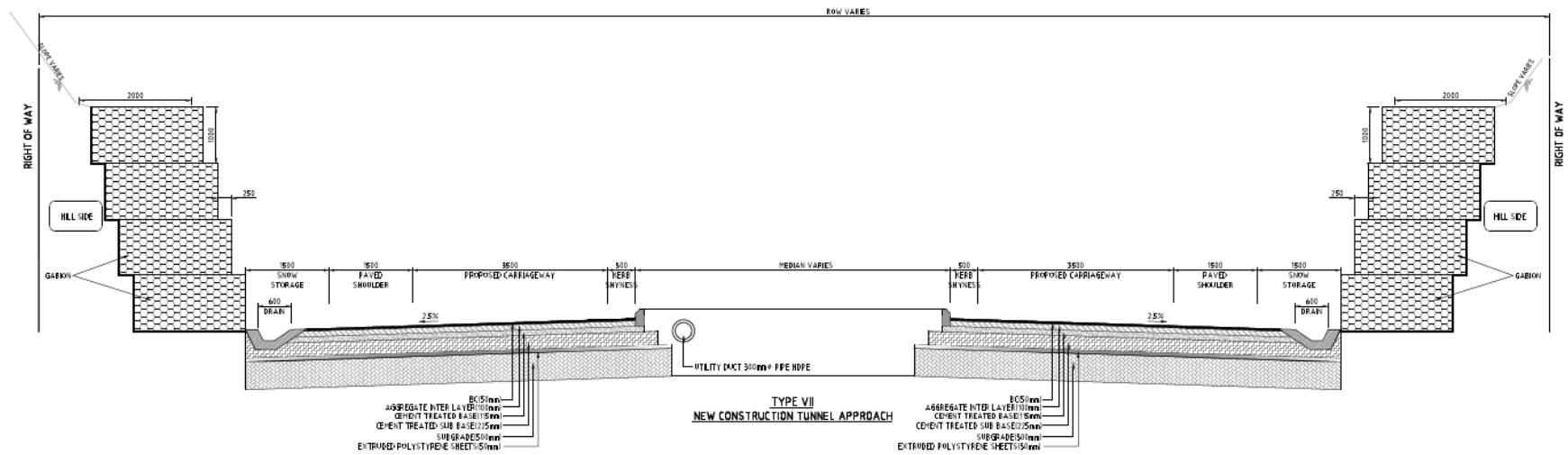


Figure B4: TCS XII- Tunnel Section

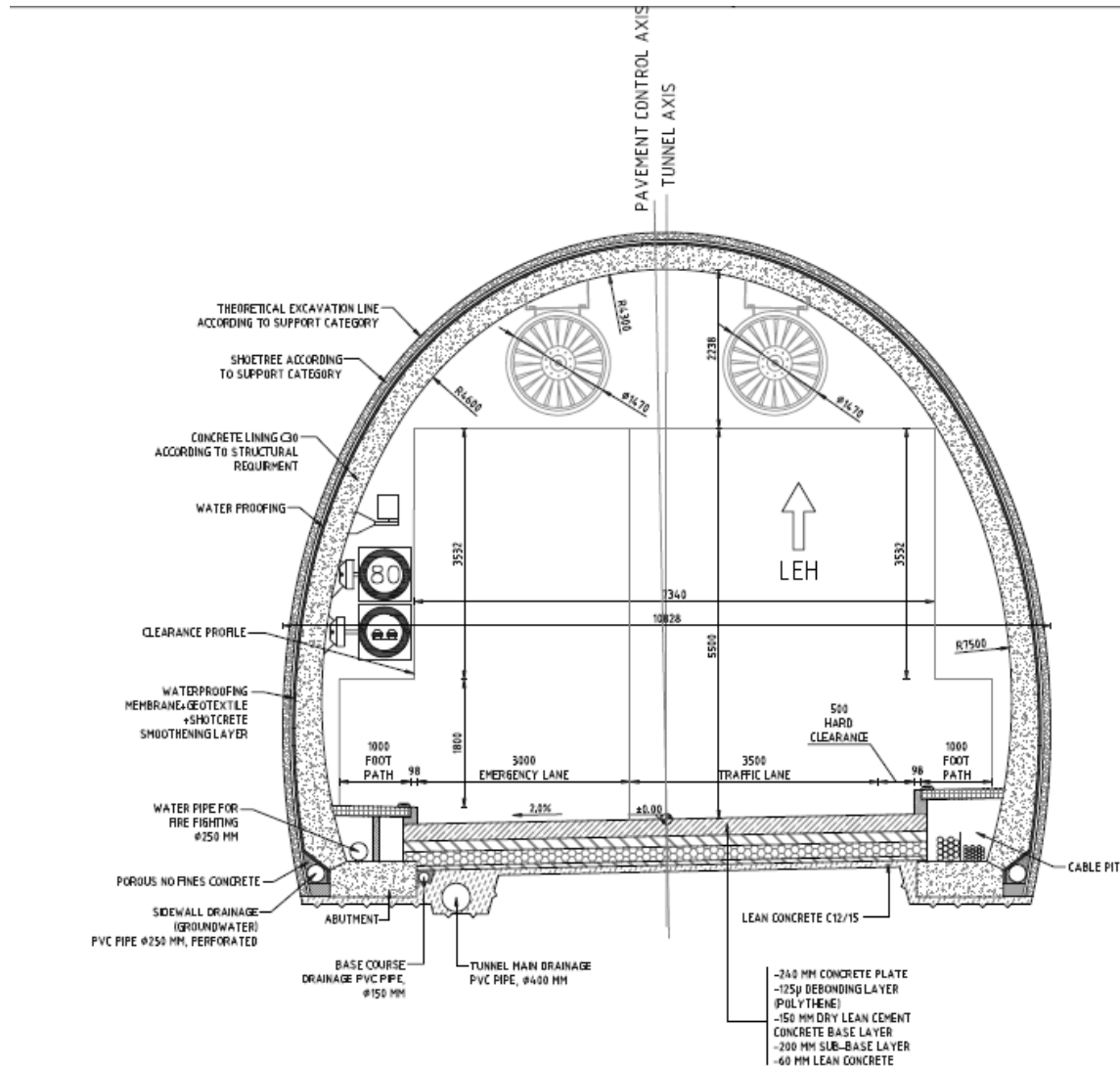


Figure B5: TCS XIII- Tunnel Approach Section on High Embankment

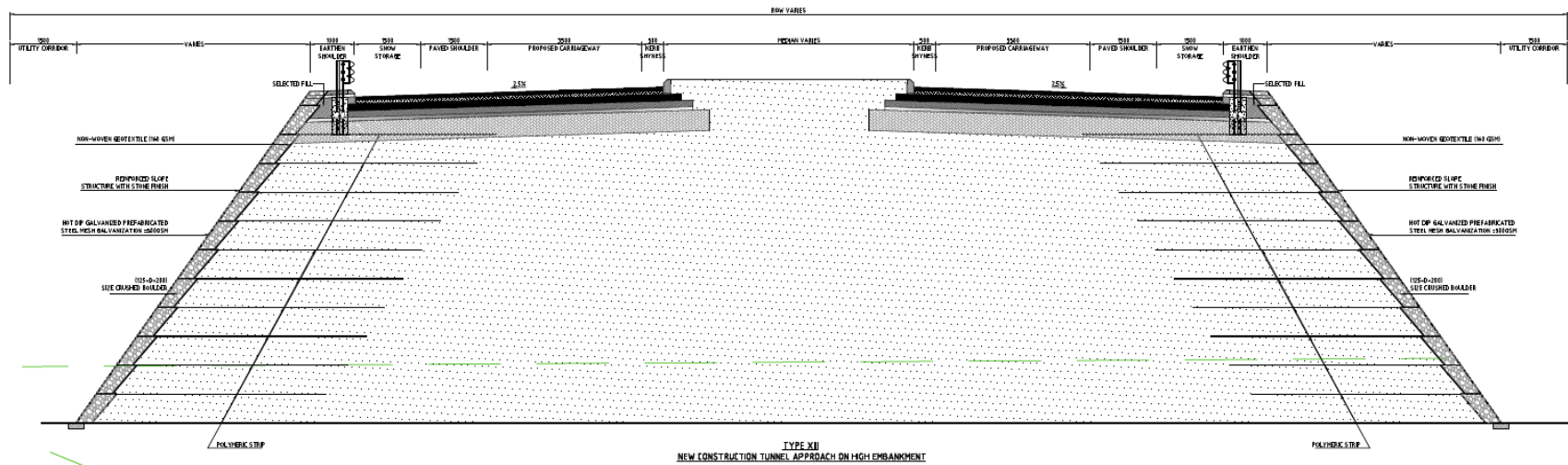
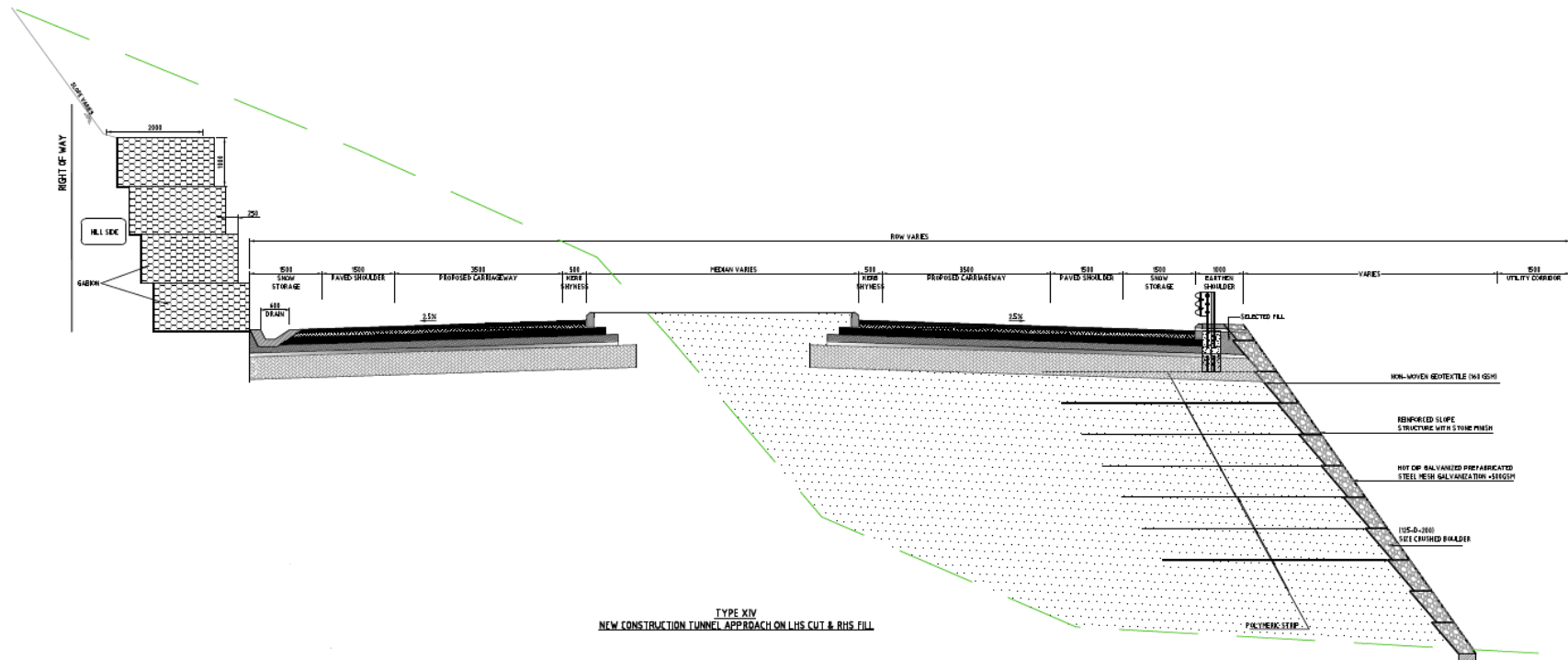


Figure B6: TCS XIV- Tunnel Approach Section with Hill Side Gabion Wall and Valley Side RE wall



4. INTERSECTIONS AND GRADE SEPARATORS

All intersections and grade separators shall be as per Section 3 of the Manual.

Properly designed intersections shall be provided at the locations and of types and features given in the tables below:

(i) At-grade intersections

Sl. No.	Existing Location (km)	Proposed Location (km)	Type	Major/Minor	Cross Road	
					LHS	RHS
Nil						

(ii) Grade separated intersection with/without ramps

Sl. No.	Location	Salient features	Minimum length of viaduct to be provided	Road to be carried over/under the structures
Nil				

5. Road Embankment and Cut Section

- (i) Widening and improvement 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) Raising of the existing road [Refer to the provision of relevant Manual and specify sections to be raised]

The existing road shall be raised in the following sections:

Sl. No.	Section (from km to km)	Length	Extent of raising [Top of finished road level]
Nil			

6. Pavement Design

- (i) Pavement design shall be carried out in accordance with the provision of relevant Manual.
- (ii) Type of pavement

Flexible Pavement is proposed throughout the road portion project in accordance with IRC: 37-2018 and rigid pavement is provided in the tunnel portion in accordance with IRC:58-2015. The estimated cost of civil works is based on flexible pavements consisting of Bituminous concrete, granular crack relief layer, cement treated base, cement treated sub-base, expanded extruded polystyrene sheet and subgrade in road portion and rigid pavements consisting of Granular base, DLC and PQC. The minimum crust shall be as follows.

Rigid Pavement:

Layer	Thickness (mm)
PQC	240
DLC	150
GSB - I	200
Total Thickness	590

Flexible Pavement:

Layer	Thickness (mm)
BC	50
Granular Crack Relief Layer	100
Cement Treated Base	115
Cement Treated Sub-base	235
Expanded Extruded Polystyrene sheet	50
Subgrade	500

(iii) Design requirements

(a) Design Period and strategy

Flexible pavement for new pavement shall be designed for a minimum design period of 20 years. Stage construction shall not be permitted.

Rigid pavement for new pavement shall be designed for a minimum design period of 30 years. Stage construction shall not be permitted.

(b) Design Traffic

Notwithstanding anything to the contrary contained in this Agreement or the Manual, the Contractor shall design the pavement for a minimum design traffic of 20 million standard axles.

7. Roadside Drainage

Drainage system including surface and subsurface drains for the Project Highway shall be provided as per the provision of relevant Manual.

Open RCC rectangular drain shall be provided in open areas of the project highway in order to intercept surface water from the carriageway, shoulders and slopes. Closed RCC rectangular drains have also been proposed in urban/semi urban/intersection stretches. The concrete drains shall be covered in reaches along commercial establishments and intersections. The drains outfall into the natural water courses i.e. either in culverts or bridges. Table below gives the location of lined drains.

These are guidelines for minimum provisions. However, contractor has to design as per requirement of road in accordance with manual.

Sr. No.	Design Chainage		Length (m)	TCS type	Drain	Remarks
	From	To				
1	7150	7171	21	TCS XIII	RCC Open	One Side
2	7171	9099	1928	TCS XII	Drainage Pipe	Tunnel
3	9099	9146	47	TCS VII	RCC Open & PCC Trapezoidal	One on each Side
4	9146	9216	70	TCS XIV	RCC Open	Both Sides
5	9216	9600	384	TCS XIII	RCC Open	One Side
6	9600	9706	106	TCS VI	RCC Open	One Side
7	9706	9760	54	TCS IV	RCC Open	One Side

8. Design of Structures

(i) General

(a) All bridges, culverts and structures shall be designed and constructed in accordance with the provision of relevant Manual and shall conform to the cross-sectional features and other details specified therein.

(b) Width of the carriageway of new bridges and structures shall be as follows: NA

(c) The following structures shall be provided with footpaths:

[Refer to the provision of relevant Manual and provide details of new Structures with footpath.]

S. No.	Design Chainage (Km)	Proposed Arrangements/ Details				
		Type of Bridge	Improvement Proposal	Load Classification	Total Span (CL of Exp) (m)	Type of Super-structure
NIL						

(d) All bridges shall be high-level bridges.

(e) The following structures shall be designed to carry utility services specified in table below: [Refer to the provision of relevant Manual and provide details]

Sl. No.	Bridge at km	Utility service to be carried	Remarks
1	NIL		

(f) Cross-section of the new culverts and bridges at deck level for the Project Highway shall conform to the typical cross-sections given in the provision of relevant Manual.

(ii) Culverts

(a) Overall width of all culverts shall be equal to the roadway width of the approaches.

(b) Reconstruction of existing culverts:

The existing culverts at the following locations shall be re-constructed as new culverts:

[Refer to the provision of relevant Manual and provide details]

Sl. No.	Culvert location	Structure Type	Span/Opening (m)	Remarks, if any*
Nil				

*[Specify modifications, if any, required in the road level, etc.]

(c) Widening of existing culverts:

All existing culverts which are not to be reconstructed shall be widened to the roadway width of the Project Highway as per the typical cross section given in the provision of relevant Manual. Repairs and strengthening of existing structures where required shall be carried out.

Sl. No.	Culvert location	Type, span, height and width of existing culvert (m)	Repairs to be carried out [specify]
Nil			

(d) Additional new culverts shall be constructed as per particulars given in the table below:

Sl. No.	Culvert location	Structure Type	Span/Opening/Pipe dia(m)	Remarks
1	9+281	Pipe	2x1.2 ø	-
2	9+676	Pipe	3x1.2 ø	-

(e) Repairs/replacements of railing/parapets, flooring and protection works of the existing culverts shall be undertaken as follows:

[Refer to the provision of relevant Manual and provide details]

Sl. No.	Location at km	Type of repair required
Nil		

(f) Floor protection works shall be as specified in the relevant IRC Codes and Specifications.

(iii) Bridges

(a) Existing bridges to be re-constructed/widened

(b) The existing bridges at the following locations shall be re-constructed as new Structures [Refer to the provision of relevant Manual and provide details]

Sl. No.	Bridge location (km)	Salient details of existing bridge	Adequacy or otherwise of the existing waterway, vertical clearance, etc*	Remarks
Nil				

*Attach GAD

(i) The following narrow bridges shall be widened:

Sl. No.	Location (km)	Existing width (m)	Extent of widening (m)	Cross-section at deck level for widening @
Nil				

(c) Additional new bridges

New bridges at the following locations on the Project Highway shall be constructed. GADs for the new bridges are attached in the drawings folder.

Sl. No.	Location (km)	Span Arrangement	Total length (m)	Remarks, if any
Nil				

(d) The railings of existing bridges shall be replaced by crash barriers at the following locations:

[Refer to the provision of relevant Manual and provide details:]

Sl. No.	Location at km	Remarks
Nil		

(e) Repairs/replacements of railing/parapets of the existing bridges shall be undertaken as follows:

[Refer to the provision of relevant Manual and provide details]

Sl. No.	Location at km	Remarks
Nil		

(f) Drainage system for bridge decks

An effective drainage system for bridge decks shall be provided as specified in the provision of relevant Manual

(g) Structures in marine environment

[Refer to the provision of relevant Manual and specify the necessary measures / treatments for protecting structures in marine environment, where applicable]

(iv) Rail-road bridges

(a) Design, construction and detailing of ROB/RUB shall be as specified in the provision of relevant Manual. [Refer to the provision of relevant Manual and specify modification, if any]

(b) Road over-bridges

Road over-bridges (road over rail) shall be provided at the following level crossings, as per GAD drawings attached:

Sl.No.	Location of Level crossing (Chainage km)	Length of bridge (m)
Nil		

(c) Road under-bridges

Road under-bridges (road under railway line) shall be provided at the following level crossings, as per GAD drawings attached:

Sl. No.	Location of Level crossing (Chainage km)	Number and length of span (m)
Nil		

(v) Grade separated structures

[Refer to the provision of relevant Manual]

The grade separated structures shall be provided at the locations and of the type and length specified in paragraphs 2 (ix) and 3 of this Annex-I.

(vi) Repairs and strengthening of bridges and structures

[Refer to the provision of relevant Manual and provide details]

The existing bridges and structures to be repaired/strengthened, and the nature and extent of repairs /strengthening required are given below:

(a) Bridges

Sl.No.	Location of bridge (km)	Nature and extent of repairs /strengthening to be carried out
Nil		

(b) ROB / RUB

Sl.No.	Location of ROB/RUB (km)	Nature and extent of repairs /strengthening to be carried out
Nil		

(c) Overpasses/Underpasses and other structures

Sl.No.	Location of Structure (km)	Nature and extent of repairs /strengthening to be carried out
Nil		

(vii) List of Major Bridges and Structures

The following is the list of the Major Bridges:

Sl. No.	Location (km)	Span Arrangement	Total length (m)	Remarks, if any
Nil				

9. Traffic Control Devices and Road Safety Works

- (i) Traffic control devices and road safety works shall be provided in accordance with the provision of relevant Manual.
- (ii) Specifications of the reflective sheeting. [Refer to the provision of relevant Manual and specify]

The minimum quantity of Traffic signage and pavement marking are tabulated here:

Sr. No.	Traffic Signage, Road Marking and other appurtenances	Unit	Quantity
1	Road Marking:-Lines, strips, arrows	Sqm	509
2	Fixing of retro- Reflectorized cautionary, mandatory and informatory sign as per IRC :67		
	(i) Triangular 900 mm	Nos.	0
	(ii) Circular 600 mm	Nos.	11
	(iii) Rectangular 800 X 600	Nos.	0
	(iv) Octagonal 600 mm	Nos.	0
	(v) 600 EquiTrangle	Nos.	17
3	5 th Kilometre stone (precast)	Nos.	0
4	Ordinary Km stone(precast)	Nos.	2
5	Hectometer Stone(precast)	Nos.	26
6	Road Studs	Nos.	370
7	Installation of delineators	Nos.	1092
8	Metal Beam Crash barrier	M.	581

10. Roadside Furniture

- (i) Roadside furniture shall be provided in accordance with the provision of relevant Manual.
- (ii) Overhead traffic signs: 1 Nos. (Start of Project Road)
Locations and size shall conform to the Manual of Specification.

11. Compulsory Afforestation

The contractor is to plant trees as compensatory forestation as per as per IRC SP 21 and guidelines of the forest department.

The contractor is to plant ten times of no of trees cut for the widening of road on both sides of road.

12. Hazardous Locations

The safety barriers like metal beam crash barriers shall also be provided at the following hazardous locations:

Metal Beam Crash Barrier

Sr. No.	Design Chainage		Length	Remarks
	From	To		
1	7150	7171	21	Both Side
2	9146	9216	70	Valley Side
3	9216	9600	384	Both Side
4	9600	9706	106	Both Side

13. Protection Works

There are following protection works are provided at the following locations.

Retaining Walls: Retaining walls shall be provided at the valley side as per applicable Typical Cross-Section. The detailed chainages are as follows:

Design Chainage		Length	Side
From	To		
9706	9760	54	RHS

Breast Walls: Breast walls shall be provided at the hill side as per applicable Typical Cross-Section. The detailed chainages are as follows:

Design Chainage		Length	Side
From	To		
Nil			

Gabion Walls: Gabion Walls shall be provided at the hill side as per applicable Typical Cross-Section. The detailed chainages are as follows:

Design Chainage		Length	Side
From	To		
9099	9146	47	Both
9146	9216	70	Hill Side
9706	9760	54	Hill Side

Reinforced Earth Wall Structure for Embankment & Slopes: Reinforced Earth Wall Structure for High embankments shall be provided as per applicable Typical Cross-Section.

Design and construction of reinforced earth steep slope shall include all dead and live loads and combinations including snow loads with adequate factor of safety, seismic loads, drainage provision for dissipation of pore water pressure and flexible galvanized steel mesh facing system with erosion protection measure for long term performance with a minimum design life of 100 Years. The contractor shall assess and substantiate the availability and design adequacy of foundation soil for overall stability under the location of the reinforced earth steep slope before execution of the works.

The work shall generally be done in conformity to the MORTH "Specification for Road and Bridge Works: Latest Revision, Section 3100 and specifically as per this document.

The detailed chainages are as follows:

Design Chainage		Length	Remarks
From	To		
7150	7171	21	
9146	9216	70	
9216	9600	384	
9600	9706	106	

14. Special Requirement for Hill Roads

In accordance with section 13 of the manual (from IRC: SP: 73-2018), IRC: SP 48: 1998 and Recommended practices for Treatment of Embankment and Roadside slopes for Erosion control (First Revision), IRC: 56-2011 and relevant IRC codes.

15. Slope Protection

As the project involves cutting of existing hill slopes, it is imperative that slopes are stabilized for ensuring longevity of the slope and the road. Slope stability, erosion control and landslide correction shall be accomplished in accordance with IRC: SP: 48-1998. Reference may be drawn from IRC: 56- 2011.

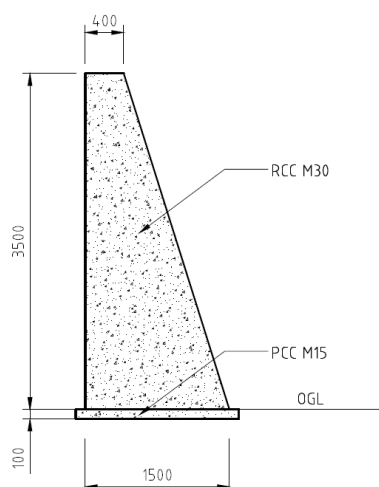
16. Avalanche Protection

In view of the identified avalanches falling on the project road, avalanche protection measures are required. The major avalanches where protection measures would be required are as follows:

Air Blast Protection Wall: This is in general provided for protection from direct impact of air blast on moving vehicles.

Design Chainage		Length	Side
From	To		
9100	9250	150	RHS

Typical Section of Air Blast Protection Wall is shown below:



TYPICAL DETAIL OF WALL FOR AIR BLAST

17. Snow Clearance

During the winter season, the contractor is to make sure that the snow clearance mechanism is to be followed in order to optimise the resources within the least operation time. Snow Clearance Activities such as Snow Plowing/Removal with the use of machineries (Snow Plower, Snow Blower, Snow Grader etc.) shall be done by the contractor on daily basis for the full length of Construction Package. Cost of the Snow Clearance mechanism whether mechanical or electrical will be borne by the contractor.

18. Change of Scope

The length of Structures, bridges, culverts and slope protection works whatsoever in terms of retaining wall, breast wall, gabion wall, RE wall, chute drain, catch pit, baffle piers/blocks etc. are under special requirement of hill slope specified hereinabove shall be treated as an approximate assessment. The actual lengths as required on the basis of detailed investigations shall be determined by the Contractor in accordance with the Specifications and Standards. 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 Article 13.

(Schedule B-1)

Schedule B-1

The shifting of utilities and felling of trees shall be carried out by the contractor. The cost of the same shall be borne by the Authority. The details of utilities are as follows:

Sl. No.	Type of Utility	Unit	Quantity	Location/stretch (LHS/RHS)
A	Electrical Utilities			
A1	Electrical poles	Nos.	Nil	-
A2	Electrical cables	Meters	Nil	-
A3	Transformers	Nos.	Nil	-
B	Felling of Trees	Nos.	5	LHS/RHS
C	OFC	No.	Nil	-

Schedule C

(See Clause 2.1)

PROJECT FACILITIES

1. Project Facilities

The schedule indicates the minimum spatial and functional requirements of the facilities to be provided on the **Project Highway (Total Length of 2.61 km)** with an aim to cater to the envisaged demand till the end of the concession period.

The Contractor shall construct the Project Facilities in accordance with the provisions of this Agreement. Such Project Facilities shall include:

- a) Roadside Furniture;
- b) Toll Plazas;
- c) Pedestrian facilities;
- d) Tree Plantation;
- e) Bus-Bay & Bus Shelters;
- f) Toilets;
- g) Others to be specified

2. Description of Project Facilities

Each of the Project Facilities is described below showing:

Sl.No.	Project Facility	Location	Design Requirements	Other essential details
Nil				

Schedule - D

(See Clause 2.1)

Specifications and Standards

1. Construction

The Contractor 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:

Annex – I

(Schedule-D)

Specifications and Standards for Construction

1. Specifications and Standards

All Materials works and construction operations shall conform to the Manual of Specifications and Standards for Two-Laning of Highways IRC:SP:73-2018 and Hill Road Manual (IRC:SP: 48-1998) referred to as the Manual, and MORTH Specifications for Road and Bridge Works. Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

2. Deviations from the Specifications and Standards

- (i) The terms "Concessionaire", "Independent Engineer" and "Concession Agreement" used in the Manual shall be deemed to be substituted by the terms "Contractor", "Authority's Engineer" and "Agreement" respectively.
- (ii) [Notwithstanding anything to the contrary contained in Paragraph 1 above, the following Specifications and Standards shall apply to the Project Highway, and for purposes of this Agreement, the aforesaid Specifications and Standards shall be deemed to be amended to the extent set forth below:]

[Note 1: Deviations from the aforesaid Specifications and Standards shall be listed out here. Such deviations shall be specified only if they are considered essential in view of project-specific requirements.]

SR.No	Item	Provisions	Deviation
1	Width of Structure	For open country mountainous terrain total width of the structure should be 18 m as per Clause 7.3(ii) of IRC:SP:73-2018 (Fig.- 7.6).	Provided total width of Uni directional Minor bridge – 10 m of carriageway width 7 m

- 3. Design life of all the underground structures shall be 100 years.

ATTACHMENT-DI

TECHNICAL SPECIFICATIONS FOR ROAD TUNNELS & BRIDGE

TECHNICAL SPECIFICATIONS

1. PREAMBLE

- 1.1 The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents as specified in Volume-XIII.

1.1.1 General

The Technical specifications covering the materials and the workmanship aspects as well as method of measurements and payments are included in this section. These specifications cover the items of civil and non-civil works coming under scope of this document. All work shall be carried out in conformity with the same. These specifications are not intended to cover the minute details. The works shall be executed in accordance with good practices followed for achieving high standards of workmanship, thus ensuring safety and durability of the construction. All codes and standards referred to in these specifications shall be the latest thereof unless otherwise stated.

1.1.2 Inclusive Documents

The provisions of special conditions of contract, those specified elsewhere in the tender document, as well as execution drawings and notes, or other specifications issued in writing by the Engineer shall form part of the technical specifications of this project.

- 1.1.3 The attention of the contractor is drawn to those clauses of codes which require supporting specification either by the Engineer or by 'Mutual agreement between the supplier and purchaser'. In such cases, it is the responsibility of the tenderer/contractor to seek clarification on any uncertainty and obtain prior approval of the Engineer before taking up the supply/construction. In absence of such prior clarification, the Engineer's choice/design will be final and binding on the contractor without involving separately any additional payment.

1.1.4 Measurement and Payment

The methods of measurement and payment shall be as described under various items and in the Bill of Quantities. Where specific definitions are not given the methods described in CPWD, IS and B.I.S. Code will be followed. Should there be any detail of construction or materials which has not been referred to in the specification or in the Bill of Quantities and Drawings but the necessity for which may be implied or inferred there from, or which is usual or essential to the completion of the work in the trades, the same shall be deemed in the rate and prices entered by the contractor in the Bill of Quantities.

1.1.5 Defective Works

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc., as specified by the Engineer the cost of repairs will be borne by the contractor.

1.2 SITE INFORMATION

1.2.1 The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.

1.2.2 The area in which the works are located is mostly plain to rolling terrain, the approximate longitude and latitude of the region being 75° E and 34° N respectively.

1.2.3 General Climatic Conditions

1.2.3.1 The variation in daily temperature in this region is as under:

- 1) During summer months, the maximum temperature is about 30°C.
- 2) During winter months, the minimum temperature is about -2°C.

1.2.3.2 Jammu & Kashmir state is the only part of the India that receives snowfall during winter months. The annual average snowfall for the last five years (2013-2018) in Zozila is 948.68 mm.

1.2.4 Seismic Zone

The works are located in Seismic Zone IV as defined in IRC : 6-2000.

2. GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor shall comprise of the following:

2.1 PART-I: General Technical Specifications

The General Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, April 2013)", as issued by the Ministry of Road Transport & Highways, Government of India and published by the Indian Roads Congress.

2.2 PART-II: Particular Technical Specifications

2.2.1 This Particular Technical Specifications of the Specifications revises certain Causes of MORTH Specifications for Road and Bridge Works 5th Revision 2013.

2.2.2 The amendments, if any, issued to the MORTH Specifications for Road and Bridge Works Fifth Revision 2013, shall apply to the relevant Clauses, otherwise as specified in this Section.

2.2.3 These revisions comprise substitutions, modifications or additions to clauses of the MORTH Specifications referred to in Part 1 - General Technical Specifications and accordingly the said Specifications so amended shall form part of the Contract.

2.2.4 The following list shows the Clauses of the MORTH Specifications, which are modified or added by this Particular Technical Specifications:

Section 100: 105, 106, 111, 112, 114 and 120

Section 200: 201 and 202

Section 300:	301, 304, 305, 306 and 309
Section 400:	401, 406, 409 and 410
Section 500:	501, 502, 503, 504, 505, 507, 508, 510 and 516
Section 800:	801, 802, 803, 805, 807, 809, 811 and 813
Section 1000:	1002, 1006, 1007, 1008 and 1014
Section 1500:	1501, 1502, 1506 and 1513
Section 1600:	1602, 1603 and 1605
Section 1700:	1705, 1706, 1707 and 1715
Section 1800:	1803
Section 2000:	2005, 2009 and 2011
Section 2100:	2104
Section 2200:	2204 and 2210
Section 2500:	2504 and 2507
Section 2700:	2703, 2706 and 2708
Section 2900:	2906, 2910 and 2911
Section 3000:	3001

2.2.5 Additional Specifications

The Clauses A-1 to A-8 have been added to the “SPECIFICATIONS FOR ROAD AND BRIDGE WORKS” (Fifth Revision, April 2013)

Clause A-1 DIVERSION AND FILLING OF EXISTING WATER COURSES ALONG THE ROAD ALIGNMENT

Clause A-2	CHUTE DRAIN FOR HIGH EMBANKMENT SECTIONS
Clause A-3	SPECIFICATIONS FOR PAINTING OF STRUCTURES WITH SYNTHETIC ENAMEL PAINT/ WATER PROOFING CEMENT PAINT
Clause A-4	CONTROLLED BLASTING
Clause A-5	INTER LOCKING CONCRETE BLOCKS
Clause A-5A	INTER LOCKING PAVER BLOCKS FOR RAISED PEDESTRIAN CROSSING
Clause A-6	POST CONSTRUCTION SERVICES
Clause A-7	SPECIFIC PROVISIONS FOR PROTECTION OF ENVIRONMENT
Clause A-8	SHEET PILES
Clause A-9	CUT & COVER SECTIONS

Clause A-10 HIGH EMBANKMENT SECTIONS

In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of IRC, BIS, BS, ASTM, AASHTO and CAN/CSA in that order. Where even these are silent, the construction and completion of the works shall conform to sound engineering practice as approved by the Engineer.

- 2.2.6 The latest edition till 28 days before the final date of submission of the bid of all specifications / standard shall be applicable.

SECTION 100 GENERAL.

CLAUSE 105 SCOPE OF WORK

Sub Clause 105.3

Add the following to the Sub Clause 105.3

The QA programme shall also conform to the requirements of EN ISO 9001.

CLAUSE 106 CONSTRUCTION EQUIPMENT

Add the following sub Para (l) after sub Para (k):

- l) All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken when results are unsatisfactory. Calibration of all measuring devices and gauges etc., which the Contractor intends to use in the contract, shall be calibrated from a competent/reputed authority/agency accredited to NABL and the frequency of the calibration shall be as directed by the Engineer. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

CLAUSE 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT

Replace entire Clause 111 with the following:

Sub Clause 111.1 General

The Contractor shall take all precautions for safeguarding the environment during the course of the construction of works. He shall abide by all rules, regulations and laws in force governing pollution and environmental protection that are applicable to the area where the works are situated.

NOISE:

The Contractor shall mitigate against any sustained increase in base line ambient Noise levels at sensitive receptors during construction of work.

All construction operations shall be performed in a manner to minimize noise and vibration. The parameters for noise are detailed below.

- 75 dB (A) for day;
- 70 dB (A) for night;
- 50 dB (A) for day and 40 dB (A) for night for sensitive receptors

If the noise levels are found to be above these standards and it is determined by the Engineer that these levels are due to the equipment or plant being deployed by the Contractor, he shall undertake, at his own cost measures as approved by the Engineer, to bring these levels down to the specified levels. Blasting should be done as per Indian Explosive Act. People living near such blasting sites shall have prior information of operational hazards. Blasting will not be undertaken at night. Workers at blasting sites will be provided with earplugs. Material haulage roads will be properly regulated.

Labour shall be warned against the hunting of wild life, if any. No archaeological site shall be disturbed.

Sub Clause 111.2 Borrow pits for Embankment Construction

Borrow pits shall not be dug within the Right-of-Way of the road. Arable lands will not be used for earth borrowing. The Contractor will ensure that proper excavation techniques are used to improve stability and safety of the borrow area. The excavation shall be carried out in such a way that the area does not inundate during monsoons or generate cesspools of water to become mosquito-breeding sites. The stipulations in Clause – 305.2.2 shall govern.

Sub Clause 111.3 Quarry Operations

The Contractor shall obtain material from licensed quarries only after the consent of the forest department or other concerned authorities. The quarry operation shall be undertaken within the purview of the rules and regulations in force. The Contractor shall ensure scheduling the movement of transport carrying material to and from the site during non-peak hours. The trucks carrying all the dusty material, red earth, moorum and fly ash/ pond, ash shall be covered with a tarpaulin and provided with adequate free board to prevent spillage. End boards shall be provided in loaders to prevent spillage.

Stockpiling of material shall be properly planned so as to ensure that no traffic jam takes place on the highway.

Sub-Clause 111.4 Control of Soil Erosion, Sedimentation and Water

The Contractor shall carry out the works in such a manner that soil erosion is fully controlled, and sedimentation and pollution of natural water courses, ponds, tanks and reservoirs is avoided. The stipulations of Clause 306 shall govern.

Sub Clause 111.5 Precautions against Dust

The Contractor shall take all reasonable steps to minimize dust nuisance during the construction of the works. All existing highways and roads used by vehicles of the Contractor or any of his sub-Contractors or suppliers of materials or plant, and similarly any new roads which are part of the works and which are being used by traffic shall be kept clean and clear of all dust / mud or other extraneous material dropped by the said vehicles or their tyres. Similarly, all dust / or mud or other extraneous material from the works spreading on these highways shall be immediately cleared by the Contractor. Clearance shall be effected

immediately by manual sweeping and removal of debris, or, if so directed by the Engineer, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed entirely from the road surface. Additionally, the road surface including haul road from Quarries and Plants shall be hosed or watered using suitable equipment to avoid dust pollution. Special care shall be taken to combat dust problem originating from use of fly ash/pond ash.

Sub Clause 111.6 Pollution from Hot Mix Plant, WMM Plant, Batching Plant & Crusher and Other Construction Machinery

The Contractor shall ensure the use of a relatively new, well maintained hot mix plant (batch type) so that any emission conforms to the CPCB norms and be fitted with a dust extraction unit to avoid prolonged engine powered equipment illness. Hot Mix Plant, WMM plant, Batching Plant & Crusher shall be located more than 500 m from any community or residence and 1 km away from the sensitive receptors (schools, hospitals), unless otherwise required by the statutory requirements. The Contractor has to obtain necessary consent/clearance from State Pollution Control Board to operate Hot Mix Plant, WMM plant, Batching Plant, DG Set & Crusher before commencement of works.

All vehicles, equipment and machinery needed for construction will be regularly maintained to ensure that pollution emission levels conform to CPCB norms. All vehicles should be fitted with silencers.

Construction vehicles, machinery & equipment will move or be stationed in designated areas to avoid compaction of soil to ensure the preservation of the top soil for agriculture.

Sub Clause 111.7 Road Safety

The Contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers and flag persons for traffic control. If there are traffic jams during construction, measures shall be taken to relieve the congestion with the assistance of local traffic police. Safety of workers undertaking various operations during construction will be ensured by providing helmets, masks, safety goggles, etc. One Qualified Safety Officer and one Safety Supervisor must be available in the Contractor's working team for the entire construction period.

The Contractor shall submit the **construction safety check** list in the format given below filled up to fourth column to the Engineer by 5th of every month. The Engineer shall fill up the remaining column of the check list and forward to the Employer within a week period.

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
Safety during Construction Stage							
1	Appointment of qualified Construction safety officers						

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
2	Approval for Construction Safety Management Plan by the Engineer.						
3	Approval for Traffic Management/control Plan in accordance with IRC: SP: 55-2001						
4	Maintenance of the existing road stretches handed over to the Contractor.						
5	Provision of Temporary Traffic Barriers/Barricades/caution tapes in construction zones						
6	Provision of traffic sign boards						
7	Provision for flags and warning lights						
8	Provision of metal drum/empty bitumen drum delineator, painted in circumferential strips of alternate black and white 100mm wide 2 coats fitted with reflectors 3 Nos of 7.5cm diameter						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work and access (ladders with handrail) for works at a height of more than 3.0 m						
11	Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of						

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
	more than 3.0 m depth.						
12	Demarcations (fencing, guarding and watching) at construction sites						
13	Provision for sufficient lighting especially for night time work						
14	Arrangements for controlled access and entry to Construction zones						
15	Safety arrangements for Road users / Pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular Inspection of Work Zone Traffic Control Devices by authorized contractor personnel						
18	Construction Workers safety - Provision of personnel protective equipment's						
19	A. Helmets						
	B. Safety Shoe						
	C. Dust masks						
	D. Hand Gloves						
	E. Safety Belts						
	F. Reflective Jackets						
	G. Earplugs for labour						
20	Workers employed on bituminous works, stone crushers, concrete batching plants etc. provided with protective goggles, gloves, gumboots etc.						

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
21	Workers engaged in welding work shall be provided with welder protective shields						
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition						
24	Regular health check-up for Labour/ Contractor's personnel						
25	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camps.						
26	The Contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers and flag persons for traffic control						
27	Provision for insurance coverage to the contractor's personnel						

Sub Clause 111.8 Sanitation & Waste Disposal in Construction Camp

The Contractor shall ensure that construction camps are located at a distance of minimum 200m from water sources. Special attention shall be paid to the sanitary conditions of the camps. The Contractor shall ensure that sufficient measures are taken i.e. provision of garbage tanks and sanitation facilities. Waste in septic tanks shall be cleaned periodically. Garbage shall be collected in four empty drums at each construction site and disposed of daily. The Contractor shall provide adequate measures for the health care of workers and arrange their regular medical check-up to ensure that they do not suffer from any

communicable disease. At every workplace, good & sufficient water supply will be maintained to avoid waterborne/ water related diseases. If any pits are dug at construction / camp sites which are not filled and then may turn into mosquito breeding sites during monsoons shall be filled up properly so that no water accumulates.

Sub Clause 111.9 Substance Hazardous to Health

The Contractor shall not use or generate any material in the works, which is hazardous to the health of persons, animals or vegetation. Where it is necessary to use some such substance which can cause injury to the health of the workers, the Contractor shall provide suitable protective clothing or appliances to his workers, viz. earplugs, helmets or dust masks.

Sub Clause 111.10 Damage to Existing road/ CD Structures

Any structural damage caused to the existing roads/structures by the Contractor's construction equipment shall be made good without any extra cost.

Sub Clause 111.11 Use of Nuclear Gauges

Nuclear gauges shall be used only where permitted by the Engineer. The Contractor shall provide the Engineer with a copy of the regulations governing the safe use of nuclear gauges he intends to employ and shall abide by such regulations. Without written approval, no such equipment shall be used at any level of the work.

Sub Clause 111.12 Environmental Monitoring

In order to carry out periodic checks, environmental monitoring will be carried out by the Engineer as per schedule and if any parameter is found above the acceptable standards, mitigation measures / control measures as decided by the Engineer shall be complied with by the Contractor.

Sub Clause 111.13 Protection of Existing Trees

Some of the existing trees within the right of way are likely to be cut down by the Employer prior to handing over of the site to the Contractor. The Contractor shall take all necessary measures to ensure safety and protection of the remaining trees from any action whatsoever relating to his construction operations in the adjoining areas.

Giant neighbourhood trees recognized locally as important shall be preserved and engineering designs modified to accommodate these wherever possible depending on Engineer's directions.

Sub Clause 111.14 Disposal of Materials outside Work Site

Notwithstanding other relevant provisions in the contract, the excess material generated by dismantling, excavation, waste material and lubricants, used oil, gasoline and other such substance etc., shall be removed from site outside the right of way at regular intervals and site shall kept clean from all such disposable materials. Grease, cotton and other waste construction materials shall be disposed of in shallow pits and periodically burnt in a incinerator constructed at each construction site. Such intervals shall not exceed one month under any circumstances. The selection of the disposal site shall be the responsibility of the

Contractor and he shall ensure that the selected site does not result in any claim for damages to the Employer or violation of any existing laws.

This section of Technical Specifications sets out instructions, recommended standards and technical specifications for the design and implementation of EMP mitigation works associated with construction of roads.

Environmental Management Plan has been prepared for the Project road, which needs to be followed during the implementation of the civil works. The key responsibility of the contractor/sub-contractor will be the successful implementation of the EMP. In addition, he will update MoRT&H on the progress of environmental protection and / or enhancement works as envisaged in the EMP. Execution of environmental mitigation measures meeting the requirement of Technical Specifications in conformity with applicable legislation will be the responsibility of the contractor. It shall also be accompanied with relevant documents (statements of compliance, certificates of compliance, test reports, etc.), evidencing their conformity with the statutory regulations.

111.14.1 DISPOSAL OF UNSERVICEABLE MATERIALS:

The locations of Disposal sites have to be selected such that:

- Locating the disposal sites is the sole responsibility of the contractor with the approval of Engineer.
- Joint inspection of all disposal sites shall be done by Engineer and Contractor prior to approval.
- No residential area are located downwind side of these locations,
- Disposal sites are located at least 1000 m away from sensitive locations like Settlements, Water body, notified forest areas, Sanctuaries or any other sensitive locations.
- Disposal sites do not contaminate any water sources, rivers etc for this site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the Village/local community is to be obtained for the Disposal site selected.
- Contractor will resolve all claims arising out of waste disposal at his own cost.
- Contractor shall utilize the suitable borrow areas, abandoned quarries and other waste land for the debris disposal.
- Contractor needs to plan the disposal in the following way:
 - Identify the disposal area.
 - Prepare a Contractors debris disposal plan with design drawings for each identified area and get it approved by the Engineer.
 - Need to photograph the present land use and condition of the area.
 - Construct all required structures (e.g. retaining wall).

- The dumpsites filled only up to the ground level with compaction of the debris materials in layers after disposal.
- The 30 cm top layer of disposal pit shall be provided with good earth suitable for development of vegetation/plantation.
- After levelling, the site could be suitably rehabilitated by planting local species of grass (turfing), shrubs and other plants as decided by the Engineer.

111.14.2 CONSTRUCTION OF WATER RECHARGE PITS:

Storm water recharge pits shall be located such that it should be in the valley of the surface layout nearby cross drainage structures and other water bodies along the project road. Water recharge pits shall be located at a height of 3 m. above the ground water table of the area as per the Central Ground Water Board norms. Recharge pits are constructed by the side of the guiding drains such that all the storm water shall be directed to the recharge pit. Any proposal for change in number and location recharge pits by the contractor shall be checked and approved by the Engineer.

Pits, trenches, abandoned dug wells, recharge wells or abandoned bore wells shall be connected by the rain water harvesting system with the consent of the respective owner or as approved by the Engineer.

111.14.3 CONSTRUCTION OF SILT TRAPS:

Silt fences shall be planned such that each recharge pit will have one silt fence to prevent silt from entering the nearest water bodies and also prevent choking of recharge pit by the silt coming from runoff water and increase the life of recharge pits. Silt fence are mounted in guiding drains at a distance of 3 to 5 M in the upstream direction depending on the gradient of the guiding drains. However any proposal for change in number and location silt fences by the contractor shall be checked and approved by the Engineer. Sand / silt removal facilities such as sand traps, silt traps and sediment basins should be provided to remove sand / silt particles from run-off.

111.14.4 SCARIFIED BITUMEN DISPOSAL PITS:

Scarified bitumen generated out of scarification of existing pavement is used for approach roads by mixing it with fresh bitumen or other granular materials to achieve the required strength followed by profiling and compaction.

The left out portion of the scarified bitumen is disposed safely in a clay lined pit or as directed and approved by the Engineer. A typical clay lined bitumen disposal pit with standard dimensions has been worked out. The dimension of the bitumen disposal pit may change provided the clay lining of required thickness is adhered to.

The selection of sites for disposal of scarified bitumen is made on following lines:

- Locating the bitumen disposal sites is the sole responsibility of the contractor with the approval of Engineer.

- Selection of bitumen disposal site is avoided in the quarry regions. If the disposal site is located in the abandoned quarry, region is suitably treatment seal the fractures and fissures.
- Joint inspection of all disposal sites shall be done by Engineer and Contractor prior to approval.
- Disposal sites shall be located at least 1000 m away from sensitive locations like Settlements, Water body, notified forest areas, Sanctuaries or any other sensitive locations.
- Disposal sites do not contaminate any water sources, rivers etc for this, site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of bitumen disposal site has to be obtained before finalizing the location.
- Permission from the Village/local community is to be obtained for the Disposal site selected.
- Contractor will resolve all claims arising out of waste disposal at his own cost. Contractor needs to plan the bitumen disposal in the following way:
 - ☐ Identify the disposal area.
 - ☐ Prepare a Contractors bitumen disposal plan with design drawings for each identified area and get it approved by the Engineer.
 - ☐ Need to photograph the present land use and condition of the area.
 - ☐ Construct all required structures (e.g. retaining wall) along with clay lining and measures to prevent the seepage of bitumen leachate.
 - ☐ The dumpsites filled only up to the ground level with compaction of the materials in layers after disposal.
 - ☐ The 30 cm top layer of disposal pit shall be provided with good earth suitable for development of vegetation/plantation.
 - ☐ After levelling, the site could be suitably rehabilitated by planting local species of grass (turfing), shrubs and other plants as decided by the Engineer and the supervision consultant.

111.14.5 PROVISION FOR OIL INTERCEPTORS:

Location of Oil Interceptors shall be considered such that each construction camp having refuelling stations, oil and lubricants storage places will have one oil interceptor to stop & separate the floating oils. However the number of interceptors shall be increased as the situation demands or during the accidental spillages with the consent of the Engineer.

111.14.6 ENVIRONMENTAL MONITORING:

Environmental Monitoring of Air, Noise, Water and Soil parameters shall be carried by the contractor as per the consents and latest environmental norms, guidelines and policies of national and state level environmental authorities. The Contractor shall comply by all obligations and make sure that there are no deviations from them or from the Contract.

Environmental standards for Air, Noise and water are outlined below.

1. Ambient Air Quality Standards (National)

S. No.	Pollutants	Time weighted average	Concentration in ambient air		Method of measurement
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Area (notified by Central Government)	
1.	Sulphur Dioxide (SO ₂) µg/m ³	Annual*	50	20	- Improved West and Geake - Ultraviolet Fluorescence
		24 hours**	80	80	
2.	Nitrogen Dioxide (NO ₂) µg/m ³	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
		24 hours**	80	80	
3.	Particulate Matter (size less than 10 µm or PM ₁₀) µg/m ³	Annual*	60	60	- Gravimetric - TOEM - Beta attenuation
		24 hours**	100	100	
4.	Particulate Matter (size less than 2.5 µm or PM _{2.5}) µg/m ³	Annual*	40	40	- Gravimetric - TOEM - Beta attenuation
		24 hours**	60	60	
5.	Ozone (O ₃) µg/m ³	8 hours**	100	100	- UV Photometric - Chemiluminescence - Chemical method
		1 hour **	180	180	
6.	Lead (Pb) µg/m ³	Annual*	0.5	0.5	- ASS/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
		24 hours**	1.0	1.0	

S. No	Pollutants	Time weighted average	Concentration in ambient air		Method of measurement
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Area (notified by Central Government)	
7.	Carbon Monoxide (CO) mg/m ³	8 hour	02	02	- Non Dispersive Infra Red (NDIR)
		1 hours**	04	04	- Spectroscopy
8.	Ammonia (NH ₃) µg/m ³	Annual*	100	100	- Chemiluminescence 24
		24 hours**	400	400	- Indophenol blue method
9.	Benzene (C ₆ H ₆) µg/m ³	Annual*	05	05	- Gas chromatography based - on continuous analyser - Adsorption and desorption - followed by GC analysis
10.	Benzol (O) Pyrene (BaP) – Particulate phase only ng/m ³	Annual*	01	01	- Solvent extraction followed - by HPLC/GC analysis
11.	Arsenic (As) ng/m ³	Annual*	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12.	Nickel (Ni) ng/m ³	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
*	Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.				
**	24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it				

S. No.	Pollutants	Time weighted average	Concentration in ambient air		Method of measurement
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Area (notified by Central Government)	
	may exceed but not on two consecutive days.				

2. Water quality Standards (IS 10500: 1991)

S. No.	Parameter	Requirement desirable Limit	Remarks
1.	Colour	5	May be extended up to 50 if toxic substances are suspected
2.	Turbidity	10	May be relaxed up to 25 in the absence of alternate
3.	pH	to 8.5	May be relaxed up to 9.2 in the absence of alternate
4.	Total Hardness	300	May be extended up to 600
5.	Calcium as Ca	75	May be extended up to 200
6.	Magnesium as Mg	30	May be extended up to 100
7.	Copper as Cu	0.05	May be relaxed up to 1.5
8.	Iron	0.3	May be extended up to 1
9.	Manganese	0.1	May be extended up to 0.5
10.	Chlorides	250	May be extended up to 1000
11.	Sulphates	150	May be extended up to 400
12.	Nitrates	45	No relaxation
13.	Fluoride	to 1.2	If the limit is below 0.6 water should be rejected, Max. Limit is extended to 1.5
14.	Phenols	0.001	May be relaxed up to 0.002
15.	Mercury	0.001	No relaxation
16.	Cadmium	0.01	No relaxation
17.	Selenium	0.01	No relaxation
18.	Arsenic	0.05	No relaxation

S. No.	Parameter	Requirement desirable Limit	Remarks
19.	Cyanide	0.05	No relaxation
20.	Lead	0.1	No relaxation
21.	Zinc	5.0	May be extended up to 10.0
22.	Anionic detergents (MBAS)	0.2	May be relaxed up to 1
23.	Chromium as Cr+6	0.05	No relaxation
24.	Poly nuclear aromatic Hydrocarbons	--	--
25.	Mineral Oil	0.01	May be relaxed up to 0.03
26.	Residual free Chlorine	0.2	Applicable only when water is chlorinated
27.	Pesticides	Absent	--
28.	Radio active	--	--

3. Ambient Noise Quality Standards in respect of Noise

Area code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Note:-

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

- * *dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.*

A “decibel” is a unit in which noise is measured.

“A”, in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is an energy mean of the noise level over a specified period

Note: *The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.*

Sub Clause 111.15

Compliance with the foregoing will not relieve the Contractor of any responsibility for complying with the requirements of any highway authority in respect of the roads used by him.

Sub Clause 111.16 Measurement

For Compliance of all provisions made in this Clause 111, it shall be deemed to be incidental to the work and no separate measurement shall be made. The Contractor shall be deemed to have made allowance for such compliance with these provisions in the preparations of his prices for items of work included in the Bill of Quantities and full compensation for such compliance shall be deemed to be covered by them.

CLAUSE 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION

Sub Clause 112.1 Add the following at the end of this Sub-Clause:

“The Contractor shall ensure that all the traffic management devices as per Traffic Management Plan approved by the Engineer are in position before opening of sites of work.”

Sub-Clause 112.2 Passage of Traffic along a part of the Existing Carriageway under improvement

Replace 2nd sentence of 1st paragraph of the Sub Clause 112.2 with the following:

The treatment of the shoulder shall consist of providing at least 150mm thick granular (Wet Mix Macadam) base course covered with 20 mm thick Close-Graded Premix Surfacing/Mixed Seal Surfacing (Type B) as per Clause 508 in a width of at least 1.5m such that the total paved width available for traffic including part of the existing road and treated shoulder is not less than 3.75m and the treated shoulder shall be maintained throughout the period during which traffic uses the same to the satisfaction of the Engineer.

Replace the Sub Clause 112.3 of MoRT&H with the following

Sub Clause 112.3 Passage of Traffic along a Temporary Diversion

In stretches where it is not possible to pass the traffic on part width of the carriageway, a temporary diversion shall be constructed with 5.5 m carriageway and 2.5 m earthen shoulders on each side (total width of roadway 10.5 m) with the following provision for road crust in the 5.5 m width:

- (i) Earthwork
- (ii) 200 mm (compacted) granular sub-base;
- (iii) 225 mm (compacted) granular base course (Wet Mix Macadam);
- (iv) Priming and Tack Coat and
- (i) 20 mm thick Close-Graded Premix Surfacing / Mixed Seal Surfacing (Type B).

The use of fly ash in temporary diversions shall not be permitted.

The location of such stretch, alignment and longitudinal section of diversion including junctions and temporary cross drainage provision shall be as approved by the Engineer.

The Contractor shall be responsible for the design of temporary diversions and submit the designs to the Engineer for his approval. If the Contractor finds it necessary to construct part of any diversion outside the Right of Way, the temporary use of additional land shall be arranged for by the Contractor at his own risk and cost. Further as per Conditions of Contract, the Contractor shall indemnify the Employer and the Engineer against any claims or proceedings resulting from the occupancy and use of such areas of additional land. Any roadside trees that have to be removed for the construction of temporary diversions shall be at the responsibility and cost of the Contractor.

Sub Clause 112.4 Traffic safety and Control

Add the following paragraph at the end of the Sub Clause 112.4

The Provisions made in Bill of Quantities shall be the ceiling for the Contract during the Contract Period. The Additional claims due to damage and theft of the same shall be deemed incidental to works. No extra payment shall be made towards additional quantities for these bill items.

Replace the Sub Clause 112.6 with the following

Sub Clause 112.6 Measurements for Payment and Rate

- (i) All arrangements for traffic during construction including provision of temporary cross drainage structures, if required and treated shoulder as described in Clause 112.2 including their maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be the Contractor's responsibility, **unless provided as a separate payable item in the BOQ.**

- (ii) The construction of temporary diversion including temporary cross drainage structures at the site of bridge reconstruction locations as described in Clause 112.3, shall be **payable** and measured in linear metre and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labour, tools, etc.), maintenance, final dismantling, and disposal.

CLAUSE 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

Sub Clause 114.2 Add the following at the end of Item (ii) of Clause 114.2:

“The Contractor shall submit data via electronic media and hard copy to the Engineer in a form readily compatible with the Engineer’s planning system.”

Sub Clause 114.2 Add the following as item (xix) to sub-clause 114.2:

“Monthly progress report in a format acceptable to the Engineer” The report shall state the progress which has been achieved compared with the planned progress, illustrate delays in proportion to the progress planned, analyse the consequences and state planned corrective measures. Intermediate progress reports may also be required.

The first issue of the detailed programme including the detailed description of the system and the procedures shall be submitted to the Engineer for acceptance not later than 28 days after the date of receipt of the letter of acceptance.”

S. No	Item, Specifications	Nos. required
	A: General	
1)	Weigh Balances	
(a)	5 kg to 20 kg capacity Electronic Type –Accuracy 1 gm	2
(b)	500 gm capacity Electronic Type – Accuracy 0.01 gm	2
(c)	Chemical balance 100gm capacity - Accuracy 0.0001gm	1
(d)	Pan balance 5 kg capacity Electronic Type - Accuracy 0.5 gm	2
(e)	Platform Balance Scale – 300 kg capacity	1
(f)	Triple Beam balance-25kg capacity Accuracy 1gm	2
2)	Oven – electrically operated, thermostatically controlled (including thermometer), stainless steel interior	
(a)	From 0°C to 220°C – Sensitivity 1°C	2
3)	Sieves: as per IS: 460-1962	
(a)	IS Sieves 450 mm internal dia. of sieve sets as per BIS of required sieve sizes complete with lid and pan	2 set

	(b)	IS sieve 200 mm internal dia. (brass frame and steel/ or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with lid and pan	2 set
4)		Sieve shaker capable of taking 200 mm and 450 mm dia. Sieves electrically operated with time switch assembly (As per BIS)	1
5)		200 tonnes compression testing machine	1
6)		Stop watches 1/5 sec. Accuracy	2
7)		Glassware comprising of Beakers, Pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0°C to 100°C and metallic thermometers range 300°C	1 Dozen each
8)		Hot plates 200 mm dia (1500 watt)	6
9)		Enamel trays	
	(a)	600 mm x 450 mm x 50 mm	10
	(b)	450 mm x 300 mm x 40 mm	10
	(c)	300 mm x 250 mm x 40 mm	6
	(d)	Circular plates of 250 mm dia.	6
10)		Water Testing Kit	1
11)		First Aid Box	1
12)		Spatula Set of 100 and 200 long	3
13)		Digging Tools (pixels, shovel, fork etc.)	As reqd.
14)		Miscellaneous tools (sledge hammer, lump hammer, wooden pegs etc.)	As reqd.
15)		Maximum and Minimum Thermometer	2 Set
16)		Rain Gauge	1 Set
17)		Timer 0-60 minutes with alarm & 1/5 sec accuracy.	3 Sets
		B: For Soils and Aggregates	
1)		Water still, 3 liter/hr with fittings and accessories	1
2)		Liquid limit device with Casagrande and ASTM grooving tools as per IS: 2720	1
3)		Sampling pipettes fitted with pressure and suction inlets, 10 ml. Capacity	2 set
4)		Compaction apparatus (Proctor) as per IS: 2720 (Part 7) complete with collar, base plate and hammer and all other accessories	1 set
5)		Modified AASHTO compaction apparatus as per IS. 2720 (Part 8) 1983 or Heavy Compaction Apparatus as per IS complete with collar, base plate, hammer and all other accessories	1 set
6)		Sand pouring cylinder with conical funnel and tap and complete as per IS 2720 (Part 28) 1974 including modified equipment	4

7)		Ennore Standard Sand	As Reqd.
8)		Sampling tins with lids 100 mm dia x 75 mm ht ½ kg capacity and miscellaneous items like moisture tins with lid (50 grams) etc.	12
9)		Lab CBR testing equipment for conducting CBR testing, load frame with 5 Tonne capacity, electrically operated with speed control as per IS: 2720 (Part 16) and consisting of following:	1 set
	(a)	CBR moulds 150-mm dia – 175-mm ht. complete with collar, base plate etc.	24
	(b)	Tripod stands for holding dial gauge holder	24
	(c)	CBR plunger with settlement dial gauge holder	1
	(d)	Surcharge weight 147-mm dia 2.5 kg wt.	48
	(e)	Spacer disc 148-mm dia, 47.7-mm ht. With handle	3
	(f)	Perforated plate (Brass)	24
	(g)	Soaking tank for accommodating 24 CBR moulds	
	(h)	Proving rings of 1000 kg, 2500 kg and 5000 kg capacity	1 each
	(i)	Dial gauges, 25 mm travel- 0.01 mm/division	10
	(j)	Aluminium Tins	
		50x30mm	36 nos
		55x35mm	36 nos
		70x45mm	36 nos
		70x50mm	36 nos
		80x50mm	36 nos
10)		Standard Penetration test equipment	1
11)		Nuclear moisture Density meter or equivalent	2
12)		Speedy moisture meter complete with chemicals	2
13)		Unconfined compression test apparatus	1 set
14)		Aggregate Impact Test Apparatus	1
15)		Aggregate Impact Test Apparatus as per IS 2386 (Part 4) 1963	1
16)		Los Angeles abrasion Test Apparatus as per IS 2386 (Part 4) 1963	1
17)		Riffle Box of Slot size of 50mm as per ASTM C-136	1
18)		Dynamic Cone Penetrometer	1
19)		Hydrometer with high speed stirrer and jars	2 sets
20)		Post-hole augur (to BS-812)	3
		C: For Bitumen and Bituminous Mixes	
1)		Constant temperature bath for accommodating bitumen test specimen,	2

		electrically operated and thermostatically controlled (to accommodate minimum six Specimens)	
2)		Penetrometer automatic type, adjustable weight arrangement and needles as per IS. 1203 – 1978	2
3)		Soxhlet extraction or centrifuge type apparatus complete with extraction thimbles with stocks of solvent and filter paper	1
4)		Bitumen laboratory mixer including required accessories (20 ltrs.)	1
5)		Marshall compaction apparatus automatically operated as per ASTM 1559-62 T complete accessories (with 180 N Marshall Moulds	1 set
6)		Distant Reading Digital Thermometer for Measuring Temperatures in Asphaltic Mixes	As required
7)		Riffle Box	1
8)		Automatic Asphalt Content Gauge [Nuclear or equivalent]	1
9)		Thin film Oven test apparatus for modified binder either with PMB or CRMB	1
10)		Ring Ball Apparatus as per IS 1205- 1978	1
11)		Asphalt Institute Vacuum Viscometer as per IS 1206 (part II) – 1978	1
12)		BS U- Tube Modified Reverse Flow Viscometer IS 1206 (Part III) – 1978	1
13)		Apparatus for Determination of Ductility Test as per IS 1208 – 1978	1
14)		Pen Sky – Martin closed Tester for testing flash and fire point as per IS 1209 – 1978.	1
15)		Apparatus for Float Test – IS – 1210 – 1978	1
16)		Apparatus for Determination of water content (Dean and Stark Method) IS – 1211 – 1978	1
17)		Apparatus for Determination of Loss on Heating IS – 1212-1978.	1
18)		Apparatus of Determination of specified Gravity IS-1202-1978	1
19)		Core cutting machine suitable for upto 150mm dia. Core	1
20)		Apparatus for Elastic Recovery test for Modified Bitumen	1
21)		Apparatus for Storage Stability test for Modified Bitumen	1
22)		Apparatus for Separation test for Modified Bitumen	1
23)		Sand Equivalent test apparatus	1
24)		Mastic Asphalt Hardness testing equipment	1

25)		Automatic Asphalt content Meter	1
		D: For Cement, Cement Concrete and Materials	
1)		Water still	1
2)		Vicat needle apparatus for setting time with plungers, as per IS. 269-1967	1
3)		Moulds	
	(a)	150 mm x 300 mm ht cylinder with capping component along with the capping set and compound as per IS	As required
	(b)	Cube 150mm, and 100mm (each size)	As required
	(c)	150mmx100 mm x600mm beam for flexural strength	As required
4)		Concrete permeability apparatus	1
5)		High frequency mortar cube vibrator for cement testing	1
6)		Concrete mixer power driven, 1 cu ft capacity	1
7)		Variable frequency and amplitude vibrating table size 1 metre x 1 metre as per the relevant British Standard	1
8)		Flakiness & Elongation test apparatus	2each
9)		Aggregate impact test apparatus as per IS 2386 (Part 4) 1963	2
10)		Los Angeles abrasion apparatus as per IS. 2386 (Part 4) 1963	1
11)		Flow table as per IS 712-1973	1
12)	(a)	Equipment for slump test	2
	(b)	Compaction factor test equipment	1
13)		Equipment for determination of specific gravity for fine and coarse aggregate as per IS 2386 (Part 3) 1963	2
14)		Compression and Flexural strength testing machine of 200T capacity with additional dial for flexural testing	1
15)		Core cutting machine with 100 mm dia. Diamond cutting edge	1
16)		Needle vibrator	1
17)		Vibrating hammer as per BS specification	1
18)		Air entrainment meter ASTM C - 231	1
19)		0.5 Cu. ft, 1 Cu. ft cylinder for checking bulk density of aggregate with tamping rod	1
20)		Soundness testing apparatus for cement	1
21)		Flexural Beam testing machine with accessories	1
22)		Chemicals solutions and consumable	As reqd.

23)		Chloride Testing kit for chemical analysis of chloride content.	1
24)		ION Exchange kit for rapid determination of sulphate content.	1
		E: For Control of Profile and Surface Evenness	
1)		Precision automatic level with micrometer attachment	2 sets
2)		Distomat or equivalent	2 Nos.
3)		Theodolite – Electronically operated with computerised output attachment	2 sets
4)		Total Station with all accessories	2 sets
5		Roughometer (Towed Fifth Wheel Bump Indicator)	1 set
6)		3 metre straight edge and measuring wedge	2 sets
7)		Camber templates 2 lane	
	(a)	Crown type cross-section	2 sets
	(b)	Straight run cross-section	2 sets
8)		String line Arrangement with sensor paver	1
9)		Steel tape	
	(a)	5 m long	as reqd
	(b)	10 m long	as reqd
	(c)	20 m long	as reqd
	(d)	30 m long	as reqd
	(e)	50 m long	As reqd
9)		Precision Staff	3 Sets

Sub Clause 114.2 Add the following as item (xx) to Sub-Clause 114.2

Cost of carrying out Topographic Surveys and Auto Level Surveys.

CLAUSE 120 FIELD LABORATORY

Sub Clause 120.2 Replace Sub-Clause 120.2 with the following:

120.2 Description

The Contractor shall arrange to provide fully furnished and adequately equipped field laboratory. The field laboratory shall be located in close proximity to the Works site. It shall be provided with electricity supply, electrical wiring and points, all necessary electrical

fittings and fixtures; potable water supply including pipes, pumps, storage tanks, plumbing, all necessary fittings and fixtures; septic tank, sewer lines, drains; surfaced access road; fencing and security lighting; security services etc.

The floor space requirement for the field laboratory shall be as indicated in the drawings. It shall include office space for the Materials Engineers, one from the Contractor's side and another from the Engineer's side, space for the installation of equipment, and space for other facilities. The field laboratory shall be fitted complete with laboratory equipment, laboratory tables and cupboards, wash basins, toilet facilities, curing tank around 4m x 2m x 1m in size for the curing of samples, a fume chamber, working platform area of about 1m x 10m against the walls, cupboards above and below the working platform, space for storage of accessories such as sample moulds, space for storage of samples etc. At least 4 racks of slotted angles and M.S. sheets shall also be provided. The furnishing in each of two offices of the Materials Engineers shall include working tables and chairs.

Table 100-2: List of Laboratory Equipment

Note: 1) The laboratory set-up must be complete including a set of reference standards, adequately staffed and operational to the satisfaction of the Engineer not later than 2 months from the date of receipt of Notice to commence the works. The Contractor shall be responsible for the provision of adequately experienced and qualified laboratory staff, in sufficient numbers to be able to meet all testing requirements to the approval of the Engineer, and for the supply of all transportation of staff, testing equipment and samples necessary to allow the testing to be performed in a time scale compatible with the needs of the Site.

2) The laboratory setup may be reduced after issue of Taking Over Certificate with the approval of Engineer.

Sub Clause 120.4 Maintenance

This Clause shall read as under:

"The Contractor shall arrange to maintain the laboratory in satisfactory manner and will carry stocks of spare equipment and laboratory consumables until the issue of Performance Certificate. Maintenance include the day to day upkeep of the laboratory building and the surroundings, attending to repairs to various parts of the building, furniture, fittings, office/laboratory equipment's and the concerned services as and when necessary, including the periodic white/colour washing of building and painting of wood, steel work, replacing the broken window/door/ventilator, glasses, furniture and other hardware and maintaining necessary watch and ward during the day and night.

The Contractor shall arrange to provide uninterrupted supply of electricity and water for the laboratory building. In case of failure of main power/water supply, alternate source shall be available for providing uninterrupted supply."

SECTION 200 SITE CLEARANCE

CLAUSE 201 CLEARING AND GRUBBING

Sub Clause 201.1 Scope

Add the following Paragraph at the end of this Sub-Clause.

“Diversion and filling of existing Water courses along the road alignment shall be as per Additional Technical Specification A-1.”

Sub Clause 201.5 Delete 1st sentence in the 1st Paragraph in Sub-Clause 201.5 and add the following sentence.

Clearing and grubbing for road embankment, drains and cross drainage structures shall be measured on area in plan basis in terms of hectares.

CLAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/PAVEMENTS

Sub-Clause 202.6 Measurements for Payment

This Clause shall read as:

The work of dismantling shall be paid for in units indicated below by taking measurements before and after, as applicable:

(i)	Dismantling brick/stone masonry / plain cement concrete / reinforced cement concrete including reinforcement.	Cum
(ii)	Dismantling pavement structures such as Granular Course, Bituminous course, Concrete pavement	Cum
(iii)	Dismantling pipes, guard rails, road kerbs, gutters and fencing	Linear Meter
(iv)	Dismantling Guard Stones/KM stones/Sign post/Hect. Stones/5 th KM stones	Nos
(v)	Dismantling RCC railing	Linear Meter
(vi)	Dismantling angle type expansion joints of bridges	Linear Meter
(vii)	Dismantling of railing kerb	Linear meter
(viii)	Dismantling of Concrete Edge strip without damaging existing structure	Linear Meter
(ix)	Dismantling of Drainage spout including cleaning entire area, enclosure of metallic bearing	Nos.
(x)	Dismantling of Stone pitching/ boulder apron/ brick soling/ stone soling	Cum

SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE

CLAUSE 301 EXCAVATION FOR ROADWAY AND DRAINS

Sub-clause 301.3.5 Rock Excavation

The first sentence of first paragraph shall read “Rock, when encountered in road excavation shall be removed up to a level of 150mm below the base of WMM”.

Sub-clause 301.3.7 Excavation of road shoulders/verge/medians for widening of pavement or providing treated shoulders:

The 2nd sentence of this Clause shall read as under:

The Subgrade material within 500mm from the bottom of the pavement for the widened portion and paved shoulder shall be loosened and compacted as per Clause 305 if it does not meet the compaction requirement of Table 300-2.”

Sub Clause 301.6 Preparation of Cut Formation

Third paragraph shall be read as under:

“In rock formation, the rock shall be cut 150mm below the specified elevation of base of WMM and the surface irregularities shall be corrected. The gap between rock cut and base of WMM shall be filled with 150mm thick granular sub-base as per Grading-V of Table 400-1 of Clause 401. The unsuitable material shall be disposed of in accordance with Clause 301.3.11”.

Sub Clause 301.8 Measurements for Payment

In **first line of first paragraph** add “and drains” after the word “roadway”

CLAUSE 304 EXCAVATION FOR STRUCTURES

Sub Clause 304.3.2 Excavation

At the end of 1st paragraph of Clause 304.3.2 insert the following additional sentences:

“The Contractor shall ensure the stability and structural integrity of adjacent existing foundations and structures and if necessary shall, at his own expense, install temporary or permanent sheet piles, coffer dams, shoring or similar support or protection to the satisfaction of the Engineer.”

CLAUSE 305 EMBANKMENT CONSTRUCTION

Clause 305.2.1.6 the 1st sentence of this Clause shall read as under:

“The material to be used in subgrade shall conform to the design CBR value of not less than 8% at the specified density and moisture content of the test specimen.”

Clause 305.2.2.4 Compaction Requirements

In Clause 305.2.2.4 after the 1st paragraph delete Table 300-2 and substitute the following:

Table 300-2: Compaction Requirements for Embankment and Sub-grade

S. No.	Type of Work/Material	Relative Compaction as %age of maximum laboratory dry density as per IS 2720 (Part 8)
1	Subgrade and earthen shoulders	Not less than 97%
2	Embankment	Not less than 95%
3	High Embankment (Height >6m)	Not less than 97%
4	Expansive clays	Not allowed
5	Design CBR of Subgrade & Shoulder shall be as per Drawing, but not less than 8%	

Sub Clause 305.3.4 Compacting Ground Supporting Embankment/Sub-grade

Add the following paragraph at the end of 2nd Paragraph in Sub Clause 305.3.4

Backfilling layers in pits, trenches and below the original ground are to be compacted to the relative natural ground density. The natural ground density shall be determined by conducting field density tests at three widely spaced locations along the central line of the proposed carriageway at a depth in between 0.5m to 1.0m. Samples of natural ground are collected at each location, and are tested in accordance with IS: 2720 (Part 8). The relative density (i.e. the percentage of the field dry density to the laboratory maximum dry density) is assessed for each sample, and the greatest relative density obtained is selected as the “natural ground density”. If the natural ground density is less than 85% then these are to be compacted after necessary watering so as to achieve not less than 85% of relative compaction”.

Sub-Clause 305.9.1

Add new sub section as (xv) “slush removal”

Sub Clause 306.4 Replace Sub-clause 306.4 with the following:

a)	Unlined ditch drain	.....	As per Clause 301
b)	Semi-Circular median drain as shown in the drawing with PCC M20, NP2 pipe, levelling concrete M15 and filter media.	.....	Running metre
c)	Drainage Chute	.....	Running metre
d)	Lined open/Covered drain		

(i) Levelling concrete M15	.....	Cubic metre
(ii) Coarse rubble masonry	.....	Cubic metre
(iii) Stone pitching grouting with CM 1:3	.....	Cubic metre
(iv) RCC grade M20	.....	Cubic metre
(v) Steel Reinforcement	.....	Tonne
(vi) Precast perforated slab	.....	Nos.
(vii) Catch pits/inspection chambers	.....	Nos.
(viii) RCC pipes	.....	Running metre
f) Sub-surface drains		Running metre

“The soil erosion, sedimentation and pollution control works shall be deemed as incidental to the Earthwork and other items of work and, as such, no separate payment shall be made for the same

Sub Clause 306.5 Rates

This Clause shall be deleted.

Sub-Clause 309.4 Measurements for Payment

This Clause shall read as:

“Construction of drains shall be measured as finished work in position as below:

SECTION 400 SUB-BASES, BASES (NON-BITUMINOUS) AND SHOULDERS

General

Sub clause (i) of clause 401.7 stands deleted and remaining sub paras (ii) to (v) are renumbered as (i) to (iv).

Sub clause (i) of clause 405.7 stands deleted and remaining sub paras (ii) to (v) are renumbered as (i) to (iv).

The provision of clause 401.7 (i) to (v) be read as “Clause 401.7 (i) to (iv)” in the sub clauses 402.8, 403.8, 404.7, 407.8 and 408.7.”

CLAUSE 401 GRANULAR SUB-BASE

Sub Clause 401.2 Materials

Sub Clause 401.2.1 The Clause shall read as follows:

“The material to be used for the work shall be crushed stone conforming to the physical requirements stipulated in Sub-Clause 401.2.2. The material shall be free from organic or other deleterious constituents and conform to Grading-V of Table 400-1.”

Sub Clause 401.3 Construction Operations

Sub-Clause 401.3.1: Preparation of Sub grade

Add the following paragraphs at the end of the 1st paragraph of Sub-Clause **401.3.1: Preparation of Sub grade**

Where the existing pavement is to be overlaid by a granular base/ sub-base, then the pavement shall be scarified in accordance with Sub Clause 501.8.3.2. Where the existing pavement contains multiple bituminous layers the scarification shall be to the underside of the lowest bituminous layer. The Contractor will verify that all bituminous layers have been removed using appropriate methods approved by the Engineer. The bituminous surfacing material removed from the existing pavement may be used in other parts of the works as directed by Engineer provided it complies with the relevant specification clauses.

After scarification and removal to the satisfaction of the Engineer of the bitumen surface from the existing pavement to be overlaid, the surface shall be lightly sprinkled with water if necessary and rolled with three passes of an 8-10 Ton smooth wheeled roller. The existing pavement shall then be proof rolled with an 8 tonne single drum vibrating roller in the presence of the Engineer who shall determine suitability of the surface for overlay

CLAUSE 406 WET MIX MACADAM SUB-BASE/BASE

Sub Clause 406.2 Materials

Sub-Clause 406.2.1.1 Physical requirements

Delete **2nd Sentence in 1st Paragraph in the Sub Clause 406.2.1.1 and replace with the following Sentence:**

“The constituents of the aggregates shall be produced by an integrated crushing and screening plant (300T/hour) having appropriate primary crusher, secondary cone crusher, vertical shaft impactor and vibratory screen, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages. The fraction of material passing through 4.75mm sieve shall also be crusher run screening only.”

Sub-Clause 406.3 Construction Operations

Sub-Clause 406.3.3 Preparation of Mix

Replace “suitable capacity” **with** “200T/hour capacity” in 1st sentence of 1st paragraph of Sub-Clause 406.3.3.

Sub Clause 406.3.4 Spreading of Mix

Replace “may” **with** “shall” in the 1st sentence of 2nd paragraph of Sub-Clause 406.3.4.

Delete the last paragraph of Sub-Clause 406.3.4.

Sub-Clause 406.3.5 Compaction

Delete second sentence of Paragraph 1 of Clause 406.3.5.

CLAUSE 409 CEMENT CONCRETE KERB AND KERB WITH CHANNEL

Sub Clause 409.5 Construction Operations

Sub Clause 409.5.1 Add at the end of the first sentence “as shown in the drawings”

CLAUSE 410 FOOTPATHS AND SEPARATORS

Replace the entire Clause 410 with the following:

410.1 Scope

The work shall consist of constructing footpaths and/or separators at locations as specified in the drawings or as directed by the Engineer. The lines, levels and dimensions shall be as per the drawings. The scope of the work shall include provision of all drainage arrangements as shown in the drawings or as directed.

410.2. Materials

The footpaths and separators shall be constructed with the following type:

Precast cement concrete block/tiles of Grade M20 as per Sections 1700 of the Specifications. The minimum thickness of the cement concrete block/tile shall be 25 mm and minimum size shall be 300 mm x 300mm.

410.3. Construction Operations

410.3.1 Drainage pipes below the footpath originating from the kerbs shall be first laid in the required slope and connected to the drains/sumps/storm water drain/drainage chutes as per provisions of the drawings, or as specified.

410.3.2 Portion on back side of kerbs shall be filled and compacted with granular sub-base material as per Clause 401 of the Specifications in specified thickness.

410.3.3 The base shall be prepared and finished to the required line, levels and dimensions as indicated in the drawings with the following:-

(a) Minimum 150 mm thick, compacted granular sub-base material as per Clause 401 of the Specifications.

(b) Minimum 25 mm thick cement concrete of Grade M15.

Over the prepared base, precast concrete tiles shall be set/laid as described in Clauses 410.3.4.

410.3.4 Precast cement concrete tiles:

The tiles shall be set on a layer of average 12 mm thick cement-sand mortar (1:3) laid on prepared base in such a way that there is no rocking. The gaps between the tiles shall not be more than 12 mm and shall be filled with cement-sand mortar (1:3).

410.4 Measurements for Payment

Footpaths and separators shall be measured in sq. meter between inside of kerbs.

410.5 Rates

Contract unit rates shall be inclusive of full compensation of all labour, materials, tools, equipment and incidentals to construction of footpaths. Cost of providing pipes and arrangement for their discharge into appropriate drainage channels shall be incidental to the construction of footpaths.

SECTION 500 BASE AND SURFACE COURSES (BITUMINOUS)

General

Sub para (i) of Clauses 501.8.8.2 stands deleted and remaining sub paras (ii) to (x) are renumbered as (i) to (ix).

The provision "Clause 501.8.8.2 (i) to (x) to be read as Clause 501.8.8.2 (i) to (ix)" in the Sub-Clauses 506.9 and 513.9

CLAUSE 501 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS

Sub Clause 501.2 Materials

Sub Clause 501.2.1 Binder

Replace "Tables 500-5 and 500-6" **with** "Tables 500-1" in the last paragraph of **Sub-Clause 501.2.1**

Sub-Clause 501.2.2 Coarse Aggregates

Delete ", crushed gravel or other hard material" from 1st Line of Para 1."

Para 2 is deleted.

Sub Clause 501.3 Mixing

Line 1, Paragraph 1, replace "Adequate Capacity" with "Hot mix plant of Batch Mix type of minimum capacity of 160 T per hour."

Sub Clause 501.6 Compaction

Replace the sentence "The intermediate rolling 0.56 MPa." **with** "The intermediate rolling shall be done with a smooth wheeled tandem vibratory roller of 8-10 tonne weight followed by a pneumatic tyre roller of 12-15 tonnes weight having nine wheels, with a tyre pressure of at least 0.56 MPa." **in 2nd paragraph.**

CLAUSE 502 PRIME COAT OVER GRANULAR BASE

Sub-Clause 502.2 Materials

Sub-Clause 502.2.1 This Clause shall be read as under:

"502.2.1 The primer shall be cationic bitumen emulsion SS1 grade conforming to IS: 8887 and shall be refinery produced."

Sub Clause 502.8 Rate

This Clause shall be read as under:

"502.8. Rate

The contract unit rate for prime coat shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 and as applicable to the work specified in these Specifications.”

CLAUSE 503 TACK COAT

Sub-Clause 503.2 Materials

This Clause shall be read as under:

"503.2 Materials

The binder used for tack coat shall be cationic bitumen emulsion (RS 1) complying with IS: 8887 and shall be refinery produced.”

Sub Clause 503.8 Rate

This Clause shall be read as under:

“503.8. Rate

The contract unit rate for tack coat shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 and as applicable to the work specified in these Specifications.”

CLAUSE 504 BITUMINOUS MACADAM

Sub-Clause 504.2.1 Bitumen

This Clause shall be read as under:

“The bitumen shall be paving bitumen of viscosity grade VG-30 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

Sub-Clause 504.2.2 Coarse Aggregates

Delete the words “, crushed gravel or other hard material’ from the first sentence of Clause 504.2.2.

Delete 4th sentence of Clause 504.2.2.

Sub-Clause 504.2.4 Aggregate Grading and Binder Content

Replace the word “The type and quantity” with “The quantity” in the last sentence of Clause 504.2.4.

Sub-Clause 504.8 Rate

After the words “required operations” in second line of this Clause, add the words “except the items of tack coat and prime coat (if any).”

CLAUSE 505 DENSE BITUMINOUS MACADAM

Sub-Clause 505.2.1 Bitumen

This Clause shall be read as under:

“The bitumen shall be paving bitumen of viscosity grade VG-30 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

Sub-Clause 505.2.2 Coarse Aggregates

Delete the words “, crushed gravel or other hard material’ from the first sentence of Clause 505.2.2.

Delete 2nd paragraph of Clause 505.2.2.

Sub-Clause 505.2.3 Fine Aggregates

Replace the words “or natural occurring mineral material, or a combination of the two” with “material” in the 1st sentence of the Clause 505.2.3.

Delete the 4th sentence of the Clause 505.2.3.

Sub Clause 505.2.4 Filler

“The first sentence of this clause shall read as “Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer”

Sub Clause 505.2.5 aggregate Grading and Binder Content

Add the following at the bottom of **Table 500-10**:

“The grading of the aggregate mix as used in work shall be a smooth curve within and approximately parallel to the envelope in Table 500-10”.

Sub-Clause 505.9 Rate

Add the words “except for item of prime coat and tack coat” after the words “required operations” in 2nd line.

CLAUSE 507 BITUMINOUS CONCRETE

Sub-Clause 507.2.1 Bitumen

This Clause shall be read as under:

“The bitumen shall be modified bitumen complying with Clause 501.2.1.”

Sub-Clause 507.2.2 Coarse Aggregates

Delete the words “and where crushed gravel is proposed two fractured faces” from the first sentence of Clause 507.2.2.

Sub Clause 507.2.5 aggregate Grading and Binder Content

Add the following at the bottom of **Table 500-17**:

The grading of the aggregate mix as used in work shall be a smooth curve within and approximately parallel to the envelope in Table 500-17”.

Sub-Clause 507.9 Rate

Replace “504.9” with “505.9” in the Clause 507.9.

CLAUSE 508 CLOSE GRADED PREMIX SURFACING/MIXED SEAL SURFACING

Sub Clause 508.1 Scope

Sub Clause 508.1.2

This Clause shall read as under

508.1.2 Close graded Premix surfacing shall be “Type B”

Sub Clause 508.2 Materials

Sub-Clause 508.2.1 Binder

This Clause shall be read as under:

“The binder shall be paving bitumen of viscosity grade VG-30 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

Sub-Clause 508.2.2 Coarse Aggregates

Replace “511.1.2.2” with “510.1.2.2” in the **Sub-Clause 508.2.2**.

Sub-Clause 508.2.3 Fine Aggregates

Delete the words “, or natural sand or a mixture of both” with “material” in the 1st sentence of the Clause 508.2.3.

Sub-Clause 508.3 Constructions Operations

Replace “510.1.3.1 through Clause 510.1.3.5” **with** “510.1.3.1 to Clause 510.1.3.5” in the **Sub-Clause 508.3**.

Sub Clause 508.8 Rate

Add the words “except for item of prime coat and tack coat” after the words “required operations” in 2nd line.

CLAUSE 510 OPEN GRADED PREMIX SURFACING

Sub Clause 510.1 Open-Graded Premix Surfacing using Viscosity Grade Paving Bitumen

Sub Clause 510.1.2 Materials

Sub Clause 510.1.2.1 Binder

This Clause shall read as under

“The binder shall be paving bitumen of viscosity grade VG-30 complying with Indian Standard Specifications for “Paving Bitumen”, IS: 73.”

Sub-Clause 510.1.3 Constructions Operations

Sub-Clause 510.1.3.5 Spreading and Rolling

Replace “to Clause 501” with “as per Clause 501” in the 1st line of 1st paragraph of **Sub-Clause 510.1.3.5**.

Sub Clause 510.1.8 Rate

Add the words “except for item of prime coat and tack coat” after the words “required operations” in 2nd line.

CLAUSE 516 MASTIC ASPHALT

Sub-Clause 516.2 Materials

Sub-Clause 516.2.2 Coarse Aggregates

Delete the words “, crushed gravel/shingle or other stones” from the first sentence of Clause 516.2.2.

Fine Aggregates

Delete the words “, natural sand or a mixture of both” in the 1st sentence of the Clause 516.2.2.

Sub-Clause 516.4.5 Spreading

Replace “Table 500-6” with “500-5” in sub-paragraph 2) of 4th paragraph of Sub-Clause 516.4.5.

Sub-Clause 516.4.7 Surface Finish

Replace “retained on the 6.7 mm sieve” **with** “retained on the 9.5 mm sieve” in 4th line of Sub-Clause 516.4.7.

SECTION 800 TRAFFIC SIGNS, MARKINGS AND OTHER ROAD APPURTENANCES

Clause 801 Traffic Signs

Sub-Clause 801.2.6 This clause shall read as under:

“The signs shall be 2mm thick with Aluminium sheet.”

Sub-clause 801.4 Installation

Sub-clause 801.4.1 The 1st sentence of Clause shall read as follows:

Traffic Signs shall be mounted on support posts, which shall be of MS pipe 80mm dia. (NB-MW) or as shown in the drawing.

Sub-clause 801.4.2 Add following at the end of this clause:

“The sign back shall be painted with two coats of grey colour epoxy paint. The sign post shall be painted in black & white alternate bands with two coats of epoxy paint.”

Sub-clause 801.5 Measurement for Payment

This clause shall read as under:

“The measurement of cautionary, mandatory, information, route marker, chevron and direction & place identification sign shall be in numbers.”

Clause 802 OVERHEAD SIGNS

Sub-Clause 802.4.2 Replace the words “they shall IS Specifications.” with “they shall be thoroughly descaled, cleaned, primed along with all other components of signs, except reflective portion. They shall be painted with two coats of epoxy paint. The sign back side shall be painted with grey colour and post shall be painted in black & white alternate bands. The post below ground shall be painted with three coats of red lead paint.

Sub-Clause 802.4.3 The last sentence of this Clause shall read as under:

“The thickness of aluminium sheet shall be 2 mm.”

CLAUSE 803 ROAD MARKINGS

Sub Clause 803.2 Materials

This clause shall read as under:

“Road markings shall be of hot applied thermoplastic compound and the materials shall meet the requirements as specified in Clause 803.4.

Sub Clause 803.8.11 Measurement for Payment

The 1st sentence of this Clause shall read as under:

“The Audible and Vibratory pavement markings shall be measured in square metre of area including the gaps.”

CLAUSE 805 DISTANCE INDICATOR POST

Sub Clause 805.3 The first sentence of this Clause shall read as under:

“The hectometre/kilometre/5th kilometre distance indicator posts shall be made of concrete of grade as shown in the drawing.”

Sub Clause 805.5 Rate

This Clause shall read as under:

“The Contract unit rate for hectometre/kilometre/5th kilometre distance indicator posts shall be payment in full compensation for furnishing all labour, materials, tools, equipment including cost of excavation, foundation in M15 grade concrete, formwork, backfilling, etc and making the posts, painting and lettering and fixing at site and all other incidental costs necessary to complete the work to these Specifications.”

CLAUSE 807 BOUNDARY STONES

Sub Clause 807.1 Scope

Add at the end of Paragraph 1, “The boundary stones shall be of concrete as shown in drawing.” The words ‘NH-217’ should be engraved on each stone appropriately..

CLAUSE 809 TUBULAR STEEL RAILING

Sub Clause 809.3 Add the following to the end of this Sub-Clause:

“The railing shall be embedded in the concrete foundation of size and the grade of concrete along with the depth of the embedment of post as indicated in the drawing.”

Sub Clause 809.5 Rate

After the words “test and final erection at site” in 3rd line of this Clause, add the words “including cost of excavation, concrete foundation etc.”

CLAUSE 811 CRASH BARRIER

Sub Clause 811.2 Concrete Crash Barrier

Sub Clause 811.2.1 Materials

Sub Clause 811.2.1.2 This Clause shall read as under:

“The grade of concrete shall be M-40.”

Sub Clause 811.2.2 Construction Operations

Sub Clause 811.2.2.2 Replace “Clause 810.2.2.3” with “Clause 811.2.2.3” in the 4th line of 1st paragraph of Clause 811.2.2.2.

CLAUSE 811.3 Metal Beam Crash Barrier

Sub Clause 811.3.1.2 Replace 1st paragraph of Sub-Clause 811.3.1.2 with the following:

Metal beam is a “W” profiled corrugated beam as specified in drawings made from cold rolled steel strip of 3.0 mm thick using high strength steel of IS:5986 Fe 510 grade and have properties as under:

Ultimate Tensile Strength (Min.): 483 Mpa.

Yield stress (Min.): 345 Mpa.

Elongation (Min.) in 50mm: 12%

The beam after forming shall have formed width of 312 mm and depth of 83 mm and shall have punched holes for fixing as specified in drawings.

The steel post and the blocking out spacer shall both be channel section of 75 mm x 150 mm & size 5 mm thick conforming to IS: 5986 grade Fe.360 as specified in drawings. The rail shall be 71 cm above the ground level and posts shall be spaced 2.0 m centre-to centre. Double “W” beam barrier shall be as indicated in the drawing.

The Guardrail reflector shall be made of material and placed in position as shown in drawings. It shall be hot dip galvanized 0.55 kg per square meter.

Test specimens for mechanical properties and coating shall be prepared and tested as specified in relevant IS codes.

Sub Clause 811.3.1.3 This Clause shall read as under:

“Concrete for bedding and anchor assembly shall conform to Section 1700 of these Specifications. The size of the concrete foundation block for embedding the posts and grade of concrete shall be as shown in the drawing.”

Sub-Clause 811.3.3 Installation of Posts

The sub-clause 811.3.3.1, 811.3.3.2, 811.3.3.3 and 811.3.3.4 are replaced as below:

“The steel posts shall be embedded in the concrete foundation of size and the grade of concrete along with the depth of the embedment of post as indicated in the drawing.”

Sub Clause 811.3.3.5 This Clause shall read as under:

“Posts and end section for metal beam guardrails on bridges shall be bolted to the structure as detailed in the drawings. The anchor bolts shall be set to proper location and elevation with templates and carefully checked.”

Clause 811.3.4.3 Add at the end of this Clause:

“The guard rail reflector shall be bolted replacing splice washer at every 10th posts interval.”

Sub-Clause 811.3.7 Measurements for Payment

Sub-Clause 811.3.7.1 The 2nd sentence "Terminals/anchors of various types shall be paid by numbers" is **deleted**.

Sub-Clause 811.3.7.2 This Clause shall read as under:

“No separate measurement for payment shall be made for Terminals/anchors of various types required for the work. The cost of these elements shall be deemed to be included in the rate quoted by the Contractor. Furnishing and placing anchor bolts and/or devices for guard rail posts on bridges shall be considered incidental to the construction and the costs thereof shall be included in the price for other items of construction.”

Sub-Clause 811.3.7.3 The words “or backfilling” shall be **substituted** as “and concreting”.

Sub Clause 811.3.8 Rate

Add the words “**and drawings**” at the end of the last sentence in Sub-Clause 811.3.8.

CLAUSE 813 TRAFFIC CONTROL AND SAFETY DEVICES IN CONSTRUCTION ZONE

Sub Clause 813.11: Measurement

This Clause shall read as under:

The Provisions made in Bill of Quantities shall be the ceiling for the Contract during the Contract Period. The Additional claims due to damage and theft of the same shall be deemed incidental to works. No extra payment shall be made towards additional quantities for these bill items.

Sub Clause 813.12: Measurement

All arrangements for traffic control and safety device in construction zone during construction including their maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be the Contractor's responsibility, **unless provided as a separate payable item in the BOQ."**

SECTION 1000 MATERIALS FOR STRUCTURES.

CLAUSE 1002 SOURCES OF MATERIALS

Add the words "at his own expense" at the end of 3rd paragraph of Clause 1002.

CLAUSE 1006 CEMENT

The 1st paragraph of this Clause shall read as follows:

"Cement to be used in bridge structures shall conform to the following standard:

IS:12269 – Specification for 53 Grade Ordinary Portland cement.

For other works Ordinary Portland cement 43 grade, conforming to IS 8112 shall be used with the prior approval of the Engineer."

CLAUSE 1007 COARSE AGGREGATES

Delete **the following from 3rd and 4th lines of 1st paragraph "Crushed gravel inert material"**

CLAUSE 1008 SAND/FINE AGGREGATES

Delete from the 1st line the word "or crushed gravel sand" and from the 2nd line "or gravel" in Paragraph 2.

CLAUSE 1014 STORAGE OF MATERIALS

Sub Clause 1014.3: Add the following to the Sub-clause 1014.3:

"Aggregates shall be stored or stockpiled in their respective size in such a manner that the various sizes will not become intermixed before proportioning. They shall be stored, stockpiled and handled in such a manner that will prevent contamination by foreign materials."

SECTION 1500 FORMWORK

CLAUSE 1501 DESCRIPTION

Add the following paragraphs at the end of this Clause:

"The Contractor shall prepare a formwork mobilization and utilization plan and submit the plan for Engineer's approval at least 21 days before the commencement of construction of structures. The requirement of formwork shall be worked out considering the overall construction program of all the structures to be cast in one or more stages, as specified in the drawings. The plan shall take into account the time required for erection of formwork,

retention in position, stripping, and removal and subsequent use in the next and subsequent structures.

Notwithstanding Engineer's approval of mobilisation plan, if due to any reason, Contractor has to arrange additional formwork, to meet the requirements of the construction program, it shall be done by the Contractor without any extra cost to the Employer."

CLAUSE 1502 MATERIALS

Delete **the last sentence in 1st paragraph.**

Delete **the word "or timber" in 1st line of 2nd paragraph.**

CLAUSE 1506 PRECAUTIONS

Add the following as items (vii) and (viii) to this Clause:

- i) Adequate support against sideways and lateral loads due to construction operations and wind shall be provided.
- ii) In case cantilevers are supported directly from the ground, the supports for cantilevers shall be removed simultaneously with main supports only after approval for the same from the Engineer.

Clause 1513 Rate

Add the following at the end of the first paragraph:

"The unit rate shall also include all costs for preparation of erection scheme, designs of false work and formwork."

SECTION 1600 STEEL REINFORCEMENT

CLAUSE 1602 GENERAL

Paragraph 2 of Clause 1602 shall read as follows:

"Reinforcements shall be High Strength Deformed Steel Bars (HSD) of grade Fe 500 conforming to

IS: 1786. Only uncoated steel shall be used as reinforcement unless specified."

CLAUSE 1603 PROTECTION OF REINFORCEMENT

Replace "1010.3.2" with "1009.3.2" in 2nd line of 3rd paragraph of Clause 1603.

CLAUSE 1605 PLACING OF REINFORCEMENT

Add the following as sub Para (f) to this Clause:

Tolerances:

- 1. Tolerance of cover: Deviation shall not exceed + 10 mm No negative tolerance is allowed.
- 2. Tolerance in position: Tolerance for deviation from the positions shown in

the drawings shall not exceed the following:

Structural depth d (mm)	Tolerance (mm)
$d < 1000$	< 10
$1000 < d < 2000$	$< 0.01d$
$2000 < d$	< 20

SECTION 1700 STRUCTURAL CONCRETE

CLAUSE 1705 ADMIXTURES

Sub Clause 1705.1: Chemical Admixtures

Replace "Clause 1007" with "Clause 1012" in the 3rd paragraph of Sub-Clause 1705.1.

CLAUSE 1706 SIZE OF COURSE AGGREGATE

Table 1700-7 shall be modified as given below:

Components	Maximum nominal size of Coarse aggregate (mm)
a. RCC Well Curb.	20
b. RCC / PCC well steining, PCC below foundations and approach slab, annular filling around foundations.	40
c. Well cap or pile cap; solid wall type abutments, piers, median walls, splayed wing walls and their foundations.	40
d. RCC works in T-beam and slab / solid slab / voided slab and box girder superstructure, wearing coat, kerb, crash barrier, approach slab, dirt walls, coping on masonry wing walls, hollow abutments and piers, pier / abutment caps, pedestals, dirt walls, piles, all components of counter fort type abutments, columns, cantilever return walls etc.	20
e. All PSC works	20
f. Any other item	As specified by the Engineer

Clause 1707 EQUIPMENT

The Para “a (i) & (ii)” shall be replaced with the following:

For production of concrete, batching and mixing of the concrete shall be done in a concrete batching and mixing plant fully automatic of a minimum capacity of 15 cum/hour. The plant shall be approved by the Engineer.”

The third para of para “(a)” shall be replaced with the following:

“The accuracy of measuring devices shall fall within the following limits:

Measurement of Cement $\pm 1\%$ of the quantity of cement in each batch.

Measurement of Water $\pm 1\%$ of the quantity of water in each batch.

Measurement of Aggregate $\pm 2\%$ of the quantity of Aggregate in each batch.

Measurement of Admixture $\pm 1\%$ of the quantity of Admixture in each batch.

CLAUSE 1715 HIGH PERFORMANCE CONCRETE

Sub Clause 1715.9: Additional Tests for Concrete

Replace “Clause 1714.3” **with** 1714.4 in 2nd line of Sub-Clause 1715.9.

CLAUSE 1800 PRESTRESSING

CLAUSE 1803 MATERIALS

Sub Clause 1803.2.2

Replace “1804.6” **with** “1805.6” in 3rd line of 3rd paragraph of Clause 1803.2.2.

SECTION 2000 BEARINGS

CLAUSE 2005 ELASTOMERIC BEARINGS

Sub Clause 2005.4: Acceptance Specifications

In Paragraph 5, substitute the words "Engineer or his authorised representative" for the word "Inspector".

Sub-Clause 2005.4.5 Inspection Certificate

Substitute the words "Engineer or his authorised representative" for the word "Inspector".

Sub-Clause 2005.4.6 Quality Control Certificate

Delete the words “/Inspector” in sub-paragraph b) of 1st paragraph.

CLAUSE 2009 MEASUREMENTS FOR PAYMENT

Add the following after Paragraph 2:

"Tar Paper bearings shall be measured in square meters."

CLAUSE 2011 TAR PAPER BEARING

Add the new Clause 2011 at the end of the Section 2000.

“2011 TAR PAPER BEARING

Tar Paper bearing shall be reinforced bitumen laminated Kraft paper conforming to the requirements of IS- 1398.”

CLAUSE 2100 OPEN FOUNDATIONS

CLAUSE 2104 WORKMANSHIP

Sub Clause 2104.1 Preparation of Foundations

Replace “M10” with “M15” in 5th line of 1st paragraph of Clause 2104.1.

Sub Clause 2104.3 Construction

Replace “M10” with “M15” in 1st & 7th line of sub-paragraph ii) of Clause 2104.3.

SECTION 2200 SUB-STRUCTURE

CLAUSE 2204 PIERS AND ABUTMENTS

Add the following paragraph at the end of Clause 2204

“Wherever necessary, suitable cofferdams or other means shall be provided to exclude water from the construction area. The Contractor shall provide necessary pumping equipment for dewatering in working areas.”

CLAUSE 2210 RATE

This Clause shall read as under:

“The contract rate for masonry, concrete reinforcement and weep hole in substructure shall include all works as given in respective sections of these Specifications and cover the cost of all incidental items like providing cofferdams, dewatering, providing special formwork, where necessary, and all other items for furnishing and providing substructure as mentioned in this Specifications and shown on the drawings.

The necessary material (asphaltic/bituminous board or equivalent material) and labour, tools etc. required for maintaining 20 / 40 mm gap between faces of various structures (old / new) wherever required / as shown in drawing shall be incidental to work and shall not be measured / paid separately.”

SECTION 2500 RIVER TRAINING AND PROTECTION WORK

CLAUSE 2504 PITCHING/REVTMENT ON SLOPES

Sub Clause 2504.3 Construction Operations

Replace “Clause 1405.3” **with** “Clause 1405.1.3” in 3rd line of 3rd paragraph of Clause 2504.3.

CLAUSE 2507 CURTAIN WALL AND FLEXIBLE APRON

Sub Clause 2507.1 Curtain Wall

The last sentence of this Clause shall read as:

“The curtain wall shall be in cement concrete grade as shown in the drawing.”

SECTION 2700 WEARING COAT AND APPURTENANCES

Add the following additional clauses:

Sub-Clause 2703.5 Concrete crash barrier for bridges

Sub-Clause 2703.5.1 General

This work shall consist of construction, provision and installation of concrete crash barrier on the bridge deck / approach slab / approaches at locations and of dimensions as shown on the drawings or as directed by the Engineer.

Sub-Clause 2703.5.2 Materials

All materials shall conform to Section 1000-Materials for Structures as applicable, and relevant Clauses in Section 1600 shall govern the steel reinforcement. The concrete barriers shall be constructed either by the “cast-in-place with fixed forms” method or the “extrusion or slip form” method or a combination thereof at the Contractor’s option with the approval of the Engineer. Where “extrusion or slip form” method is adopted, full details of the method and literature shall be furnished.

Grade of concrete for Crash barriers on deck slab, approach slab etc. shall be M40.

An expansion joint with Polysulphide Joint sealants and bituminous fiber board shall be provided in the crash barriers at the location of expansion joints/ gaps on the bridge, approaches etc.

Sub-Clause 2703.5.3 Construction Operations

The location of crash barrier shall be strictly adhered to as shown on the drawing and as directed by the Engineer. Concrete crash barriers shall present a smooth, uniform appearance in their final position, conforming to the horizontal and vertical lines shown on the plans or as ordered by the Engineer and shall be free of lumps, sags or other irregularities. The top and exposed faces of the barriers shall conform to the specified tolerances, as defined in Clause 2703.5.4, when tested with 3 m straight edge, laid on the surface.

The concrete crash barrier or precast shall be given two coats of cement paint or aqua based paint as directed by the Engineer of approved brand and shade.

Sub-Clause 2703.5.4 Tolerance

The overall horizontal alignment of crash barrier and rails shall not depart from the road alignment by more than + 30 mm, nor deviate in any two successive lengths from straight by more than 6 mm and the faces shall not vary more than 12 mm from the edge of a 3 m straight edge. Barriers shall be at the specified height as shown in the plans above the edge of the nearest adjacent carriageway or shoulder, within a tolerance of + 30 mm.

Sub-Clause 2703.5.5 Measurements for Payment

All barriers will be measured in linear metres of concrete in place, including approach and departure ends. The steel rails on the top of crash barrier shall be measured and paid separately. The sealing of opening in crash barrier at expansion joints with polysulphide

rubber joint sealant and bituminous fibre board as per sub-clause 2703.6 shall be incidental to work. The painting shall be measured in square meter.

Sub-Clause 2703.5.6 Rate

The Contract unit rate shall include full compensation for furnishing all labour, materials including steel reinforcement as per drawings, tools, equipment and incidental costs necessary for doing all the work involved in constructing the concrete barrier complete in place in all respects as per these Specifications.

Sub-Clause 2703.6 POLYSULPHIDE RUBBER JOINT SEALANT

Polysulphide Joint sealants with bituminous fiberboard shall be provided in the Expansion Joints/ gaps in Crash Barriers.

Before application it shall be ensured that the top of the bituminous fiberboard and the concrete faces are dry, sound, and free from dirt, grease and other loose foreign matter. A thin coat of primer shall be applied on concrete faces with a brush to air dry before applying sealant. The components of the sealant i.e. base and hardener shall be mixed in a slow speed mixed sealant till uniform colour is obtained. Placement of the mechanical mixer shall be done with either cartridge or fully enclosed gun barrels within 30 minute of mixing. Manufacturer's recommendation shall be followed.

The sealing compound shall be two packs, low modulus of elasticity Polysulphide elastomer having bituminous ingredients such as Cico T-680 or equivalent with following properties of the cured compound.

Tensile strength	-	0.4 MPa $\pm$ 10%
Modulus of elasticity	-	At 100% elongation: 0.15 MPa
Elongation	-	Elongation at break 550%
Hardness	-	Shore 'A' hardness 22 $\pm$ 3 @ 25°C
Operating temperature	-	-20°C to + 80°C
Shrinkage	-	Less than 1%
Permanent dynamic	-	$\pm$ 25%

Movement capability

Polysulphide material shall be approved by the Engineer prior to procurement.

Measurements for Payments:

Cost for providing Polysulphide Joint sealants and bituminous fiberboard in the Expansion Joints in Crash Barriers shall be deemed to be included in the unit rate of Crash Barrier and shall not be measured separately.

CLAUSE 2706 WEEP HOLES

This Clause shall read as under:

“Weep holes shall be provided in solid plain concrete / reinforced concrete/ brick or stone masonry abutments, wing walls, return walls as shown in the drawing or as directed by the Engineer to drive moisture from the back filling. Weep holes shall be provided with 100mm dia PVC (6 Kg/cm²) pipe and shall extend through the full width of concrete/masonry with slope of about 1 vertical: 20 horizontal towards the draining face.

The spacing of weep holes shall generally be 1 m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.”

CLAUSE 2708 MEASUREMENT FOR PAYMENT

Sub-paragraph i) of this Clause shall read under:

“i) Cement wearing coat shall be measured in cubic metres. Bituminous wearing coat be measured in square metres. Steel reinforcements in concrete wearing coat shall be measured in tonnes.”

Sub-paragraph iii) of this Clause shall read under:

“iii) Concrete crash barriers shall be measured in linear metres of concrete in place, including approach and departure ends. The steel rails on the top of crash barrier shall be measured and paid separately. The sealing of opening in crash barrier at expansion joints with polysulphide rubber joint sealant and bituminous fibre board as per sub-clause 2703.6 shall be incidental to work. The painting shall be measured in square meter. .”

SECTION 2900 PIPE CULVERTS

Clause 2906 JOINTING

The first and second sentences of Paragraph 1 shall read as under:

“The pipes shall be jointed by collar. The collars shall be of RCC 150 to 200 mm wide and having the same strength as the pipes to be jointed.”

CLAUSE 2910 MEASUREMENT FOR PAYMENT

This Clause shall read as under:

“RCC pipe culverts including selected granular material and cement concrete for pipe bedding shall be measured along their centre between the inlet and the outlet ends in linear metres.

Ancillary works like headwalls, Aprons etc., shall be measured as provided for under the respective Sections.”

CLAUSE 2911 RATE

This Clause shall read as under:

“The Contract unit rate for the pipes shall include the cost of pipes including loading, unloading, hauling, handling, storing, laying in position and jointing complete and all incidental costs to complete the work as per these Specifications. Cost of selected granular material and cement concrete for pipe bedding shall be included in the Contract unit rate for pipes.

Ancillary works such as excavations including backfilling, concrete and masonry shall be paid for separately, as provided under the respective Clauses.”

SECTION 3000 MAINTENANCE OF ROAD

CLAUSE 3001: GENERAL

Add the following at the end of Clause 3001:

“The maintenance work carried out during the period from the Commencement Date to the issue of Taking Over Certificate shall be incidental to the works. The same shall not be measured and paid.”

ADDITIONAL TECHNICAL SPECIFICATIONS

CLAUSE A-1 DIVERSION AND FILLING OF EXISTING WATER COURSE ALONG THE ROAD ALIGNMENT

Where watercourses have to be diverted from the sites of embankments, the original channels shall be cleared of all vegetation and soft deposits as directed by the Engineer and carefully filled in with suitable materials and compacted as specified. The new channel/ side drain shall be formed as shown in the drawings or as directed by the Engineer.

1. Measurement for Payment

The work involved in filling existing watercourses shall be measured as follows:

- (i) The work involved in filling existing watercourses shall be measured under clearing and grubbing item on area basis.
- (ii) Excavation and removal of soft deposits shall be measured in cubic metre.
- (iii) Filling with suitable material shall be measured in cubic metre.
- (iv) The works involved in forming the new channel/side drain shall be measured under the relevant items of work.

CLAUSE A-2 CHUTE DRAIN FOR HIGH EMBANKMENT SECTIONS

Clause A-2.1 Scope

This work shall consist of construction of chute drain on the slope of the road embankment including erosion protection works at the locations and to dimensions shown on the Drawings or as directed by Engineer. Schedule of works shall be so arranged that the drains are completed in proper sequence with roadway to ensure that no damage is caused due to lack of drainage.

Clause A-2.2 Materials

The drains shall be rectangular 300mm wide and 200 mm depth in cement concrete M-20 grade with foundation in M-15 grade concrete as shown in the drawings. The RCC work shall conform to the relevant clauses of these specifications.

Energy dissipation structures in M-20 grade shall be provided at the foot of the chute as shown in the drawings.

Dumped riprap for erosion protection at ground level shall be hard, unweathered and durable rubble stone of size 150 to 250mm.

Clause A-2.3 Construction Operations

Excavation for fixing drain sections: At the locations where the chute drains are to be installed, a rectangular cut on the side slope of the embankment along the line of the chute drain shall be made in such a way that the RCC drain sections could be fixed snugly with their edges flush with the adjoining embankment slope. The sloping bed of the drain shall be to a regular line and suitably compacted to provide a firm bed.

Fixing RCC Drains sections: The ends of the RCC drain sections shall be specially shaped to form a self-canting joint. Fixing of the drain sections shall start from top of toe wall at the lower end and proceed towards the upper. The jointing space shall be filled with cement mortar (1 cement to 2 sand) mixed sufficiently dry to remain in position when fixed with a trowel or wooden rammer. Care shall be taken to fill all voids, and excess mortar shall be removed. All joints shall be made with care with interior surface of RCC sections. After finishing, the joints shall be kept covered and damp for at least 4 days.

Dumped Rip Rap: Dumped rip rap for erosion protection shall be placed above ground level at the lower end of the chute drain in such a way that the rip rap stones are not easily moved by water flowing down the chute drain.

Clause A-2.4 Measurements for Payment

Chute drain shall be measured as length of drain sections placed in position in linear metre. Excavation and preparation of bed for the drain shall not be measured separately

Energy dissipation structures shall be measured in cum. Dumped riprap shall be measured as volume of the material placed in position in cu.m.

Clause A-2.5 Rate

Rate for the different items of work shall be payment in full for completing the respective work including all materials, labour, equipment and incidentals.

CLAUSE A-3 SPECIFICATIONS FOR PAINTING OF STRUCTURES WITH SYNTHETIC ENAMEL PAINT/ WATER PROOFING CEMENT PAINT

Clause A-3.1 Materials

Synthetic enamel paint conforming to IS: 2932 of approved brand and manufacture and of the required colour shall be used for the top coat and an undercoat of ordinary paint of shade to match the top coat as recommended by the same manufacturer as far as top coat shall be used.

Clause A-3.2 Painting on New Surface

Clause A-3.2.1 Preparation of surface

The surface shall be thoroughly cleaned and dusted off. All dirt, mortar droppings and grease shall be thoroughly removed before painting is started. The prepared surface shall have received the approval of the Engineer after inspection, before painting is commenced.

Clause A-3.2.2 Application

The number of coats including the undercoat shall be as stipulated in the item.

- (a) **Under coat:** One coat of the specified ordinary paint of shade suited to the shade of the top coat shall be applied and allowed to dry overnight. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dusted off.

- (b) Top Coat:** Two top coats of synthetic enamel paint of desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.

Clause A-3.3 Lettering and Numbering on New Surface

The letters and numbers for bridges/culverts span and number shall be as per IRC-71971. The size of area for painting shall be varied depend upon the numbers and letters. The background area and letters/numbers shall be painted with one prime coat (under coat) and two coats (top coat) of synthetic enamel paint.

Clause A-3.4 Measurement for payment

The painting of culverts /Bridges numbering and span arrangement shall be measured in number of each side facing traffic.

The Painting of edge stones, breast walls, parapet walls and road side trees at curves shall be measured in Square metres.

Clause A-3.5 Rate

Rate for the painting of culverts /Bridges numbering and span arrangement shall include the cost of materials, labour and other operation described above to complete set of letters and numbers required in each side facing traffic.

Rate for Painting of edge stones, breast walls, parapet walls and road side trees at curves shall include the cost of materials, labour, including all other incidental costs to complete the work.

CLAUSE A-4 CONTROLLED BLASTING

Clause A-4.1 GENERAL

The specifications for excavation in rock are covered by MoRT&H "Specifications for Road & Bridge Works" (5th revision April, 2013), vide Section 300. The following specifications are additional and supplementary to the same.

Clause A-4.2 CONTROLLED BLASTING

Whenever required by the Engineer, the rock blasting shall be controlled so that vibration generated during the blasting does not cause damage to the building and installation around built up areas. Similarly, the rock pieces should not fly off the pits and thus damage the buildings and installation and life and limb of people around. Apart from the general precautions mentioned in the MoRT&H Specifications, following protective measures and limits for use of explosives are suggested as guidelines.

Clause A-4.3 PROTECTIVE MEASURES

- a) Short delay blasting with light charges shall be used.
- b) The blast hole shall be covered with 0.6 to 1.0 sq.m. Mild steel plate of minimum 6 mm thickness.
- c) Reinforcement rod mesh not less than 20 mm dia. at 150 mm centres in both directions shall be placed over the steel plates.

d) Steel plate and reinforcements shall be inspected after every blasting operation and all twists shall be removed before reuse to the satisfaction of the Engineer.

e) The thickness of the covering plate and the kind of dead weight is to be duly approved by the Engineer.

When blasting is necessary adjacent in partially or completely built structures the contractor shall take all precautions necessary to prevent flying rock from causing damage to the structures.

Clause A-4.4 BLASTING WITHIN CERTAIN LIMITS

No blasting shall be allowed for any of the excavation until freshly placed concrete of nearby structures has reached a minimum strength of 7 MPa.

Normally, blasting shall be resorted to only after 7 days of concreting work in case of OPC (10 days in case of PPC) in adjacent structures.

In no case shall blasting be allowed closer than 15m to any structure after concrete placing has started.

When minor blasting is necessary after concrete placing has started in any structure, the maximum size of charge for distance from 100m and above shall be limited to the following:

Distance in m	Safe particle velocity 10 mm/sec. Charge in kgs per delay	Safe particle velocity 3 mm/sec. Charge in kgs per delay.
100	10.7	2.6
150	24.2	5.8
200	43.0	10.3
250	67.3	16.7
300	96.9	23.2
350	131.9	31.6
400	172.3	41.2
450	218.2	52.2
500	269.3	64.5

Any deviation in the above-recommended limits will be adopted only after the specific approval of the Engineer. The contractor shall submit the scheme with charges and delays he proposed to use for blasting, for approval of the Engineer.

It is generally recommended that where the blasting is to be done, within 20 m of the nearest point of permanent building, the area shall be line drilled on periphery before blasting.

The Contractor shall be responsible for all damage caused by blasting whether to permanent or temporary structures and shall replace or repair the structures at his own cost.

Clause A-4.5 PRECAUTIONS AFTER BLASTING

After the blast, the supervisor must carefully inspect the work and satisfy himself that all the charges have exploded. After the blast takes place in underground works, the workmen shall not be allowed to go to the face till toxic gases have disappeared from the face.

If it is suspected that part of the blast has failed to fire or is delayed, sufficient time shall be allowed to elapse before entering the danger zone. When fuse and blasting caps are used, a safe time should be allowed and then the supervisor alone shall leave the shelter to inspect the blasting zone.

None of the drillers are to work near the misfired hole until one of the two following operations has been carried out by the Supervisor:

Either (i) the Supervisor should very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper or jet of water or compressed air (using a pipe of soft material) and withdraw the fuse with the primer and a fresh detonator with fuse should be placed in these holes and fired out, or (ii) the hole may be cleared of 30 cm of tamping and its direction then be ascertained by placing a stick in the hole. Another hole may then be drilled at least 60 centimetres away and parallel to it and about 30 cm less in depth, this hole shall then be charged and fired. The balance of the cartridges and detonators found in the muck shall be removed.

Before leaving his work, the Supervisor of the concluding shift shall inform the Supervisor of the relieving shift of any case of misfires and should point out the position with a red cross denoting the same and also stating what action, if any, he has taken in the matter.

The Supervisor should also at once report at the office of the Contractor and the Engineer all cases of misfire, the cause of the same and what steps were taken in connection with these.

The names of the day and night shift Supervisors must be noted daily in the Contractor's office.

If a misfire has been found to be due to a defective detonator of dynamite the whole quantity or box from which the defective article was taken, must be thoroughly inspected by the Contractor.

Drilling in holes not completely exploded by blasting shall not be permitted.

Clause A-4.6 PERSONNEL

Excavation by blasting will be permitted only under the personal supervision of competent and licensed blasters and trained workmen.

All supervisors and workmen in-charge of preparation, handling, storage and blasting work shall be adequately insured by the Contractor.

Storage shall be in charge of a very reliable person approved by the Engineer, who may, if necessary conduct police enquiries as to his reliability, antecedents etc. The contractor shall have to produce a security for the person in-charge of the explosives, if and when required by the Engineer, of the civil authorities of the district.

The Contractor shall make sure that his supervisors and workmen are fully conversant with all the rules to be observed in storing, handling and use of the explosives. It shall be ensured that the supervisors in charge are thoroughly acquainted with the details of the handling of explosives and blasting operations.

CLAUSE A-5 INTER LOCKING CONCRETE BLOCKS

Clause A-5.1 Scope

The scope of work involves laying of Precast M-30 grade interlocking concrete blocks of 75mm thick laid on 25 mm thick prepared sand bed conforming to IRC: SP: 63 and as directed by Engineer. The shape of blocks, the source of supply, the methodology for laying of blocks shall be got approved from Engineer.

Clause A-5.2 Unit of measurement

The unit of measurement shall be the area of the finished item of work of interlocking blocks measured in plan in sq m.

Clause A-5.3 Rate

The unit cost includes full compensation for laying the sand bed and laying the interlocking tiles including the cost of sand and tiles.

CLAUSE A-5A INTER LOCKING CONCRETE BLOCKS FOR RAISED PEDESTRIAN CROSSING

Clause A-5A.1 Scope

The scope of work involves laying of interlocking Paver blocks of 75mm thick conforming to IRC: SP: 63 laid on 50 mm thick prepared sand bed. M-30 grade Precast Concrete blocks of size (400x100X150) mm for lateral support and Bituminous Concrete ramp as per drawing on either side and as directed by the Engineer. The shape of paver blocks, the source of supply, the methodology for laying of blocks shall be got approved from Engineer.

Clause A-5A.2 Unit of measurement

The unit of measurement shall be the area of the finished item of work of interlocking Paver blocks including M-30 grade Precast Concrete blocks and Bituminous Concrete ramp on either side measured in plan in sq m.

Clause A-5A.3 Rate

The unit cost includes full compensation for laying the sand bed, laying the interlocking Paver blocks, M-30 grade Precast Concrete blocks and Bituminous Concrete ramp including the cost

of sand, interlocking Paver blocks, M-30 grade Precast Concrete blocks and forming Bituminous Concrete ramp on either side complete.

CLAUSE A-6 UTILITY DUCTS

Clause A-6.1 Scope

The work shall consist of laying and jointing of R.C.C. Utility Ducts in accordance with the requirements of these specifications.

Clause A-6.2 Materials

Reinforced concrete pipes shall be of NP 4 type conforming to IS: 458 as shown in the drawings.

Clause A-6.3 Laying of Pipes

Laying of Pipes shall be carried out in accordance with clause 2905; the Pipes shall be fitted and matched so that when laid in work they shall have a smooth uniform invert.

Clause A-6.4 Jointing

The Pipes shall be jointed either by collar joint or flush joint. Caulking shall be carried out as directed by the Engineer. The provisions of clause 2906 of the specifications shall be followed to the extent applicable. The Engineer's decision shall be final and binding.

Clause A-6.5 Back Filling

Where directed by the Engineer shall be carried out in accordance with clause 2907 of the specifications.

Clause A-6.6 Closing of Ends

The ends of Pipes shall be closed with plastic covers to prevent ingress of foreign materials

Clause A-6.7 Measurement of Payments

The utility ducts shall be measured from end to end in linear meter.

Clause A-6.8 Rate

The contract rate for ducts shall include the cost of pipes including collars and covers, handling and storing of Pipes, laying in positions and jointing, construction of head wall and inspection chamber, complete and all incidental works necessary for completion. Excavation including back filling where necessary shall not be measured and paid separately and the same shall be included in the rate for Utility Ducts.

CLAUSE A-7 Specific Provisions for Protection of the Environment

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
P.1	Land Acquisition	The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. All grievances of the PAPs will be redressed in accordance to the RAP implementation mechanism.	RAP/LAP and Project Requirement	PIU, Revenue Dept., NGOs, Collaborating Agencies	PIU,
P. 2	Preservation of Trees	<i>Efforts will be made to preserve trees including evaluation of minor design adjustments/alternatives (as applicable) to save trees. Specific attention will be given for protecting giant trees.</i> Tree cutting will be done only after obtaining clearances from the State Forest Departments and subsequently a written order will be issued to the contractor. Stacking, transport and storage of the wood will be done as per the relevant norms. Systematic corridor level documentation for the trees cut and those saved will be maintained by the PIU.	Forest Conservation Act, (1980)	PIU, Forest Department	PIU,
P.3	Relocation of Common Property Resources	All community utilities and properties i.e., water supply lines etc. will be relocated before construction starts, on any section of the project corridor. The PIU will relocate these	Contract Requirement	PIU	PIU,

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
		properties in consultation and written agreement with the agency/owner/community. The relocation sites will be identified in accordance with the choice of the community. <i>Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.</i>			
P.4	Joint Field Verification	The Environmental Expert of PIU and the contractor will carry out joint field verification to ascertain the possibility to saving trees and community resources. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.	Contract Requirement	Contractor	PIU,
	Location of crushers, hot-mix plants, WMM Plant, Concrete Batching plants etc.	Contractor shall obtain clearance from SPCB for location of hot mix plant, storage yard, vehicle yard prior to construction activities. Stone crushers, Hot mix plants; WMM Plants and Concrete Batching plants will be sited sufficiently away from settlements, agricultural operations and any commercial establishments. Such plants will be located at least 500 m away from the nearest settlement and 1	Contract Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
		km away from the sensitive receptors (schools, hospitals), unless otherwise required by the statutory requirements.			
P.5	Arrangement for construction water	Contractor will use ground water as a source of water for the construction and will set up his own bore well facility for construction work. Contractor can use the roadside water bodies, but before using any pond water Concessionaire should obtain written consent from the local body and submit then to SC. To avoid disruption/disturbance to other water users, Contractor will extract water from fixed locations and consult the Environmental Expert before finalizing the locations. Contractor will not be allowed to pump from any irrigation canal and surface water bodies used by the community. Contractor will comply with the requirements of the State Ground Water Department and seek approval and submit copies of the permission to Environmental Expert of SC and PIU.	Contract Requirement	Contractor	Environmental Expert of SC and PIU
P.6	Site identification for disposal of	Contractor shall identify site(s) away from the project area where unsuitable materials (debris, solid waste)	Contract Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
	unsuitable materials	generated in the course of the construction can be safely disposed off. Such locations shall be inspected by the Environmental Expert of Supervision Consultant and approved in consultation with the PIU before construction work starts.			
P.7	Construction camp – location, design and layout	Sitting of the construction camps will be as per the guidelines below: Locations identified by Contractor will be reported as per format given. Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. Location for stockyards for construction materials will be identified at least 1000 m from water sources. The waste disposal and sewage system for the camp will be designed, built and operated such that no odour is generated and also it shall be ensured to prevent contamination of ground water regime. Unless otherwise arranged by the local sanitary authority, arrangements for night soils (human excreta) disposal as approved by the local medical health or municipal authorities or as directed by Environmental Expert will have to be	Contract Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
		provided by Contractor.			
	CONSTRUCTION PHASE				
C.1	Clearing & Grubbing and impact on Flora	Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora is minimum.	Contract Requirement Forest Conservation Act, (1980)	Contractor	Environmental Expert of SC and PIU
C.2	Generation of debris from dismantling structures and road surface	Debris generated due to the dismantling of the side of existing road for pavement rehabilitation will be suitably reused in the proposed construction, subject to the suitability of the materials and approval of the Engineer and Environmental Expert as follows: The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads and any place specifically directed by the Engineer. <i>Contractor will suitably dispose-off unutilized debris materials at pre-designated disposal locations, subject to the approval of the Environmental Expert. Contractor will ensure that disposal pits are covered with a layer of soil and compacted.</i> The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan (CSWMP) to be prepared by Contractor in	MoRT&H:112.6 MoRT&H:112.2	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		consultation with the Environmental Expert and the Engineer of the SC.			
C. 3	Stripping, stocking and preservation of top soil	The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert. The following precautionary measures will be taken to preserve them till they are used: (a) Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, the edges of the pile will be protected by silt fencing (b) Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction takes place. The stockpiles shall be covered with gunny bags or vegetation. (c) It will be ensured by Contractor that the topsoil will not be unnecessarily trafficked either before stripping	MORT&H:300 MORT&H:305.3.9 MORT&H:301.7	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		or when in stockpiles. Such stockpiled topsoil will be utilized for - - covering all disturbed areas including borrow areas (not those in barren areas) - top dressing of the road embankment and fill slopes - in the agricultural fields of farmers, acquired temporarily. Residual topsoil, if there is any will be utilized for the plantation.			
C.4	Traffic diversion	Detailed Traffic Control Plans will be prepared and submitted to the Environmental Expert for approval, 14 days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen. <i>Contractor will provide specific measures for safety of pedestrians and workers at night as a part of traffic control plans. Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to</i>	MORT&H:112.1	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
		<i>avoid disruption to traffic flow. Contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from SC and PIU.</i>			
C.5	Borrow Areas	<i>No borrow area will be opened without permission of the Environmental Expert. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of SC. The borrowing operations will be carried out as specified in the guidelines for setting and operation of borrow areas.</i> Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the Borrow Area. Rehabilitation/Redevelopment Guidelines or as instructed by the Environmental Expert. Borrowing of earth will be carried out upto depth of 1.5m from existing ground level and shall not be done continuously. Slope of the edges shall be maintained not steeper than 1:4. Borrow pit shall be re-developed, spoils shall be dumped with an overlay of stocked piled top soil with respect to MoEF/SPCB guidelines. On sections abutting water bodies stone pitching	MORT&H:305.2.2 MORTH 111.1 MORT&H 306.2	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
		needs to be carried out.			
C.6	Quarry operation	Contractor will develop a Comprehensive Quarry Redevelopment Plan as per the Mining Rules of Jammu & Kashmir and submit a copy to PIU and SC prior to opening of the quarry site. The quarry operations will be undertaken within the rules and regulations in force.		Contractor	Environmental Expert of SC and PIU
C.7	Drainage & Flood Control	Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, Contractor will take all required measures as directed by the Environmental Expert of SC to prevent temporary or permanent flooding of the site or any adjacent area, if any.	MORT&H:305.3.2	Contractor	Environmental Expert of SC and PIU
C.8	Siltation of Water Bodies & Degradation of Water Quality	Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction. Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of any water body adjacent to the ROW and around the stockpiles at the construction sites close to water bodies. The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the	MORT&H:306	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		particular sub-section of the road. <i>Equipment and plants shall be located at least 100 m away from any water body. Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby water body.</i> <i>All measures should be taken to prevent the waste water from entering into irrigation canals.</i>			
C.9	Water pollution from construction wastes	<i>The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into water bodies or the irrigation system. The Contractor will avoid construction works close to water bodies during monsoon.</i> <i>All waste arising from the project is to be disposed off in the manner that is acceptable to the State Pollution Control Board or as directed by Environmental Expert.</i> Run-off from wasted concrete may be alkaline and thus pH reduction may be needed. The Environmental Expert will certify that all liquid wastes disposed off from the sites meet the discharge standards.	Contract Requirement	Contractor	Environmental Expert of SC and PIU
	Water	Contractor will ensure that	Contract	Contractor	Environment

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
	pollution from fuel and lubricants	all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance sites are located at least 100 m away from any water body. Contractor will also ensure that spillage of fuels and lubricants do not contaminate the ground. If fuel storage and refuelling areas are located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such activities. All location and lay-out plans of such sites will be submitted by Contractor prior to their establishment and will be approved by the Environmental Expert and PIU. Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to SC and PIU) and approved by the Environmental Expert. All spills and collected petroleum products will be disposed off in accordance with MoEF and State PCB guidelines.	Requirement		al Expert of SC and PIU
C.10	Air pollution-Dust generation	Contractor will take every precaution (water sprinkling etc.) to reduce the level of dust generating from construction site. All the plants will be sited	MORT&H: 111.9, MORT&H: 111.5, MORT&H: 111.6	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
		more than 500 m from any community or residence and 1 km away from the sensitive receptors (schools, hospitals), unless otherwise required by the statutory requirements in the downwind direction from the nearest human settlement. <i>Contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation.</i> <i>The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 µg/m³. The pollution monitoring is to be conducted as per the monitoring plan.</i> <i>Alternatively, only crushers licensed by the PCB shall be used. Contractor in such a case shall submit required certificates and consents.</i> <i>Hot mix plant will be fitted with dust extraction units.</i>			
	Emission from construction vehicles, equipments and machineries	<i>Contractor will ensure that all vehicles, equipments and machineries used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of Pollution Control Board (PCB).</i> Contractor will submit PUC certificates for all vehicles/	Contract Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		equipment/ machinery used for the project and maintain a record of the same during the contract period. Monitoring results will also be submitted to SC and PIU as per the monitoring plan.			
C.11	Noise from vehicles, equipments and machineries	<i>Contractor will confirm the following:</i> All plants and equipments used in construction shall strictly conform to the MoEF/CPCB/PPCB noise standards. All vehicles and equipment used in construction will be fitted with exhaust silencers. Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing will be stopped during the night time between 9.00 pm to 6.00 am. No noisy construction activities will be permitted around educational institutions/health centres (silence zones) up to a distance of 100 m from the sensitive receptors. Workers in vicinity of loud noise, and workers	MORT&H:111.13 MORT&H:111.1 MORT&H:111.6	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		working with or in crushing, compaction, batching or concrete mixing operations shall wear ear plugs. Noise limits for construction equipment such as compactors, rollers, front loaders, concrete mixers etc. shall not exceed 75 dB(A) as specified in Environment (Protection) Rules, 1986. Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to SC and PIU. Environmental Expert will be required to inspect regularly to ensure the compliance of EMP.			
C.12	Protection of Fauna	<i>During construction, at any point of, if any wildlife or threatened species is spotted Contractor shall intimate the Forest Department / Wildlife Authority.</i> <i>Hunting and fishing will be strictly prohibited in the area.</i> <i>Labour camps will be located away from the Sensitive areas/wildlife Sanctuary. Movement of labour force should be monitored by the prospective contractor.</i>	MORT&H 111.1	Contractor	Environmental Expert of SC and PIU
C13	Personal safety measures for labour	<i>Contractor will provide:</i> Protective footwear and protective goggles to all workers employed on mixing asphalt materials,	MORT&H:111.1 MORT&H:111.6	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		cement, concrete etc. Protective goggles and clothing to workers engaged in stone breaking activities. Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. Adequate safety measures for workers during handling of materials at site. Contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this contract. Contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. Contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. Contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.			

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		He will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint is rubbed and scraped. Contractor will mark 'no smoking' in high risk areas and enforce non-compliance with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by Contractor during mobilization and will be approved by SC and PIU.			
C.14	Traffic & Road Safety	<i>Before taking up construction on any section of the existing road, a Traffic Management Plan will be devised and implemented to the satisfaction of the Environmental Expert of SC and the Engineer.</i> Contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of SC. <i>Contractor will ensure that all signs, barricades, pavement markings are</i>	MORT&H:112.4 MORT&H 112.5	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
		<i>provided as per the MoRTH specifications or as directed by the Engineer.</i> <i>Rash driving by Contractor's vehicle drivers should be strictly controlled.</i> Special consideration should be given in the preparation of the traffic control plan to the safety of pedestrians and workers at night. Contractor shall ensure that the running surface is always maintained in running condition, particularly during the monsoon so that no disruption to the traffic flow occurs.			
C.15	Risk from electrical equipments	<i>Contractor will take all required precautions to prevent danger from electrical equipment and ensure that –</i> No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights is provided to protect the public in construction zones. <i>All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, are free from patent defect, are kept in good working order, regularly inspected and properly maintained as per IS provision and to the satisfaction of the Environmental Expert.</i>	MORT&H: 106	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
C.16	First aid	Contractor will arrange for – A readily available first aid unit including adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital Equipment and trained nursing staff at construction camp.	MORT&H: 112.6	Contractor	Environmental Expert of SC and PIU
C.17	Informatory Signs and Hoardings	<i>Contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Expert of SC.</i>	MORT&H:112.4	Contractor	Environmental Expert of SC and PIU
C.18	Plantation Strategy	Contractor will carry out plantation in the median with shrub species as recommended by CPCB. Minimum 80 percent survival rate of the saplings will be acceptable otherwise Contractor will replace dead plants at his own cost. Contractor will maintain the plantation till he handover the project site to PIU. <i>The Environmental Expert of SC will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.</i>	Project Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
C.19	Labour Camp Management	Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The location, layout and basic facility provision of each labour camp will be submitted to SC and PIU prior to their construction. The construction will commence only after the written approval of the Environmental Expert. Contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the SC.	Contract Requirement	Contractor	Environmental Expert of SC and PIU
	Potable water	<i>Contractor will provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.</i> Contractor will also guarantee the following: a) Supply of sufficient quantity of potable water (as per IS:10500) in every workplace/labour camp at suitable and	Contract Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/ Monitoring
		easily accessible places and regular maintenance of such facilities. b) If any water storage tank is provided, the bottom of the tank will be kept at least 1m. high from the surrounding ground level. c) If water is drawn from any existing well, which is within 30m. proximity of any toilet, drain or other source of pollution, the well will be disinfected before water is used for drinking. d) All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. e) A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. Environmental Expert will be required to inspect the labour camp once in a week to ensure the compliance of the EMP.			
	Sanitation and sewage system	Contractor will ensure that – The sewage system for the camp will be designed, built and operated in such a fashion that it should not pollute the ground water or nearby surface water. Separate toilets/bathrooms, will be	MORT&H:105.2	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/ Monitoring
		arranged for men and women. Adequate water supply is to be provided in all toilets and urinals. All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition. Night soil (human excreta) is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight.			
	Waste disposal	<i>Contractor will provide segregated garbage bins (biodegradable and non-biodegradable) in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of SC.</i> <i>Unless otherwise arranged by local municipal authority, arrangements for disposal of night soils (human excreta) suitably approved by the local municipal authority or as directed by Environmental Expert, will be arranged by Contractor.</i>	Contract Requirement	Contractor	Environmental Expert of SC and PIU
C.20	Awareness Training	<i>The Concessionaire will arrange to impart training to his staff on the various aspects of awareness as</i>	Contract Requirement	Contractor	Environmental Expert of SC and PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
		<i>related to health, safety and environment. The focus shall be on the protection of environment viz. minimal felling of trees, waste recycling, water conservation, composting of biodegradables, measures for suppression of fugitive dust, importance of personal protective equipments etc.</i>			
C.21	Clean-up operations, restoration and rehabilitation	Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of SC and PIU. The clean-up and restoration operations are to be implemented by Contractor prior to demobilization. Contractor will clear all temporary structures; dispose all garbage, night soils, POL waste and all construction zones as per Comprehensive Waste Management Plan and as approved by SC. <i>All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/proximate barren land or areas identified by Environmental Expert in a layer of thickness of 75 mm-150 mm.</i>	Contract Requirement	Contractor	Environmental Expert of SC and PIU
	OPERATION STAGE				
0.1	Monitoring Operation Performance	The PIU will monitor the operational performance of the various mitigation/enhancement measures carried out as a part of the	Project Requirement	PIU	/PIU

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation Agency	Supervision/Monitoring
	nce	project. The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated utilities, hand pumps and other relocated structures if any; status of rehabilitation of borrow areas.			
0.2	Maintenance of Drainage	<i>PIU will ensure that all drains (side drains, cross drains etc.) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.</i> PIU will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.	Project Requirement	PIU	/PIU
0.3	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water quality (ground and surface water), soil pollution/contamination in the project stretch as suggested in pollution monitoring plan will be the responsibility of PIU. PIU may appoint CPCB/SPCB approved pollution monitoring agency for this purpose.	Project Requirement	Pollution Monitoring Agency	/PIU
Q.4	Safety Measures	The project area shall be also monitored for any accidents. The database shall be analyzed to see whether and rectification or any physical correction/alteration in the geometry of	Project Requirement	PIU	

Sl. No.	Environmental Issue	Management Measures	Reference Document	Responsible Agency	
				Implementation on Agency	Supervision/Monitoring
		the road is needed			
		The Toll Plaza should be equipped to deal with emergency situation and equipped with wireless sets, firefighting systems and first aid box.			
		Periodic maintenance of traffic signals, signposts, road markings, etc. In case of spill of Hazardous materials, relevant departments will be intimated at once to deal with it. PIU NH division will provide ambulance along the stretch in case of any accident.			

Clause : A-8 Avalanche Protection Dams

6.1 Design of avalanche catching, deflection and retarding structures

6.1.1 Design

The structure was designed using the principles described in BS 8006:2010. This is a limit state procedure considering both ultimate and serviceability limit states. Additionally FHWA and AFNOR Guidelines shall be considered for seismicity.

Partial load factors greater than unity are applied to the nominal loads having disturbing effects. Design material properties are calculated by dividing the characteristic properties by the appropriate partial resistance factor.

The ultimate limit state considers the factor of safety against collapse and the serviceability limit state considers the magnitude of deformation that will occur during the service life of the structure. The ultimate limit state assessment considers both the external and internal stability of the structure.

Most importantly, such structures offer, at low relative cost, an ideal material for sustaining dynamic loads. This is well known for example in Japan, where similar structures have been widely used based on the outstanding seismic performance, even under the most severe earthquake motions (Otani, 2013). But it is also the case for dynamic impacts, distributed like avalanche or explosion blasts, or localised in the case of rock falls. It is also important for avalanche loads since the snow flow is likely to bring other debris which will hit the dam or the braking mounds, like rocks or trees. The localised impacting energy is absorbed by moderate localised internal deformation of the granular fill. The localised impacting energy is absorbed by moderate localised internal deformation of the granular fill.

6.1.2 **Fill materials**

The core fill within the reinforced zone may be a blasted or crushed rock having a bulk density of 20 kN/m³ or above and a characteristic angle of internal friction > 30°. The general fill forming the rear face has a bulk density of 20kN/m³ and a characteristic angle of internal friction of 35°. The barrier is constructed above a 3m deep sub-fill layer having the same properties as the core fill within the reinforced zone. All of the fill materials have been considered to have been excavated from local sources only.

6.1.3 **Facing panels**

The facing panels forming the front of the structure are galvanised carbon steel panels manufactured from 8mm welded steel bars with a 100mm aperture spacing in the horizontal and vertical directions. The bars have a yield strength of 500N/mm². The facing panels are hot-dip galvanised with a protection thickness of 86µm. The galvanising provides sacrificial corrosion protection to the facing. The nominal facing panel size is 3.0m x 1.3m with two rows of soil reinforcement connected to each facing, giving a 650mm vertical spacing between layers of soil reinforcement. The arrangement and size of each panels may be modified as per site conditions.

6.1.4 **Soil reinforcement**

The polymeric soil reinforcement comprises closely packed high tenacity polyethylene terephthalate (PET) fibres encased in a linear low density polyethylene (LLDPE) sheath. A knurled finish is provided to the surface of the sheath along with trapezoidal groove like rib (lateral teeth) on both side of the strap. The finish and shape help to provide higher frictional resistance between the soil and the soil reinforcement, which, in addition to its tensile capacity, enables the structure to resist the applied loads.

Generally, three different grades of Geostraps soil reinforcement are used in the construction of the dam. These being 37.5kN, 50kN and 65kN or above corresponding to the initial strength of the soil reinforcement. Each grade has a width of 50mm or 70 mm. Concrete fascia system shall not be considered as fascia elements as those are being rigid in behaviour and unable to absorb impact load that could arise due to avalanche movements.

6.1.5 Connections

Each of the soil reinforcement strips is mechanically connected to the facing panel by a galvanised steel hook with a horseshoe shaped steel plate. The hooks and horseshoes are protected against corrosion by hot-dipped galvanisation. The dimensions of the system ensure a non-damaging bending diameter of 60mm for the soil reinforcement as it passes around the connection. It has been demonstrated that diameters smaller than 20mm can have a detrimental effect on the soil reinforcement capacity (Sankey & Lozano 2015)

7 Clause: A-9 HIGH EMBANKMENT SECTIONS

6.2 DESCRIPTION

7.1 Description

This work shall consist of Reinforced Earth steep slopes comprising of construction of internally stabilized soil mass, built in layers, duly compacted with specific fill requirements in combination with 50mm and 70mm wide Geosynthetic strap and 50mm wide High Adherence Geosynthetic strap coated with Linear Low-Density Polyethylene (LLDPE) as soil reinforcing structural elements of designated grades and design strengths connected directly with flexible galvanized steel mesh facing through mechanical connection system.

Design and construction of Reinforced Earth steep slope shall include all dead and live loads and combinations, seismic loads, drainage provision for dissipation of pore water pressure and flexible galvanized steel mesh facing system with erosion protection measure for long term performance. The contractor shall assess and substantiate the availability and design adequacy of foundation soil for overall stability under the location of the Reinforced Earth steep slope before execution of the works.

All Reinforced Earth works shall be executed as per ISO: 9001:2015 scope of registration for "The structural design, engineering, procurement, supervision and installation and Project Management of Mechanically Stabilised Earth and Precast Concrete structures for civil engineering applications."

The final approval of design, materials and construction methodology shall be obtained from the engineer in charge before commencement of works.

7.2 SCOPE

This work shall consist of Reinforced Earth steep slopes, which includes reinforcement elements comprising of Geosynthetic strap and High Adherence Geosynthetic strap coated with LLDPE with mechanical connection to the facing element and backfill material in accordance with the specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the approved drawings.

Internal drainage system provisions with chimney drain, perforated drain pipes and erosion protection with boulders at the face (for slope angle > 70 deg.) or green face coir erosion control blanket (for slope angle ≤ 70 deg.) shall form an integral part of the works.

The work shall generally be done in conformity to the MORTH "Specification for Road and Bridge Works: Latest Revision, Section 3100 and specifically as per this document. The detailed design and drawings of the work done in accordance with the MORTH specifications and in accordance to FHWA Guide line "Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes". Reference can also be made to BS: 8006:2010 "Strengthened/Reinforced Soils and Other Fills" for general detailing or wherever relevant. The design will also cater for single lane IRC class 70 R, two lanes IRC class A or combination of the two as external live traffic loads for 3-lane carriageway, safety barrier system as per engineer's approval and earthquake loads as per IS 1893: 1984 and FHWA guideline.

The work consists of designing and constructing permanent retaining wall or steep slope only through specialized system or technology providers like M/s. Reinforced Earth India Pvt. Ltd. or other similar agencies meeting the eligibility criteria as mentioned elsewhere in this document. The contractor shall arrange all design calculations, drawings, specialized materials, methodology and on-site technical assistance to construct the Reinforced Earth structure in accordance with this specification through such specialized system or technology provider.

7.3 SLOPE STABILITY ANALYSIS

The slope stability shall specifically be checked for global slip failures using TALREN | SLIDE 2.0 design software (Advanced stability software in geo techniques) prior to commencement of all works.

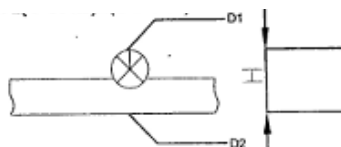
7.4 MATERIALS

Construction of steep slope using Reinforced Earth technology is a specialized work. The contractor shall make his own arrangements to secure the supply of the materials meeting the following technical specification.

7.4.1 Facing of the steep slope

In Reinforced Earth steep slope structures, the facing units are galvanized steel (GeoTrel or similar) welded mesh units. The steel mesh shall be of either 'I' shape or 'L' shape depending upon the slope angle. Special compressible type galvanized steel mesh panels and secondary reinforcement may be used for total wall | slope height more than 10.0m to allow enhanced flexibility in the wall | slope, as per recommendation and design of specialized system | technology provider.

The steel mesh shall be made from hard drawn steel wire having minimum diameter of 8mm (yield strength $\geq 350\text{Mpa}$, ultimate tensile strength $\geq 450\text{Mpa}$ and elongation $\geq 10\%$) and grade B500B or B550C complying with EN10080 or alternatively SAE1010/1019, galvanization shall be done as per IS2629:1985 except the zinc coating which shall be minimum 610 grams per sqm. The welding joint of the wire shall be interpenetration between 12% to 15% of the total diameter of the welded wire. Total height of the welded bars $H \leq (1-0.12) \times (D1+D2)$.



Welding details





High Adherence Geosynthetic strap

HA Geosynthetic strap shall be used at the top three layers of the wall, rest all layers of soil reinforcement shall be either 50mm wide or 70mm wide Geosynthetic strap having smooth edge depending upon the detailed design of the structure.

c) Specification of Geosynthetic strap

The Polyester and Polyethylene materials used for Geosynthetic strap manufacturing shall be selected amongst the best available materials. The specific properties of each are listed below;

Table 1: Core polyester fibres: High tenacity polyester yarns are used

<u>Specific properties</u>	<i>Unit</i>	Typical value	Test Method
Molecular weight	<i>g/mol</i>	28000	
Elongation at break	%	< 15	DIN 53834
Resistance to hydrolysis	%	< 25	CEN ENV 124 47

Table 2: Outer polyethylene sheath: Virgin high quality black Linear Low Density Polyethylene is used for the outer sheath

<u>Specific properties</u>	<i>Unit</i>	Typical value	Test Method
Density	<i>Kg/m³</i>	932	ISO 1183
Elongation at break	%	500-600	IEC 811.1.1
Carbon black content	%	2.5	IEC 811.4.1

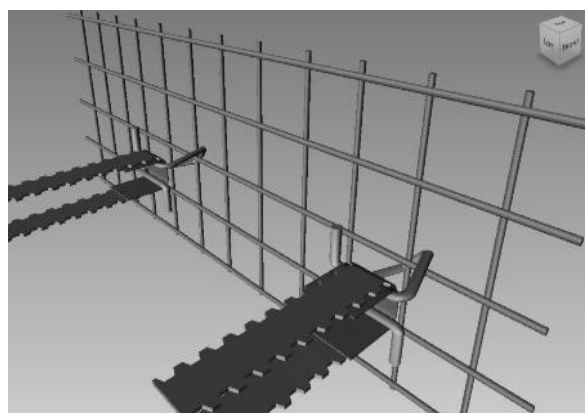
Table 3: Geosynthetic strap reinforcement: Reinforcement specification

Grade		Width	Tolerance	Characteristic Strength
		mm	mm	kN
50mm wide Geosynthetic strap or HA Geosynthetic strap	25	49.5	+/- 0.5	25.0
	37.5	49.5	+/- 0.5	37.5
	50	49.5	+/- 0.5	50.0
	65	49.5	+/- 0.5	65.0
70 mm wide Geosynthetic strap	75	70	+/- 1.0	75.0
	90	70	+/- 1.0	90.0
	100	70	+/- 1.0	100.0

Other soil reinforcement in the form of grid/ mat/ sheet made of metal or HDPE or any other form of geosynthetic shall not be acceptable.

Mechanical connection system:

The connection system between the soil reinforcing Geosynthetic strap and the Reinforced Earth facing shall be direct and mechanical in nature as shown below. The connection shall consist of galvanized steel mild steel loops and horse shoe plate. The weight of galvanization shall not be less than 610 grams per sqm (Zinc thickness not less than 86 micron).



No other connection system shall be allowed to use.

i. Fill materials

In principal fill materials may compromise of any one or combination of the following-

- a. Main fill material to build up the Geosynthetic strap reinforced gravity body.
- b. Fill material at the slope front as a basis for erosion protection.
- c. Fill material for foundation and drainage layer.

- **Principal fill material:**

The properties of structure fill, subsoil and the retained fill and their interface media shall be based on assumed representative soil data at the design stage, but the values shall be verified at the time of the construction.

Fill in the structure or slope shall either be wholly frictional or cohesive-frictional. Stratified layers of combined frictional and cohesive-frictional fill shall not be used without specific design check. The use of soft chalk, un-burnt colliery shale and unsuitable material shall not be permitted and got removed from site.

Fill for Reinforced Earth structures shall be well graded selected material as specified and available within reasonable lead distance. The fill must allow dissipation of pore pressure by designing the same with free draining characteristics or by providing vertical and horizontal drainage provisions with geosynthetic drains in the reinforced soil volume. The association of drainage bay or interface drains shall be connected properly to the gradient required and shall be maintained during compaction in layers.

Backfill materials used in the Reinforced Earth volume shall be reasonably free from organic or otherwise deleterious materials and shall conform to the following mechanical and physico-chemical requirements.

Mechanical requirements

Sieve size	Percent passing
80 mm (gravel)	100%
4.75 mm (coarse sand)	more than 75%
75 micron (silt)	less than 15%

Acceptance limits for materials with more than 15% passing 75micron are related to the percentage of particles smaller than 15 microns as follows:

- Materials with more than 15% passing 75micron sieve but less than 10% of particles smaller than 15 microns are acceptable.

- Materials with more than 15% passing 75micron sieve and more then 20% of particles smaller than 15 microns are inadequate and shall not be used except as specified in (e) below.
- The plasticity index (PI) shall be less than 6 and co-efficient of uniformity (C_u) shall be greater than 2.
- Materials with more than 15% passing 75micron sieve and 10 to 20 % of particles smaller than 15 microns are acceptable provided that the internal friction angle is not smaller than 30° .

Initially at approval of source and subsequent at each change of source, backfill is to be checked for sieve analysis, pH and angle of internal friction. The results will indicate what further tests are needed, if any.

Materials not conforming to the above requirements may be used with the written consent of engineer in charge after carrying out test. Such materials shall be tested for their functional properties to assure that they are consistent with the parameters used in the design calculations.

- **Fill material in face of construction:**

The fill materials behind the facing steel mesh of the Reinforced Earth Steep slope shall be selected as per the following guidelines;

- For slope angle > 70 Deg. with horizontal: One layer of boulder (Size 125mm to 200mm) shall be placed behind the steel mesh facing over a width of approx. 400mm for the purpose of erosion protection. One layer of non-woven geotextile filter shall be placed between the boulders and the primary fill materials so that the fines from the reinforced zone does not pass through.



Boulder facing slope

ii. **Material for drainage layer:**

Horizontal drainage gallery and chimney drain gallery shall be minimum 600 mm wide. The drainage gallery shall be constructed using aggregate or gravel (size: 19.5mm passing and 9.1mm retained). Non-woven geotextile shall be used to restrict the files

enter the drainage gallery. The drainage gallery shall be constructed as shown in the construction drawings. Alternatively, geo-composite drains as per the following specification may be used as chimney drain and drainage board wrapped with non-woven geotextiles on both sides may also be used as horizontal drainage layers. The chimney drain shall be connected with the horizontal drain.

Specification: Geo-composite Drain

Property	Test Method	Unit	Required Value	Qualifier
Composite				
Mass per Unit Area	EN ISO 1883-1	g/m²	710	Min.
Thickness	EN ISO 9863-1	mm	4.5	Min.
Tensile Strength (MD/CD)	EN ISO 10319	kN/m	18.5/19.5	Min.
Elongation (MD/CD)	EN ISO 10319	%	50/35	Min.
CBR Puncture Strength	EN ISO 12236	N	3,200	Min
In-plane permeability i=1@ 100 kPa	EN ISO 12958	l/m-sec	0.55	Min.
In-plane permeability i=1@ 200 kPa			0.45	
Geotextile				
Tensile Strength	EN ISO 10319	kN/m	8	Min.
Fabric Weight	EN ISO 9864	gm/m²	130	Min.
Water Flow	EN ISO 11058	l/m²/sec	1.26	Min.
AOS	EN ISO 12956	mm	0.43	Max.
Permittivity	ASTM D 4491/ IS:14324-1995	Sec ⁻¹	0.5	Min.

Specification: Drainage board with non-woven geotextiles on both sides

Drainage Board	
Dimension (mm):	500 x 250 x 20
Materials:	High-impact

	Polypropylene
Compressive Strength/m ² :	≥120 MT
Weight/m ² :	2kgs
Geotextile	
Tensile Strength (kN/m)	5.5
Fabric Weight (gm/m ²)	110
Water Flow (l/m ² /sec)	110
AOS (mm)	210
Permittivity (Sec ⁻¹)	2.2

iii. **Materials for covering the berms:**

The berms, if any, in the Reinforced Earth wall | slope shall be covered with one layer of Geosynthetic Clay Liner and 100mm thick Plain Cement Concrete (PCC) of M-15 grade to mitigate ingress of any water into the subsequent tier of Reinforced Earth wall | slope. Provision for drainage on the berms shall also be provided. The specification of GCL shall be as under;

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY ft ² (m ²)	REQUIRED VALUES
Bentonite Swell Index ¹	ASTM D 5890	1 PER 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss ¹	ASTM D 5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area ²	ASTM D 5993	40,000 ft ² (4,000m ²)	0.75 lb/ft ² (3.6kg/m ²)min.
GCL Tensile Strength ³	ASTM D 6768	200,000 ft ² (20,000m ²)	30 lb/in (53 N/cm)min.
GCL Peel Strength ³	ASTM D 6496	40,000 ft ² (4,000m ²)	1 lb/in (1.75 N/cm) MARV
GCL Index Flux ⁴	ASTM D 5887	Weekly	1X10 ⁸ /m ³ /m ² /sec max.
GCL Hydraulic Conductivity ⁴	ASTM D 5887	Weekly	5X10 ⁹ cum/sec max.
GCL Hydrated Internal Shear Strength ⁵	ASTM D 5321 ASTM D 6243	Periodic	150 psf (7.2 kPa) typical

TECHNICAL SPECIFICATIONS FOR ROAD TUNNELS

1. Technical Specifications

These Technical Specifications define the technical and quality standards specifically for NATM tunnel construction works.

The construction works shall be executed according to the quality requirements defined in the Specification. Any item of work arising from the execution of the works, not covered by the Technical Specification, shall be according to a Standard as agreed with the Employer's Representative and the Contractor.

This Technical Specification is based on the "Specification for Tunnelling, Third Edition", British Tunnelling Society, Institution of Civil Engineers, 2010 and "MORTH Specification for Road and Bridge Works", Ministry of Road Transport and Highways, 2000.

2. Standards and Units

Materials, equipment and methods shall comply with the Standards and Codes of Practice indicated using the versions that are current at the date for submission of tenders. The Contractor may propose the adoption of alternative standards and shall provide explanations with any proposals. The use of such standards shall be subject to the agreement of the Employer's Representative.

Some Indian, European and British Standards and Guidelines are listed below. The list is provided for information. All Work shall follow these Standards and Guidelines. First and foremost, the compliance of Indian Standards is required unless defined otherwise in this Specification. International (in the first step European) Standards and Guidelines shall be accessed to when no Indian Standards/Guidelines are available for the specific matter.

References to sources for Standards, Guidelines and Recommendations are cited in the in Table 1 below. The list is provided for information only.

References to sources of Standards, Guidelines and Recommendation

Abbreviation	Name
ASTM	American Society for Testing and Materials, 100 Bar Harbor Drive West, Conshohocken PA 19429 – 2595, U.S.A.
BSI (BS)	British Standards Institute, 389 Chiswick High Road, London, W4 4AL UK.
DIN	Deutsches Institute für Normung e.V. Beuth Verlag GmbH, Burggrafenstrasse 6 D-10787, Berlin, Germany.

EFNARC	European Federation of Producers and Applicators of Special Building Products, Association House, 235 Ash Road, Aldershot, Hampshire, GU12 4DD, United Kingdom.
EN, ENV	European Committee for Standardisation, Central Secretariat, Rue de Stassart 36 B-1050, Brussels.
IRC	The Indian Road Congress, Jamnagar House, Shahjahan Road, New Delhi- 110011.
IS	Bureau of Indian Standards, Manak Bhavan, 9 Bahdur Shah Zafar Marg, New Delhi – 110002.
ISO	International Organization for Standardisation 1, rue de Varembe CP 56, CH- 1211 Genève 20, Switzerland.
ÖNORM:	Austrian Standard Institute, Heinestraße 38, 1020 Wien, Austria
RVS (Austrian Code for Road Construction)	Austrian Association on Road, Rail and Transport (FSV), Karlsgasse 5, 1040 Wien, Austria
ÖGG	Austrian Society for Geomechanics, Bayerhamerstrasse 14, 5020 Salzburg, Austria

3. Listing of Standards

The list is provided for information only.

Indian Standards

ID of Standard	Description
IS 10262-2009	Guidelines for concrete mix design proportioning
IS 1077-1992	Common Burnt Clay Building Bricks
IS 11171-1985	Dry-Type Power Transformers
IS 1199-1959	Methods of sampling and analysis of concrete
IS 12269-1987	53 grade ordinary Portland cement
IS 12330-1988	Specification for sulphate resisting Portland cement

IS 1248	Direct Acting Indicating Analogue Electrical Measuring Instruments and their Accessories
IS 1278-1972	Filler rods and wires for gas welding
IS 1343-1980	Code of Practice for Prestressed Concrete
IS 1542-1992	Sand for plaster
IS 1554-1988	(Part 1): PVC insulated (heavy duty) electric cables: Part 1 For working voltages up to and including 1 100 V
IS 1566-1982	hard-drawn steel wire fabric for concrete reinforcement
IS 1885-1993	Electrotechnical Vocabulary: Part 32 Electric cables
IS 1651-1991	Stationary cells and batteries, lead-acid type (with tubular positive plates)
IS 8130-1984	Conductors for insulated electric cables and flexible cords
IS 1786-2008	High strength deformed steel bars and wires for concrete reinforcement-
IS 1791-1985	General Requirements for Batch Type Concrete Mixers
IS 1905-1987	Code of practice for structural safety of buildings; masonry walls
IS 2062-2011	Hot Rolled Medium and High Tensile Structural Steel
IS 2116-1980	Sand for masonry mortars
IS/IEC 60947- 1-2007	Low-voltage Switchgear and Control gear: Part 1 General Rules
IS 2180-1988	heavy duty burnt clay building bricks

IS 2309-1989	Code of practice for the protection of buildings and allied structures against lightning
IS 2386-1963	(Part 1 & 8): methods of tests for aggregates for concrete
IS 2502-1963	Code of Practice for Bending and Fixing of Bars for Concrete Reinforcement
IS 2505-1992	Concrete vibrators - Immersion type - General requirements
IS 2514-1963	Concrete vibrating tables
IS/IEC 60947-2-2003	Low-Voltage Switchgear and Control gear - Part 2: Circuit Breakers
IS 13118-1991	High-Voltage Alternating-Current Circuit-Breakers
IS/IEC 60947-3-1999	Low voltage switchgear and control gear: Part 3 Switches, disconnectors, switch-disconnectors and fuse combination units
IS 269-1989	Ordinary and low heat Portland cement (33 GRADE)
IS 2705-1992	Current transformers
IS 2750-1964	Steel Scaffoldings
IS 2751-1979	Code of Practice for Welding of Mild Steel Plain and Deformed Bars for Reinforced Concrete Construction
IS 280-2006	Mild Steel Wire for General Engineering Purposes
IS 13925-1-2012	Shunt capacitors for ac power systems having a rated voltage above 1000 V Part 1: General
IS 2961-1973	Chrome retain finished upper leather
IS 8130-1984	Conductors for insulated electric cables and flexible cords

IS 3043-1987	Code of practices for earthing
IS 3085-1965	Method of Test for Permeability of Cement Mortar and Concrete
IS 3156-1992	Voltage transformers
IS 3231-1986	Electrical relays for power systems protection
IS 3427-1997	A.C. Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 kV and Up to and Including 52 kV
IS 3443-1980	Crane rail sections
IS 3558-1983	Code of practice for use of immersion vibrators for consolidating concert
IS 3597-1998	Concrete pipes - Methods of test
IS 5578-1984	Guide for marking of insulated conductors
IS 11353-1985	Guide for Uniform System of Marking and Identification of Conductors and Apparatus Terminals
IS 3764-1992	Code of safety for excavation work
IS 383-1970	Coarse and Fine Aggregates from Natural Sources for Concrete
IS 3954-1991	Hot Rolled Steel Channel Sections for General Engineering Purposes – Dimensions
IS 4031-1989	Methods of physical tests for hydraulic cement
IS 4032-1985	Method of chemical analysis of hydraulic cement
IS 4081-1986	Safety code for blasting and related drilling operations
IS 4138-1977	Safety code for working in compressed air

IS 432-1982	Mild Steel and Medium Tensile Steel Bars and Hard-Drawn Steel Wire for Concrete Reinforcement
IS 456-1978	Plain and Reinforced Concrete - Code of Practice
IS 457-1957	Code of Practice for General Construction of Plain and Reinforced Concrete for Dams and Other Massive Structures
IS 458-2003	Precast Concrete Pipes (with and without Reinforcement)
IS 4756-1978	Safety code for tunneling work
IS 4880(Part 1-7)	Code of practice for design of tunnels conveying water
IS 4925-2004	Concrete Batching and Mixing Plant
IS 4988-1968	(Part 1-5): Glossary of terms and classification of earth moving machinery
IS 5082-1998	Wrought aluminum and aluminum alloy bars, rods, tubes and sections for electrical purposes
IS 516-1959	Method of Tests for Strength of Concrete
IS 5525-1969	Recommendation for detailing of reinforcement in RCC
IS 5640-1970	Method of test for determining aggregate impact value of soft coarse aggregates
IS 5819-1970	Recommended Short-circuit Ratings of High Voltage PVC Cables
IS 5831-1984	PVC insulation and sheath of electric cables
IS 5878-1971	(Part 1-7): Code of Practice for Construction of Tunnels
IS 5892-2004	Concrete transit mixers & agitators

IS 6430-1985	Mobile air compressor for construction purposes
IS 6461-1972	Glossary of terms relating to cement concrete: Part I Concrete aggregates
IS 6461-1972	Glossary of Terms Relating to Cement Concrete - Part III: Concrete Reinforcement
IS 650-1991	Standard Sand for Testing of Cement
IS 694-2010	POLYVINYL CHLORIDE INSULATED UNSHEATHED AND SHEATHED CABLES/CORDS WITH RIGID AND FLEXIBLE CONDUCTOR FOR RATED VOLTAGES UP TO AND INCLUDING 450/750 V
IS 7098-1988	Crosslinked polyethylene insulated PVC sheathed cables: Part 1 For working voltage up to and including 1 100 V
IS 7245-1974	Concrete payers
IS 7251-1974	Concrete finishers
IS 7293-1974	Safety code for working with construction machinery
IS 7319-1974	perforated concrete pipes
IS 783-1985	Code of Practice for Laying of Concrete Pipes
IS 7861-1981	(Part 2): Code of practice for extreme weather concreting: Part II Recommended practice for cold weather concreting
IS 7861-1981	(Part 1): Code of practice for extreme weather concreting Part 1 Recommended practice for hot weather concreting
IS 800-2007	General Construction in Steel - Code of Practice
IS 808-1989 -2004	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections

IS 8041-1990	Specification for rapid hardening Portland cement (2nd revision)
IS 8112-1989	High strength ordinary Portland cement (43 grade)
IS 814-2004	Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel
IS 816-1969	Code of practice for use of metal arc welding for general construction in mild steel
IS 817-1992	(Part 1): Training of Welders - Code of Practice: Part 1 Manual metal arc welding
IS 818-1968	Code of Practice for Safety and Health Requirements in Electric and Gas Welding and Cutting Operations
IS 2062-2011	Hot Rolled Medium and High Tensile Structural Steel
IS 8623-1993	Low-Voltage Switchgear and Control gear Assemblies
IS/IEC 60898 - 2002	Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations: Part 1 Circuit-breakers for ac operation
IS 9012-1978	Recommended practice for shotcreting
IS 9103-1999	Concrete Admixtures
IS 9284-1979	Method of test for abrasion resistance of concrete
IS 9417-1989	Recommendations for welding cold worked bars for reinforced concrete construction.

4. International Standards (for Information)

European Standards (for Information)		
1	Eurocode	Basis of design and actions on structures
2	Eurocode	Design of concrete structures
3	Eurocode	Design of steel structures
5	Eurocode	Design of timber structures
7	Eurocode	Geotechnical design
8	Eurocode	Design of structures for earthquake resistance

British Standards (for information)

BS EN ISO 62:2008	Plastics. Determination of water absorption
BS EN 196:2005	Methods of testing cement
BS EN 197-1:2011	Cement. Composition, specifications and conformity criteria for common cements
BS EN 197-1:2004	Cement – Part 1: Composition, specifications and conformity criteria for common cements
BS EN 206-1:2001	Specification, performance, production and conformity
BS EN 295-7:1996	Requirements for vitrified clay pipes and joints for pipe jacking
BS EN 338:2010	Structural timber. Strength classes
BS EN 450-1:2005	Fly ash for concrete – Part 1: Definitions, specifications and conformity criteria A1:2007
BS EN 471:2004	High-visibility warning clothing for professional use - Test methods and requirements
BS EN 480:2006	Admixtures for concrete, mortar and grout. Test methods
BS EN ISO 527-3:1996	Plastics. Determination of tensile properties. Test conditions for films and sheets
BS EN 681-2:2000	Elastomeric seals. Material requirements for pipe joint seals used in water and drainage applications. Thermoplastic elastomers

BS EN 771-3:2011	Specification for masonry units. Aggregate concrete masonry units (dense and light-weight aggregates)
BS EN 772-2:1998	Methods of test for masonry units. Determination of percentage area of voids in masonry units (by paper indentation)
BS EN 791:1996	Drill rigs – safety
BS EN 815:1997	Safety of unshielded tunneling boring machines and rod less shaft boring machines for rock
BS EN 932-6:1999	Tests for general properties of aggregates. Definitions of repeatability and reproducibility
BS EN 933-1:2012	Tests for geometrical properties of aggregates. Determination of particle size distribution. Sieving method
BS EN 934-2:2009	Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions and requirements, conformity, marking and labelling
BS EN 1008:2002	Mixing water for concrete – Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete
BS EN 1011-1:2009	Welding - Recommendations for welding of metallic materials - General guidance for arc welding
BS EN 1011-2:2001	Welding. Recommendations for welding of metallic materials. Arc welding of ferritic steels
BS EN 1062-7:2004	Paints and varnishes. Coating materials and coating systems for exterior masonry and concrete. Determination of crack bridging properties
BS EN 1090-2:2008	Execution of steel structures and aluminium structures. Technical requirements for steel structures
BS EN 1097	Tests for mechanical and physical properties of aggregates
BS EN 1367	Tests for thermal and weathering properties of aggregates
BS EN ISO 1461:2009	Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods
BS EN 1537:2000	Execution of special geotechnical work – rock anchors

BS EN 1542:1999	Products and systems for the protection and repair of concrete structures.
BS EN 1562:2012	Test methods. Measurement of bond strength by pull-off Founding. Malleable cast irons
BS EN 1563:2012	Founding. Spheroidal graphite cast iron
BS EN 1744	Tests for chemical properties of aggregates
BS EN 1849- 1.479166667	Flexible sheets for waterproofing. Determination of thickness and mass per unit area. Plastic and rubber sheets
BS EN 1928:2000	Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of water tightness
BS EN ISO 3506-2: 2009	Mechanical properties of corrosion-resistant stainless-steel fasteners - Nuts
BS EN ISO 4624:2003	Paints and varnishes. Pull-off test for adhesion
BS EN ISO 9001:2008	Quality management systems. Requirements
BS EN 10025:2004	Hot rolled products of structural steels
BS EN 10080:2005	Steel for the reinforcement of concrete. Weldable reinforcing steel. General
BS EN 10164:2004	Steel products with improved deformation properties perpendicular to the surface of the product – technical delivery conditions
BS EN 10226- 1.433333	Pipe threads where pressure tight joints are made on the threads. Taper external threads and parallel internal threads. Dimensions, tolerances and designation
BS EN ISO 11925- 2:2011	Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Single-flame source test
BS EN 12110:2002	Tunnelling machines – Air locks – Safety requirements
BS EN 12111:2002	Tunnelling machines – Road headers, continuous miners and impact rippers – Safety requirements
BS EN 12310- 1.472222222	Flexible sheets for waterproofing. Determination of resistance to tearing (nail shank). Plastic and rubber sheets for roof waterproofing
BS EN 12317- 1.479166667	Flexible sheets for waterproofing. Determination of shear resistance of joints. Plastic and rubber sheets for roof waterproofing

BS EN 12336:2005	Tunnelling machines - Shield machines, thrust boring machines, auger boring machines, lining erection equipment - Safety requirements
BS EN 12350	Testing fresh concrete
BS EN 12390	Testing hardened concrete
BS EN 12504-1	Testing concrete in structures – Part 1: Cored specimens – Taking, examining and testing in compression
BS EN 12588:2007	Lead and lead alloys. Rolled lead sheet for building purposes
BS EN 12620:2002	Aggregates for concrete
BS EN 12878:2005	Pigments for the colouring of building materials based on cement and/or lime. Specifications and methods of test
BS EN 12889:2000	Trenchless construction and testing of drains and sewers
BS EN 13055-1.431944444	Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout
BS EN 13139:2002	Aggregates for mortar
BS EN 13263-1.434027778	Silica fume for concrete – Part 1: Definitions, requirements and conformity criteria
BS EN 13492:2004 (E)	Geosynthetic barriers - Characteristics required for use in the construction of liquid waste disposal sites, transfer stations or secondary containment
DIN EN 13670-1:2011	Execution of concrete structures
BS EN 13791:2007	Assessment of in-situ compressive strength in structures and pre-cast concrete components
BS EN 14487-1.434722222	Sprayed concrete – Part 1: Definitions, specifications and conformity
BS EN 14487-1.476388889	Sprayed concrete – Part 2: Execution
BS EN 14488-1.434027778	Testing sprayed concrete – Part 1: Sampling fresh and hardened concrete
BS EN 14488-1.476388889	Testing sprayed concrete – Part 2: Compressive strength of young sprayed concrete
BS EN 14488-	Testing sprayed concrete – Part 3: Flexural

1.518055556	strengths (first peak, ultimate and residual) of fibre reinforced beam specimens
BS EN 14488-4:2005	Testing sprayed concrete – Part 4: Bond strength of cores by direct tension
BS EN 14488-5:2006	Testing sprayed concrete – Part 5: Determination of energy absorption capacity of fibre reinforced slab specimens
BS EN 14488-7:2006	Testing sprayed concrete – Part 7: Fibre content of fibre reinforced concrete
BS EN 14889-1:2006	Fibres for concrete – Part 1: Steel fibres. Definitions, specifications and conformity
BS EN 14889-2:2006	Fibres for concrete – Part 2: Polymer fibres. Definitions, specifications and conformity
BS EN 15167-1:2006	Ground granulated blast furnace slag for use in concrete, mortar and grout – definitions, specifications and conformity criteria
BS EN 60204	Safety of machinery. Electrical equipment of machines
BS EN 61672-1:2003	Electroacoustics. Sound level meters. Specifications
DD CEN/TS 14416:2005	Geosynthetic barriers. Test method for determining the resistance to roots
PD CLC/TR 50426:2006	Assessment of inadvertent initiation of bridge wire electro-explosive devices by radio-frequency radiation. Guide
BS 143 and 1256:2000	Threaded pipe fittings in malleable cast iron and cast copper alloy
BS 1134:2010	Assessment of surface texture. Guidance and general information
BS 4190:2001	ISO metric black hexagon bolts, screws and nuts. Specification
BS 4449:2005	Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product
BS 4482:2005	Steel wire for the reinforcement of concrete products. Specification
BS 4483:2005	Steel fabric for the reinforcement of concrete
BS 4921:1988	Specification for sherardized coatings on iron or steel
BS 5228-1:2009	Code of practice for noise and vibration control on construction and open sites. Noise

BS 5228-2:2009	Code of practice for noise and vibration control on construction and open sites. Vibration
BS 5607:1998	Code of practice for the safe use of explosives in the construction industry
BS 5911-1	Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete pipes (including jacking pipes) and fittings with flexible joints (complementary to BS EN 1916:2002)
BS 5975:2008	Code of practice for temporary works procedures and the permissible stress design of falsework
BS 6100	Building and civil engineering. Vocabulary. (various dates)
BS 6164:2011	Code of practice for health and safety in tunnelling in the construction industry
BS 6319	Testing of resin and polymer cement compositions for use in construction (various dates)
BS 6472:2008	Guide to evaluation of human exposure to vibration in buildings (1-80 Hz)
BS ISO 4866:2010	Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures
BS 7385-2:1993	Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration (Part 2)
BS 7668:2004	Weldable structural steels. Hot finished structural hollow sections in weather resistant steels. Specification
BS 7671:2011	Requirements for electrical installations
BS 7973-1:2001	Spacers and chairs for steel reinforcement and their Specification. Product performance requirements
BS 7973-2:2001	Spacers and chairs for steel reinforcement and their Specification. Fixing and application of spacers and chairs and tying of reinforcement
BS 7979:2001	Specification for limestone fines for use with Portland cement
BS 8102:2009	Code of practice for protection of below ground structures against water from the ground
BS 8500-1:2006	Concrete – Complementary British Standard to BS EN 206-1. Method of specifying and guidance for

	the specifier
BS 8500-2:2006	Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete
BS 8666:2005	Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete. Specification

ASTM D 1777	Standard Test Method for Thickness
ASTM D 3776	Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
ASTM D 4491a	Standard Test Method for Water permittivity
ASTM D 4751	Standard Test Method for Apparent opening size of a Geotextile
ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 3786	Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
ASTM D 4833	Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
ASTM D 4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4355	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
ASTM D 3787	Standard Test Method for Bursting Strength of Textiles-Constant-Rate-of- Traverse (CRT) Ball Burst Test
ASTM D 4157	Standard Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)
EFNARC-1996	European Specification for Sprayed Concrete
ASTM C-39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C-78	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point

	Loading)
ASTM C-94/C	Standard Specification for Ready-Mixed Concrete
ASTM C-172/C	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C-685/C	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
EFNARC Three Point Bending Test on Square Panel with Notch 2011	Testing Sprayed Concrete - Flexural tensile strength of fibre concrete on sprayed test specimen.
Austrian concrete society publications	Guide line on shotcrete and testing methods
Austrian concrete society publications	Inner lining concrete
JSCE -2004	Recommendation for design and construction of steel fibre reinforced concrete, Publications of Japan society of civil Employer's Representatives
DIN 67524 (Part 1/02)	Lighting of street tunnels and underpasses
DIN 67524-2008	Tunnel illumination
DIN 5035	Artificial lighting
RABT (2006)	Guidelines for equipment and operation of road tunnels

5. Tunnel Excavation

Tunnel excavation in any kind of ground shall be performed in accordance with modern blasting and excavating practice, using methods and techniques that will reduce over break to a minimum outside of the line of excavation (pay line), and which will preserve, in the soundest possible condition, the structural integrity of the rock beyond the line of excavation.

Excavations shall not be advanced until the pattern ground support for the previous round has been installed and the profile of the previous round has been checked and all rock remaining inside the line of excavation has been removed. The Employer's

Representative may stop the work for removal of undercuts at any time if undercutting is observed.

Tunnel excavation shall not be started until the exposed rock faces in its portal excavation have been stabilized with rock support and shotcrete and drainage measures have been installed as given in the drawings.

The Contractor shall maintain accurate records of all blasting and excavating operations and at the end of each shift he shall provide the Employer's Representative. The forms shall bear the signatures of the Contractor's and the Employer's Representative certifying that records are accurate and complete and include but not limited to the following:

- length of tunnel excavated, and theoretical volume of solid material excavated
- quantity of any rock support installation
- occurred rock falls, zones of instability and logs of pilot holes
- water inflow at the head and rate of discharge at the tunnel portal
- Unusual occurrences and all delays with reasons for these. Holes drilled in swelling ground shall be conducted without water.

Determination of Excavation and Support and Prediction of System Behaviour

For the final determination of the excavation and support method, it must be checked if the ground conditions conform to the design assumptions. When the observed conditions conform to the predicted ones, stipulations in the framework plan must be followed when determining the construction measures.

In case of a deviation exceeding the specified tolerance in the framework plan, the designer must be informed to allow for an adaptation of the prediction, based on new findings. The designer shall agree with the required additional measures in due time and update the framework plan accordingly.

The final decisions on the applied construction measures are based on the design and additional information gained during construction. The goal is a safe and economical construction.

6. Check of System Behaviour

The actual deformation in the supported area and in the final stage shall be compared to the predicted behaviour, and checked, whether the behaviour is within the specified limits of the warning criteria. Additional measurements or evaluations may be required.

Deviations between the expected and the observed behaviours must be analysed and documented.

The reasons for the deviation in behaviour must be analysed. In case the assumptions regarding the influencing factors are inappropriate, the parameters must be modified. The modifications must be supported by appropriate data and analyses and documented in an updated framework plan.

In case the ground quality is better than predicted, the geotechnical model must be revised. In case of a significant deviation, the criteria for the determination of excavation and support must be modified.

In case the ground quality is worse than predicted and warning levels exceeded, contingency measures according to the safety management plan must be implemented, and excavation and support shall be adjusted accordingly. This can be done for example by additional bolting, installation of a temporary invert, etc. In some cases, the installation of a stronger support in the following rounds may be enough to achieve the target.

In case of significant deviations, the geotechnical model has to be revised and the criteria for the determination of excavation and support have to be modified. This generally requires that the framework plan is updated

7. Updating of Design

Due to limited information available during design, a number of assumptions and simplified models have to be used to arrive at a design, which is the basis for the framework plan and the tender documents.

A continuously update of the geotechnical design with the increasing level of information shall be done. This applies to the determination of the Ground Types, the assignment and calibration of key parameters and criteria as well as for the determination of the behaviour. The refinement of parameter categories, the introduction of additional criteria, etc. help in improving the geotechnical model.

The tunnel engineer on site must report to the designer in case of significant deviations of the actual geological/geotechnical situation from the predicted ones, as outlined in the framework plan. A detailed report, containing all relevant information and coordinated with the site geologist must be prepared and submitted.

8. Blasting

Not less than 40 days prior to commencement of rock excavation in each area, the Contractor shall submit, for review by the Employer's Representative, details of the drilling and blasting methods which he intends to use in that area. If, at any time in a specific area, a plan which has been previously adopted does not produce conditions at the excavated rock face that conform to the requirements of these Specifications, the Contractor shall submit a revised plan to the Employer's Representative before continuing excavation in adjacent areas.

The Contractor shall develop controlled blasting techniques, which will satisfy the excavation requirements specified herein. In each different type of rock conditions, the Contractor's initial blasts shall be performed as trials, and the burden, drill hole pattern

and depth, explosive type and quantity, blasting sequence and drill delay pattern shall be modified to achieve the requirements specified herein.

Blasting means have to follow the licensing requirements and orders as well as the manufacturer's instructions.

Blasting operations shall be carried out only under the direction of an experienced operator. The Contractor shall appoint one competent person to be responsible for the security of explosives.

Blasting shall be carried out carefully so as to avoid loosening or shattering rock beyond the required line of excavation, and loose or shattered rock (where it does not contribute to stability of the excavation) shall be removed by scaling down or other means before personnel will be permitted to restart operations after blasting.

Notices of blasting operations shall be posted on site. Before each firing, the Contractor shall give audible warning, clear the area and shall take positive measures to prevent personnel from entering the danger area.

The Contractor shall monitor the results of blasting closely and, where it is proper to do so, shall propose changes to his blasting operation for the agreement of the Employer's Representative.

Under no circumstances shall any holes be charged until completion of all drilling operations at the face.

After each blasting operation the tunnel drive shall be sufficiently ventilated to remove any nitrous gases and the atmospheric conditions shall be constantly checked prior to personnel accessing the excavated face.

No person shall be allowed to approach the face and no face operation shall commence until the Contractor's authorized person in charge of the operation has given permission after blasting round.

As soon as practicable after blasting and without undue delay the Contractor shall erect such support as may be necessary to safeguard the excavation and personnel.

The shot-firer must keep a record of the number of shots fired, their time of firing, type and weights of explosives used, and the type and number of detonators used, together with a record of the post-blast situation for each and every location. A copy of the record shall be available to the Employer's Representative at the end of every shift on which shots are fired.

9. Controlled perimeter blasting

Controlled perimeter blasting techniques shall be used to produce rock faces conforming to the required excavation lines, slopes, elevations and dimensions shown on the drawings with a minimum of disturbance to the rock at, or outside of, the excavation pay lines.

Drill holes for controlled perimeter blasting shall not be less than 42 millimetres in diameter and shall be a single row of closely spaced holes drilled to a maximum depth of one round length along the excavation pay lines and a spacing of 0.4 to

0.6 m depending on the ground condition. The spacing of the perimeter holes may be modified on the basis of results obtained and in agreement with the Employer's Representative.

All blast holes within a distance of 5 meters normal to the excavation pay lines shall be less than 75 millimetres in diameter and shall be loaded in a manner and detonated in a sequence to ensure that a minimum of damage will result to the face when the main charge is fired

10. Explosives

The Contractor shall use explosives only in circumstances where it is safe to do so having due regard to the safety of persons, third-party property and the safety of the Works. Explosives shall not be used without the agreement of the Employer's Representative.

The Contractor shall obtain all necessary licences and consents and shall provide secure storage facilities for all explosives and equipment in accordance with Indian or International Standards Code of practice for the safe use of explosives in the construction industry and the requirements of the local Authorities and the Employer's Representative.

Explosives shall be handled and used only by the Contractor's duly authorized personnel. The names and qualifications of such personnel shall be submitted to the Employer's Representative in writing in advance of any possible use of explosives.

At an early stage, in advance of the proposed use of explosives, the Contractor shall notify the Employer's Representative, third parties, statutory authorities and services which have an interest in or are likely to be affected by blasting operations, of the general nature of the operation. The Contractor shall subsequently give a minimum of 14 days' notice to the Employer's Representative and others described above of the proposed use of explosives. With this notification the Contractor shall submit to the Employer's Representative a detailed method statement on all aspects of the proposed use of explosives, including the treatment of misfires.

The Contractor shall comply with the following documents in respect of the use of explosives:

- Indian Explosives Act 1884
- Indian Explosive Rules 2008 and further amendment in Jan.2009
- The Manufacture and Storage of Explosives Regulations 2005

- BS 5607:1998 Code of practice for the safe use of explosives in the construction industry
- Control of Explosives Regulations 1991
- Carriage of Explosives by Road. Road Traffic (Carriage of Explosives) Regulations 1996
- PD CLC/TR 50426:2004 Assessment of inadvertent initiation of bridge wire electro- explosive devices by radio- frequency radiation. Guide Quarries (Explosives) Regulations 1988, as far as it is relevant to tunnel works

11. Blasting Vibrations

For structures in the proximity of blasting, the peak particle velocity shall be measured at the locations immediately adjacent to the structure nearest to the face being blasted or any other location where it is necessary to limit vibration.

Vibration monitoring proposals shall be submitted to the Employer's Representative for his agreement.

The measurement of peak particle velocity shall be obtained from instruments capable of measuring along three orthogonal axes, one of them shall be aligned parallel to the center line of the excavation and another shall be vertical. The Contractor has to provide supports for the measuring instrument if so, required by the manufacturer's instructions.

The measurements of the particle velocities shall be the responsibility of the Contractor. Copies of the readings in an agreed form shall be supplied to the Employer's Representative.

Prior to the commencement of blasting in any location, the Contractor shall demonstrate using test firings, or by other means, that neither the peak particle velocities given in the particular Standards and Specifications will be exceeded.

The maximum allowable blasting vibrations shall be defined by the Contractor for every influenced structure with reference to the applicable Standards and Specifications for the relevant structure. The allowable blasting vibrations shall be approved by the Employer's Representative prior to any blasting operations.

12. Geological mapping

Geological mapping shall be performed by qualified geologist to provide a documentation of rock and rock mass condition encountered during excavation. Additionally, all exposed rock surfaces of the open and underground excavations shall be washed down for inspection and geological mapping. Exposed rock surfaces at the required excavation pay lines shall be mapped after preparation but before shotcrete application. Tunnel and other underground faces shall be mapped just before the start of drilling. The Contractor shall allow in his construction procedure and schedule for the geological mapping of each tunnel face not less than 30 minutes.

The geological mapping shall include but not limited to the following information:

- excavation face
- tunnel meter
- geological unit
- intact rock:
 - rock type and lithology description
 - weathering and alteration degree
 - uniaxial and unconfined compressive strength (from point load tests)
- rock mass:
 - jointing degree
 - geometry, orientation (strike and dip) and properties of discontinuities
 - face condition (homogeneous or heterogeneous)
 - water inflow
 - over breaks (separated in geological and non-geological)
 - ground response
 - suspected pervious zone
- the GSI value and the corresponding excavation class
- groundwater appearance

The Contractor shall provide lights, ladders, platforms and free access and shall assist the Employer's Representative to carry out inspection and geological mapping.

In case of sudden and unexpected changes of the geological conditions shall be informed immediately.

13. Exploratory Drillings

Long exploratory drillings with full core recovery shall be carried out when deemed necessary and required. Based on the geological mapping and the exploratory drillings may require rock mechanic laboratory tests.

14. Excavation Cross Section Check

Tunnels will be constructed to the center lines as defined herein and subsequently agreed on site. Average deviation of the tunnel centreline from the design centreline,

along a 100 m length of any tunnel section, shall not exceed 30 mm. If deviations in tunnels excavated exceed the specified tolerance, the Contractor shall be required to adapt his working methods so that the specified tolerances are achieved.

Immediately after excavation and before support installation the cross section of the actual round must be checked to avoid unexcavated ground reaching into the excavation area as per excavation and support category. The check must be done with proper instrumentation, either with free positioned theodolite or with temporarily installed monitoring device for profile check. When all ground material inside the excavation area is removed the support installation shall start earliest.

In case of partial excavation, the similar procedure shall be executed for each partial excavation area.

15. Excavation Material Disposal

The disposal of excavation material shall be in accordance with specified compliance.

Excavation material suitable to be utilized in the Works shall be stockpiled separately from materials to be disposed. The use of excavation material in the Works shall agree with the Employer's Representative.

Suitable materials shall, wherever possible, be transported directly from the required excavation to the various designated final locations.

Excavated materials, not suitable for or in excess of the construction requirements, shall be disposed of in spoil areas designated by the Local Authorities or the Employer's Representative. Unless otherwise provided for, spoil areas shall be built up in layers, with a maximum layer thickness of 0.6 m, and evenly compacted by the traffic of the construction equipment, aimed at minimizing future differential settlement. Final sloping and shaping of surfaces shall be as indicated on the Drawings. Other details of the work such as stabilization and drainage measures are shown on the Drawings.

All activity by the Contractor at spoils areas shall be confined to the limits designated by the Local Authorities or the Employer's Representative. The limits shall be clearly marked and, where directed barricaded to prevent traffic in areas outside the limits.

16. Survey

The Contractor shall be entirely responsible for the accuracy of the control survey and the plotting and periodic checking thereafter. Location and positioning of all survey control stations, reference pillars, bench marks etc. must be presented in coordinates and in a map (scale 1:1000) and approved by the Employer's Representative before the start of any works.

The Contractor shall install all necessary above ground survey stations and reference points well in advance of the commencement of excavation works to allow the

Employer's Representative sufficient time to check the initial control survey and subsequent setting out for the alignment and levels of the respective tunnels.

Survey stations, center lines, bench marks and grade lines shall be clearly marked in paint on the tunnel walls, chainages at 10-meter intervals or as otherwise agreed by the Employer's Representative. The Contractor shall appoint and employ the necessary qualified and experienced staff to carry out the required survey and setting out. The Contractor shall provide all necessary instruments, equipment, record books, level books measuring devices etc. required for survey and setting out. The Employer's Representative shall have use of any of the survey equipment required for the checking of survey work and setting out throughout the period of the Contract. Chainmen and transport shall be provided by the Contractor for checking purposes at the request of the Employer's Representative.

All additional work found to be necessary because of negligence in/or incorrect setting out, shall be carried out immediately by the Contractor as directed by the Employer's Representative at no additional costs.

17. Temporary Ventilation System

Pits, tunnels and headings shall always be kept ventilated to maintain an atmosphere fit for respiration and free from oxygen deficiency, potentially explosive or noxious gases and dust, whether present naturally or otherwise. Ventilation shall also be used to maintain a safe working temperature.

Underground works shall be ventilated in accordance with all applicable regulations. Details of the proposed ventilation system shall be submitted to the Employer's Representative, for review, not less than 40 days prior to the start of commencement.

Where more than one pollutant is present any adverse interaction between them shall be identified and mitigated.

All diesel engines used in the underground works shall be provided with means, which shall be maintained in efficient order, of cooling exhaust gases and reducing the concentration of toxic gases to acceptable levels, filtering particulates and preventing emission of flames or sparks.

In underground workings and in confined spaces the air breathed by persons shall contain not less than 19% of oxygen by volume, and shall not contain concentration of gases, vapor or dust greater than is safe for the health or workmen, having regard to the effects of time, temperature, humidity and the combined effects contaminants.

Smoking is forbidden in tunnels, headings, pits or shafts and all confined spaces.

In rock excavation all drill holes shall be wet drilled unless otherwise specified in this Specification in compliance with special ground condition.

18. Ventilation

The Contractor shall agree ventilation proposals with the Employer's Representative. Agreement shall not relieve the Contractor of his obligations under the Contract.

Proposals shall include but not be limited to the types of fan employed, sitting arrangements where appropriate, the power supply and the fan performance data, together with duct characteristics.

In forcing systems, fans shall normally be placed on the surface. The inlet to any surface forcing fan shall have unobstructed access to fresh air. It shall not be in the vicinity of a storage site for oil, chemical or diesel drums. The fan shall also be sited so that it cannot draw in internal combustion engine fumes or gas from charging batteries.

Blasting fumes shall be discharged from the underground works into a filter system or diverted adequately to ensure that concentrations of noxious or other harmful gases or dust are kept to the minimum limit as stated in the applicable laws/ Standards or the limits specified in the contract or lower.

If booster fans are to be employed by in-line staging, they shall be of an approved flameproof (FLP) construction and a monitoring system shall be installed so that the status and condition of such fans can always be monitored.

Provision shall be made for the fan to be run continuously whether persons are within the underground works or not. After tunnel break-through the ventilating system shall be kept in operation in order to maintain the fresh air-volume requirements stated hereinafter.

If a ventilation system ceases to function for any reason and for a period exceeding 30 minutes, all work in areas being ventilated by that ventilation system shall immediately cease and all workers shall immediately leave the areas.

Where a fan has been stopped and restarted, the condition of the air shall be tested before personnel enter the tunnel. If only forcing surface-mounted fans are employed, the ventilation system should be restarted and run continuously ensuring that any plugs of oxygen-deficient, flammable or noxious mixtures of gas are flushed out. Care should be taken that workmen do not encounter any plugs of these gases on re-entry to the tunnel. The Contractor should consider that air residence time in long drives can be several hours and that layered gases of different densities are difficult to disperse, especially where the gradient of the tunnel changes.

All equipment and ventilation duct shall always be maintained in sound working order. Any damage to ventilation duct shall be repaired within 12 hours of the damage.

The outlet of the duct shall be kept as close to the face as is practicable, designed to avoid turbulence and creation of dust and not more than 10 m away.

Where dust is being produced by the tunnelling system, exhaust ventilation shall be used to extract such dust from the working area.

Tunnelling shall not continue more than 10 m from the shaft or pit unless positive ventilation has been established.

The fresh air supply for underground works shall not be less than two cubic meters per minute at the face for each man underground and four cubic meters per minute per kW

power for all diesel units operating underground. These fresh air volumes shall be cumulative, and the Contractor shall allow, in his design calculations, for the maximum number of persons and diesel-powered equipment deployed in the Works at any one time. Any estimated losses, e.g. due to the leaks in the ducts, shall be considered. The fresh air supply shall also be adequate to produce a linear velocity of 0.3 meters per second throughout the underground works.

Testing devices shall be provided for measuring carbon monoxide, methane, oxides of nitrogen and aldehydes in underground works during the operation of internal combustion engines. Readings of carbon monoxide content shall be taken by the Contractor at least once during each shift. Readings of oxides of nitrogen content and of aldehydes content shall be taken frequently to ensure safety of the workers. A record of all taken readings shall be kept by the Contractor and submitted to the Employer's Representative daily.

Ventilation ducts shall be firmly fixed to the vaults in such position that a minimum clearance of 20 cm remains between the duct and the extremities of vehicular traffic employed in the Underground Works.

19. Lighting

Floodlighting on the site surface shall be adequate for the safe operation of the site. It shall be shrouded where necessary to ensure the light is directed to areas within the site, and to avoid nuisance.

Lighting in the tunnel shall extend the full length and not be less than that required for safe working and access. Lamps shall be located with an interval of 25 m.

An alternative source of power and emergency lighting system shall be provided to allow emergency securing operations and evacuation safely in the event of a primary power failure. An adequate number of hand lamps shall be located at key points underground.

The Contractor shall also provide suitable movable lamps to illuminate any area in Underground Works including areas for instrumentation and where the Engineer may wish to carry out inspection and rock mechanics tests or instrumentation.

Lighting illumination by flame is strictly not permitted in the underground Works.

20. Tunnel Excavation Monitoring

The Contractor shall survey, monitor and record tunnel and shaft construction as it proceeds to form a record of the Work. Monitoring shall generally be per unit of advance and include line, level, cross-sectional accuracy, shift advance and total advance.

Where grouting is carried out, the type, volume and pressure of grout shall be recorded.

All information recorded by the Contractor shall be provided to the Employer's Representative daily unless another interval has been agreed.

3-dimensional deformations of the tunnel lining shall be monitored by means of optical methods. The points to be observed are marked by targets or reflectors mounted on standard convergence bolts.

Where the Contractor considers that any corrective action, he may take will exceed the tolerances in the Contract, he shall so inform the Employer's Representative and obtains his agreement. Measurements shall be carried out with a free-stationed high precision electronic theodolite with integrated coaxial EDM device. The flow of data shall be fully automatic. The software shall allow determination of displacements in an absolute coordinate system with an accuracy of $\min \pm 1.0 \text{ mm}$.

The Contractor shall determine the elevation of tunnel crown or any other point as directed by the Employer's Representative during tunnel excavation to monitor vertical settlements and bottom heaves and to be able to interpret and figure the absolute amount of displacements together with convergence readings out. The method of performing the level measurements shall be such as to ensure an accuracy of $\pm 1 \text{ mm}$. Necessary conclusions shall be drawn from the geotechnical measurements, from their magnitude, alterations and tendencies about stability of the primary lining and surrounding rock, performance of the initial support applied and utilization of the supporting elements.

The locations and spacing between geotechnical measurement sections depends on geological conditions, frequency of geological alterations, rock mechanical behaviour, length of tunnels, primary stress conditions and size of tunnels. The location of designed measurement sections shall be modified during tunnelling according to the local geological conditions and the experience gained during tunnel driving and as required and approved by the Employer's Representative.

The strata exposed in the tunnel face shall be mapped and recorded where possible, and the nature of the excavated material shall be noted in all cases. The Contractor shall keep copies of all recent face records at the workplace for the information of supervisory personnel.

All significant groundwater ingress shall be recorded and monitored.

21. Instrumentation

The supply of all labor, supervisors, plant, Contractor's Equipment and materials and the execution of all work necessary to supply, assemble, check, calibrate, drill, install, backfill, embed, test and protect instrumentation in the tunnel and appurtenant structures or elsewhere as specified on the drawings and as specified herein, shall be provided by the Contractor.

During the period of the Contract, the Contractor shall ensure that his construction operations do not interfere with, or damage any of the existing instrumentation, shown on the drawings, or the instrumentation to be installed by the Contractor and by others. The Contractor will be penalized, as specified herein if any of the existing instruments or instruments that have been installed by others or by the Contractor, are damaged by his construction equipment. In addition to the penalty, the Contractor, within the days

required by the Employer's Representative, shall supply and install a replacement instrument adjacent to each instrument that was damaged by his construction equipment, at no additional cost to the Employer.

Not less than 120 days prior to the required installation date of each instrument, which is shown on the Contractor's work schedule, the Employer's Representative will either confirm that the instrument to be supplied is to conform to the requirements of the Specifications or he will issue information on the number, type, model number, manufacturer, supplier, location and other details of the instrument or instruments that are to be supplied and installed.

The Contractor's request for approval to supply and install alternative instruments shall provide enough information on each alternative instrument for the Employer's Representative to compare it with the specified instrument. The information shall be submitted to the Employer's Representative not less than 90 days prior to the first installation of that instrument.

Not less than 60 days prior to the start of instrument installation, the Contractor shall submit to the Employer's Representative a detailed description of all instrumentation, cabling and accessories including any ancillary measuring equipment, details of his checking, testing, calibrating, installing and monitoring procedures for each of the instruments.

Not less than 30 days prior to installation, each instrument shall be checked, tested and calibrated according to the instrument manufacturer's instructions and as specified herein to ensure that the instruments are in good working order and properly calibrated. A report on each such checking, testing and calibration of each instrument shall be submitted to the Employer's Representative not more than seven days after the checking, testing and calibration of that instrument.

Each instrument shall have a certificate from the manufacturer stating that the instrument was inspected before leaving the factory and presenting details of the instrument calibration. A copy of the certificate for each instrument shall be submitted to the Employer's Representative not more than three days after the delivery of the instrument to the site.

A manual shall be provided with each type of instrument.

The Contractor shall supply all components, accessories and electrical leads for the instruments from the sensor to the observation house or station including materials, equipment and tools required to install, calibrate and protect the instruments as specified herein and as shown on the drawings.

All instruments and their accessories shall be new and have been successfully performed in similar projects.

Instruments shall be assembled, tested and calibrated by the manufacturer before delivery to the site. The instruments and accessories shall be stored at the site by the Contractor under the condition conforming to the manufacturer's requirements.

Instruments shall be handled, stored and installed with care so as to avoid damage. If during handling, storing and installation instruments are damaged, the Contractor shall

replace and reinstall the instruments within 30 days as specified herein, as shown on the drawings or as required by the Employer's Representative and at no additional cost to the Employer.

All instruments and equipment used and required for the geotechnical measurements shall be made available to the Employer's Representative throughout the construction period.

22. Probing Ahead

Where required the Contractor shall be responsible for probing ahead of the tunnel face in order to prove or investigate the ground.

The selection of plant for probing shall be agreed with the Employer's Representative and shall take the probable nature of the ground ahead and its water-bearing capacity into account.

Probing shall be carried out in such way to allow modification of the excavation and support according to the encountered ground conditions. The number of probes, the diameter of drilling, their positions in the face and angles with respect to the tunnel drive shall be governed by the actual ground conditions and the machinery in use. The maximum probed distance ahead of the face shall be governed by the ground conditions and the degree of uncertainty with distance.

The diameter of probe holes shall be not less than 38 mm.

23. Primary Support Measures

Generally, the primary support measures are installed immediately after the performed blasting round and a break of work prior to support construction is not permitted. The type and amount of tunnel support is directly related to the Rock Classification as established.

The Contractor shall ensure that support elements will be installed or applied in such a manner and sequence as to prevent disintegration and loosening of the rock mass surrounding the excavated tunnel.

Comprehensive records, containing all particulars of the tunnel support installed and its performance in the course of the works, shall be prepared and maintained by the Contractor and made available to the Employer's Representative on a daily basis. These records shall include type, quantity and location of installed support elements, the clearance profile after installation of support, deviations from the designed support systems, observations of excessive deformations, shotcrete cracking, etc. Observations of excessive deformations, shotcrete cracking, etc. shall be reported immediately to the Employer's Representative.

The Contractor shall keep a record of the chainage of each face position and shall keep this record updated as the face progresses. This record shall be available for consultation at any time at a convenient location close to the relevant face.

The Contractor shall record the results of all tests performed on the rock bolts prior to, during and after their installation, and submit these documents to the Employer's Representative. The Contractor shall apply shotcrete on rock masses which tend to local over break immediately.

Structural support consisting of wood is only permitted temporarily. It is not permitted to leave wooden support in the shotcrete or concrete layer.

Damaged rock mass support system due to re-profiling shall be reconstructed subsequently.

The Contractor must provide an adequate amount of rock mass support systems and required equipment on the site; hence no delays of excavation shall occur. Prior to the beginning of excavation, the required rock supports shall be provided by the Contractor on the site.

Blasting round lengths, time schedules, construction sequences, quantity and location of installed support elements shall be constructed as per drawings. Deviations from the designed support systems shall be reported immediately to the Employer's Representative and shall be approved.

The Contractor shall in case of emergency be obliged to undertake independently such support measures as he deems necessary without the prior consent of the Employer's Representative. In such cases the Contractor shall inform the Employer's Representative immediately.

Rock mass support is defined as follows:

- Primary support: is defined as the support which is installed systematically within the heading, bench and invert zone in order to ensure the short-term integrity of the underground excavation and safety of personnel during excavation. The installation of primary support is an essential element of the excavation cycle.
- Final lining: is defined as support which is installed subsequent to the primary and supplementary support and which does not form part of the normal excavation cycle. It serves as the permanent lining of the tunnel and shall be a cast in situ concrete lining, plain or reinforced according to structural requirements.

The final lining may be installed in any section of the tunnel, with the Employer's Representative's approval, at any time after convergence measurements show that movement in the rock in the immediate vicinity has stabilized.

24. Rock Bolts, Anchors

Unless otherwise defined herein, rock bolts shall comply with the following Indian Standards or their equivalent International Standards:

- IS: 1786 Specifications for high strength deformed-steel bars and wires for concrete reinforcement
- IS: 2062 Steel for general structural purposes

Rock bolts are intentioned steel bars threaded at one end and provided with a face plate, shim plates and a conical seated washer and nut or split or deformed steel tubes. Steel bars shall be grade 500 N/mm², deformed type 2 bars complying with BS 4449. Threaded parts of bars, nuts and seating shall comply with the requirements of BS 4190. Face plates shall be of a dish shape in steel to the appropriate standard and shall have a hemispherical seating with centralized slot to suit dimensions of the rock dowels.

Rock bolts shall be installed according to the length, direction, placement and number as per approved design drawings for each relevant Excavation Class unless otherwise determined by the Employer's Representative. Rock bolt length, direction, placement and number shall be adjusted to the Ground Type.

Comprehensive records about details of the installation of rock bolts during drivage, such as reference number, grout consistency, drilling depth, length, inclination and type of rock bolts, deviations from the theoretical position, type and time of grouting, time of tightening, special observations, details of tests carried out, geological ground condition, etc. shall be kept for each rock bolt and round by the Contractor and countersigned by the Employer's supervisory personnel. Copies of these records should be submitted to the Employer's Representative.

The trademark of rock bolts and anchors to be installed shall be approved by the Employer's Representative. A quality assessment is required, unless common anchor steel and anchor plates were used. The Contractor's construction execution shall comply with the manufacturer's specifications and recommendations regarding drilling, installing, testing and maintenance of rock bolts. The characteristic bearing capacity of the anchor plate and the connection between the anchor and anchor plate shall be equal to the characteristic bearing capacity (according to BS EN 1537) of the anchor steel.

The diameter of the drillings and the drilling technique shall be adjusted to the anchor type and Ground Type. Holes for the installation of bolts shall be drilled straight and with an accuracy of $\pm 10^\circ$.

The drilling hole shall be flushed and cleaned with compressed air or water immediately prior to the installation of the bolt. The used technique shall be adjusted on the Ground Type (e.g. bore holes drilled in swelling ground no water flushing is permitted).

The water pressure during drilling may have an inadequate impact on the surrounding ground (e.g. decrease of mechanical strength properties) due to this the water pressure may be reduced or dry drilling may be conducted as directed by the Employer's Representative.

Unless instructed otherwise, rock bolts shall be installed and tensioned prior to the excavation of the next bench or round excavation. The tension force shall be determined by the Employer's Representative after completion of the initial testing program.

The Contractor shall provide torque wrenches of a type acceptable to Employer's Representative. All impact and torque wrenches shall be calibrated once every month.

The grouted hole shall be completely filled with grout. This shall be done by filling the drilled hole from the bottom of the hole and withdrawing the grout slowly, always maintaining the hose embedded in the grout. A regular surface shall be provided to seat the face plate by trimming rock surfaces or forming pads of quick-setting mortar. Where mortar pads are required, they shall be of adequate thickness and extend beyond the face plate by 25 mm all round at that thickness before being chamfered at 45°. Care shall be taken to ensure that the mortar does not interfere with the installed bolt.

25. Shotcrete

Shotcrete shall be mixed, charged, applied, cured and tested according to given Specifications which are based on "Specification for tunnelling" by British Tunnelling Society. Additionally to these Specifications and where these specifications do not cover any aspect the "Guideline for Sprayed Concrete", Austrian Society for Concrete- and Construction Technology, 2005, Austria. Enclosed in Addendum 2 shall be applied.

70 days prior to any shotcrete application the Contractor shall submit detailed description of shotcrete to the Employer's Representative for review and approval such as:

- Number and type of equipment used for mixing, batching and applying shotcrete.
- Manufacturer's certificates detailing any proposed admixture, inter alia, accelerator admixture and the Contractor's proposals for the use of such admixtures mix design

The Contractor shall, 42 days prior to commencement of the actual work of spraying concrete or as otherwise approved, submit results of preconstruction tests of sprayed concrete with the actual materials, inclusive of admixtures, mixed in the proportions proposed for the Works for approval.

The Contractor shall make available testing, production and application records daily to the Employer's Representative when concrete is applied. The application records shall contain information on when, where and how much sprayed concrete was applied in each operation.

The sprayed concrete shall comply with the BS EN 14487-1 Sprayed concrete, except as noted otherwise below.

The requirements listed below generally refer to high-quality temporary or permanent sprayed concrete.

This Specification is primarily for the use of wet-mix sprayed concrete but in certain circumstances dry-mix sprayed concrete may be suitable.

Sprayed concrete shall be applied by either the wet or dry process as appropriate to the circumstances. All aspects of the application of sprayed concrete shall be subject to the agreement of the Employer's Representative. Emphasis shall be placed on the provision of adequate ventilation.

The compressive strength of shotcrete in-situ (taken from the tunnel lining or from panels sprayed in the tunnel) shall develop progressively to a final strength according to

the minimum requirements specified below. Uniaxial compressive strength tests shall be done in accordance with the provisions stipulated in relevant codes. The strength development due to suitability tests must exceed the specified in-situ strength by a factor of $1/0.85 (=1.18)$

The sprayed concrete mix design shall, unless otherwise stated, comply with the characteristic strengths specified by the detailed design for early-age and long-term loading.

The 28-day-strength (cube) of shotcrete shall be minimum 30 N/mm^2 . The strength development of shotcrete shall be such to meet 2 N/mm^2 after 9 hours, 5 N/mm^2 after 24 and 17.5 N/mm^2 after 7 days.

Fibres are generally accepted for use in concrete conforming to BS EN 206-1 and BS 8500 if the fibre conforms to BS EN 14889, a European Technical Approval.

Fibre-

reinforced concrete will be trialled and tested to ensure it meets the designers' requirements before inclusion in the works. Historical data of the same fibre and dosage will be accepted in place of trials provided the data are deemed appropriate.

26. Grouting

Cementitious grouting material shall be injected starting from the furthest point of the drilled hole so that the dowel is completely encased in grout. Grout shall not be used after a period equivalent to its initial setting time. Where cement grout is used, a set of six cubes of cement grout shall be taken when each series of rock dowels is in progress. Sampling, preparation, curing and testing shall be in accordance with BS EN 196. Half the cubes shall be tested at 1 day and the remainder at 28 days. The average compressive strength determined from any group of cubes shall exceed the specified characteristic strength given in Table 2 of EN 197-1:2000 or equivalent Indian Standard.

Grouting operation is defined as follows:

- contact or cavity grouting, at pressures up to 300 kPa, to fill voids between final concrete lining and primary sprayed concrete lining, or between the primary lining and rock
- consolidation grouting or strata grouting, at pressures up to 6 MPa, of the rock surrounding the excavated space, which shall commence after completion of contact grouting, where applied
- consolidation grouting or strata grouting in the heading zone, at pressures up to 6 MPa, in zones of sheared and disturbed material or of high-water inflow
- final grouting of temporary drainage holes

The Contractor shall prepare a detailed grouting Specification to suit best the actual conditions encountered. This grouting specification shall be submitted to the Employer's Representative for approval unless otherwise agreed or directed by the Employer's

Representative. The Tunnel Designer's Representative shall specify the maximum pressures to be used for grout injection at each location. The pressures specified are subject to approval by the Employer's Representative.

Records of all details of grouting works such as location, inclination, diameter of boreholes, drilling time, equipment used, results of water pressure tests, mix, quantity, pressure of grouting, development and special events during grouting operation etc. shall be kept by the Contractor, countersigned on site by the Employer's supervising personnel and submitted to the Employer's Representative.

Where necessary due to the nature of the ground conditions or where adverse water conditions are anticipated, the requirements for the use of special grouts shall be stated in the Contract.

Special grouts supplied by proprietary manufacturers may be used subject to agreement with the Employer's Representative.

Preconstruction grout trials shall be undertaken to demonstrate that the required setting times and strength gains will be achieved. Details of the trials and results shall be submitted to the Employer's Representative.

Quality control of grout mortar shall be in compliance with specified code, as directed by the Employer's Representative, water pressure tests shall be carried out.

All grout mixes shall be prepared using high speed, high shearing action mixers to produce a grout of uniform consistency.

Grout holes shall be drilled either with percussion type or rotary type drilling equipment, depending on Ground Type.

The diameter at the bottom of the grout holes shall not be less than 35 mm. For percussion drill holes the diameter of the drilling bit shall be at least 8 mm larger than the diameter of the couplings used for the drill rods.

Only water shall be used for flushing during drilling unless directed otherwise by the Employer's Representative. All holes shall be thoroughly cleaned immediately after drilling using water and/or air under pressure. After washing, downward holes shall be kept plugged until the commencement of grouting operation.

When, prior to pumping, mixed grout is to be stored for short periods, purpose made agitator tanks shall be used. Grout shall be used within 1 hour of mixing.

When clay or bentonite additives are used, separate mixing tanks shall be provided for mixing and agitation.

Grouts containing polymer additives shall only be mixed in a colloidal-type mixer.

Water meters shall be provided for accurate measurement of water used for mixing. Pressure gauges, safety valves, by-pass valves etc. shall be provided where required on mixers, agitators, pumps and injection hoses.

Special grouts from proprietary manufacturers shall be mixed and used in accordance with the manufacturers' instructions.

27. Reinforcement – Wire Mesh

Cutting of reinforcement for better placing due to edges is permitted; hence additional reinforcement in these sections is required.

Welded wire mesh fabric shall be installed in surface excavations in conjunction with sprayed concrete, as shown on the drawings, or as directed by the Employer's Representative. Chain link fabric may be used for surface applications if previously approved by the Employer's Representative.

Welded wire mesh fabric shall conform to the requirements of IS: 4948 and shall have a mesh size of 150 x 150 x 6 mm as shown on the drawings, or as required by the Employer's Representative.

The diameter of additional steel bars shall be limited to 14 mm according to Austrian Guideline "Sprayed Concrete". The characteristic yield strength of the welded wire mesh shall be 500 N/mm².

Welded wire fabrics shall be installed in such way so that it follows as close as possible the irregularities of the excavation surface or previous layers of shotcrete. It shall be firmly fixed to prevent vibration and change of position during spraying of shotcrete. The use of wooden pegs or pins for attaching the wire mesh to the rock surface shall not be permitted. Welded wire fabrics shall be installed in the longest practical length. The overlap for welded wire fabrics applied in the shotcrete lining shall be at least twice the pitch distance in circumferential direction. In longitudinal direction, the overlap shall be at least one pitch distance for the first layer of fabric and at least twice the pitch distance for the second layer of fabric.

A minimum concrete cover at the tunnel side of 4.0 cm of all wire mesh layers shall be provided.

28. Lattice Girder

Steel arches or lattice girders shall be installed to maintain the designed shape of the opening and if necessary, provide an immediate support at the working face over the length of the last excavation completed. The lattice girder mainly functions as reinforcement. If necessary, the installation of steel arches or lattice girders shall also prevent ground loss and shall improve load distribution.

For the application of support arches and lattice girders the following shall be considered:

- axial stress and bending moment in the steel arch ribs induced by the ground loads
- lateral stability and bracing of steel arches or lattice girders
- method of installing the steel arches or lattice girders
- method of blocking and spacing of blocking points

- bearing capacity of the ground at the toe of the arch ribs
- the stand-up time of the unsupported part of the excavation
- the groundwater regime and permeability of the ground

Lattice girders shall consist of three primary bars, connected by stiffening elements to the manufacturer's design or as shown on the drawings. They shall be designed so as to:

- facilitate sprayed concrete penetration into and behind the girder, thereby minimizing the creation of projection shadows and/or voids
- provide good-quality bonding between the steel and sprayed concrete, to form a composite structure acting as a continuous reinforced concrete lining
- make allowance for the specified tolerances including convergence

29. Steel Ribs

Steel ribs provide an immediate support of the excavation after installation and shall subsequently act as reinforcement and load distributing members for the shotcrete lining. Steel ribs are required as support for forepoling elements, which are installed in advance of the excavation. During the entire construction period, they will contribute as load bearing members within the shotcrete lining.

The steel ribs shall be manufactured to meet the geometrical requirements for the excavation geometries for each Excavation Class including the relevant tolerances.

Prior to the beginning of the work the complete fabrication details, installation procedures and layout, details of joints, rib connections, rib spacers, geometry etc. and certificates of compliance of the materials shall be submitted to the Employer's Representative for approval.

The fabrication and installation of structural steel support shall conform to the latest edition of the following Indian Standards or, where not covered by these Standards, to the equivalent International Standards:

- IS: 800 Code of practice for general construction in steel
- IS: 808 Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections
- IS: 816 Code of practice for use of metal arc welding for general construction in mild steel
- IS: 2062 Steel for general structural purposes

Rib splices shall be welded or connected with bolted plates. Splices shall not reduce the section moment of resistance. Where possible all connections shall be welded, and all field connections shall be bolted.

Arches, base plates, ties and connections shall be formed from steel with the characteristic in accordance to reinforced concrete standards. Arches shall be rolled to

suit the dimensional requirements of the Contract. Welding shall conform with BS EN 1011-1. Holes for ties, struts and any bolted connections shall be drilled. No burning will be allowed whether for temporary Works items or permanent elements. Threaded tie rods and struts shall be of adequate length to suit arch centres and allow 25 mm projection each end beyond the nut.

Where arches are to be provided as part of the Contractor's obligation for support the Contractor shall provide dimensional details of the arches, calculations regarding imposed loads and design and such other information that the Employer's Representative may reasonably request.

Galvanized arches, where required, shall be treated in accordance with BS EN ISO 1461. All components, including the rods, fish plates, nuts and bolts, shall be galvanized.

30. Forepoling

To support the excavation roof (tunnel crown) forepoling elements are installed if required at the upper part of the tunnel excavation face. Forepoling shall be applied in rock and soil conditions which tend to produce over break, collapses or material inflows immediately following excavation. Forepoling shall be applied locally or systematically, as the circumstances require for the safety of the works and for preventing over break. The installation of forepoling always requires the erection of steel ribs. They shall be driven from the supporting frame in a slightly upwardly inclined direction at the crown of the heading and should penetrate at least half a set beyond the next excavation cycle.

Forepoling shall be applied as shown on the approved detail design drawings by the Contractor or as instructed by the Tunnel Designer's Representative and/or the Employer's Representative.

Forepoling shall be properly supported by the steel rib and the shotcrete above the steel rib. Therefore, the shotcreting of the gap between steel rib and the shotcreted sealed rock surface along the area of forepoling shall be completed after the installation of forepoling.

Spacing between consecutive forepoling pipes or bars around the crown of the excavation profile shall not exceed the maximum distance specified on the approved design drawings and shall be reduced if the actually prevailing geological conditions at the tunnel face require to do so.

Great care shall be taken to prevent the disturbance of face boards and supports in general during the fore poling cycle.

31. Lagging

Steel lagging (sheet piles) shall be employed mainly in weak ground with low cohesion with the purpose of preventing a collapse of material during and immediately after excavation. The use of lagging will always require the erection of steel ribs.

Steel lagging sheets with a thickness of 4 to 6 mm shall be used.

Lengths shall be in accordance with the round length of excavation and the support requirements beyond the face as defined by the drawings or directed by the Employer's Representative.

Voids and gaps behind the lagging sheets shall be either filled with shotcrete or by contact grouting with a suitable cement mortar.

Lagging sheets shall be driven at distances shown on the approved detail design drawings. They shall be driven in advance of excavation of the respective round to a depth extending a minimum length of 0.5 meters beyond the face of the subsequently round length into the ground.

32. Yielding Elements

Large deformations occurring during tunnel excavation in rock with unfavourable characteristics shall be managed with yielding elements.

The primary tunnel lining shall be divided into segments by means of longitudinal gaps. To make better use of the lining capacity, yielding elements (LSC – Lining Stress Controller or equivalent) consisting of multiple steel pipes in a concentric assembly with a total length of app. 510 mm are installed in the deformation gaps in the circumferential direction.

The yielding elements shall be used to achieve controlled ductility of the tunnel lining in order to prevent overstressing. To allow a smooth initial load development, special provisions have to be foreseen (predetermined breaking points at the ends of the load tube). In order to optimize the bearing capacity of the shotcrete lining, a Multi-stage system may be used in agreement with the Employer's Representative, where the bearing capacity of the element unit is increased stepwise.

It shall be possible to adjust the bearing load of the yielding elements to the actual ground conditions (e.g. variation of steel cylinders of LSC).

Installation shall be done prior to any shotcreting. The elements shall be fixed to the wire mesh or to steel ribs. The elements shall be protected to ensure functionality after primary lining installation prior to shotcreting.

The elements shall have proper contact to the shotcrete lining to transfer the lining forces.

33. Dewatering

The Contractor shall design, furnish, maintain and remove temporary works for protecting the Works under construction against flood flows in rivers and creeks, and design, furnish, operate, maintain and dismantle the temporary dewatering facilities required to remove water from construction activities and from natural surface flow or groundwater seepage from working areas on the surface as well as in the tunnel.

The Contractor's working methods and systems shall be designed to control ground and surface water to permit the construction of shafts, tunnels, breakouts and portal structures.

Where dewatering operations are used, they shall be kept to the minimum necessary for the execution of the Works. If, at any time, during construction, the inflow of water increases more than the installed pumping capacity, the Contractor shall be required to install additional pumping facilities and perform additional sealing as required by the Employer's Representative. The dewatering system shall include a system for identifying ingress of soil material during the dewatering operation.

In planning temporary pumping systems, the Contractor shall take due consideration of water quality, pressure, quantity and variations in water levels.

Settlement ponds and other measures shall be provided so as to ensure that potentially contaminated or polluted matter from the execution of the Works is nowhere released into creeks, rivers or the ground.

The Contractor will be held responsible for all damage caused by his dewatering procedures or the lack of such, and he shall reinstate or repair disturbed ground or structures to their original condition or as otherwise approved.

Plant shall be delivered to site and maintained in good working order. Plant and pipe work shall be fitted with appropriate valves, controls and gauges. Each dewatering well shall be capable of individual adjustment and being shut down and isolated from the rest of the system. Appropriate standby equipment and spares shall be maintained on site at all times.

34. Testing

Rock Bolts

The required bearing capacity of rock bolts is to be ensured by pull out test procedures, in agreement with the Employer's Representative. The pull-out tests shall be conducted with a hydraulic press, in appearance of the Employer's Representative. The test results shall be recorded and forwarded to the Employer's Representative for review.

The equipment for pull out test procedures shall be provided and maintained by the Contractor during the whole construction phase.

Grout

Prior to acceptance tests of rock bolts, tests with available cements and sands shall be carried out to determine an appropriate mix design to achieve the specified strength and a proper workability in association with the grouting equipment used. Additives may be used to improve workability. The influence of the additive on the strength development shall be followed by tests. The grout mortar shall be tested on cubes 5 x 5 x 5 cm. The cubes shall be cured in water. Five numbers of cubes shall be prepared for each

compressive strength test. The resultant strength is the average evaluated from the three remaining values after elimination of the highest and the lowest value.

During construction, cube sample shall be taken weekly at each five bolts drive from the grouting hose at the nozzle. Preparation and evaluation shall follow the procedure as described above.

Shotcrete

The testing procedure and quantity of tests shall be in accordance with: "Guideline for Sprayed Concrete", Austrian Society for Concrete- and Construction Technology, 2005, Austria.

An Employer's Representative shall be on site at all times to check the consistency of materials and workmanship with the design intent, and to ensure that ground and groundwater conditions are in accordance with design assumptions. The Contractor shall establish a procedure to respond effectively to changes in ground and groundwater conditions from the design assumptions.

Measures to establish the total thickness of shotcrete shall be set up by the Contractor and approved by the Employer's Representative. These may include visual guides installed prior to shotcreting or holes drilled after completion of shotcreting.

All required drillings for the testing procedure shall be filled with concrete subsequently.

The thickness of shotcrete is defined as a minimum thickness, consequently the shotcrete shall not be less than nominal design thickness at any place. 5 independent tests shall be done per every 500 m³ of applied shotcrete per construction element (e.g. tunnel lining).

35. Cross Section Check of Primary Lining

No reduction of the theoretical thickness of the inner concrete lining is permitted unless it is approved by the Employer's Representative. To achieve this requirement, no support elements such as shotcrete, anchor heads, steel ribs etc. may protrude into the theoretical inner concrete lining, as shown on the drawings.

The primary lining must be constructed outside the inner lining and inside the over break-line at any point.

In the area of the invert and the foundation beams no rock parts or rock peaks may protrude into the theoretical excavation line.

For tunnel sections with no concreted invert arch the Contractor shall excavate the bottom level of the invert with an accuracy of +0 to -100 mm related to the theoretical excavation line of the invert.

If the bottom excavation level, after the clearing of all detritus material, is more than 100 mm below the designed theoretical excavation line, the Contractor shall backfill such areas up to the designed, theoretical level by means of sub-base material or as directed and approved by the Employer's Representative.

For tunnel sections with a concrete invert arch no reduction of the designed, theoretical thickness of the concrete structure is permitted. Over excavation must be compensated with structural concrete for the invert arch as specified or as directed by the Employer's Representative. The inside face of the invert arch may deviate not more than ± 50 mm in elevation from the theoretical cross section.

36. Concrete

Concrete shall be mixed, charged, applied, cured and tested according to given Specifications which are based on "Specification for tunnelling" by BTS and the Indian Standards. For the tunnel inner lining and where these Specifications do not cover all aspect the Addendum 1 - "Guideline for Inner Shell Concrete", Austrian Society for Concrete- and Construction Technology, 2006, Austria shall be applied.

All structural elements must be designed for fire load if required according to the standards and guidelines.

The final lining cross section geometry shall be checked, and the tolerances shall be in accordance with these Specifications.

If squeezing ground conditions are observed during primary lining construction, stress gauges and pressure cells shall be installed in the final lining to monitor the actual stress-strain condition of the final lining. Minimum three stress gauges and pressure cells shall be installed in cross sections where squeezing ground conditions are encountered or as directed by the Employer's Representative. Records shall be kept available at site and submitted to the Employer's Representative for review.

Concrete and concrete constituents and all materials and operations relating to concrete shall meet the requirements of the Indian Standards Code of Practice for Plain and Reinforced Concrete IS 456 unless otherwise specified herein and as required by the Employer's Representative.

Where concrete is to be placed in aggressive ground, appropriate ground investigation shall be undertaken to identify the nature of the chemical composition of groundwater and ground.

The grade and properties of the concrete used in each part of the work shall be as stated on the drawings or in the Specification.

No material shall be added to ready-mixed concrete at the site unless approved by the Employer's Representative. Full responsibility shall be taken for ensuring that any materials added to ready-mixed concrete on site not causes the concrete to fail the quality control testing requirements of this Specification. Items made from such concrete which fail the quality control testing shall be rectified.

Concrete mixed by the Contractor or any other Sub-Contractor shall comply with the exposition classes and strength classes as defined in the approved detailed design drawings and BS EN 206-1.

The maximum chloride content of concrete shall be in accordance with IS 456.

Chloride content class for concrete containing steel reinforcement shall be Cl 0.20 (maximum Cl content by mass of cement 0.20%) and for concrete containing pre-stressed steel reinforcement Cl 0.10 (maximum Cl content by mass of cement 0.10%), unless otherwise directed by the Employer's Representative.

Consistence of concrete mix, other than concrete mix used for tunnel lining, shall be in compliance with IS: 456.

The Contractor shall provide at the site, modern and dependable, automatically or semi- automatically controlled batching and mixing plant or plants, in an "as new" condition, capable of supplying concrete in accordance with the Specifications and at a continuous rate adequate to meet the requirements of his schedule for concrete placement. Each plant shall have not less than two concrete mixers, each with a separate power and drive system with a standby generator and other equipment to ensure a continuous supply of concrete during concrete placement operations.

The Contractor shall provide, operate and maintain all necessary equipment and plant required to determine accurately and to control the amount of each separate ingredient entering the concrete mix. The actual amount of fine aggregate, each size of coarse aggregate, cement, fly ash, admixtures, ice and water entering each batch of concrete shall be determined by automatic weighing of each ingredient separately and not cumulatively. All constituents shall be weighed or metered in compliance with the limits prescribed in BS EN 206.

Proportioning of concrete mixes shall be in accordance with IS 456-1978 and IS 4925. Concrete is not permitted to contact to aluminium during mixing, conveying and placing.

The concrete shall be protected from damage due to load overstress, heavy shocks, excessive vibrations and the effects of rain and running water particularly during the curing period.

Curing and protection of concrete in cold weather shall be carried out in compliance with IS 7861 Part. Joints in concrete are either movement (deflection, expansion or contraction) joints or construction joints. All construction joints shall comply with IS 11817.

37. Reinforcement

The items of work falling within the scope of work under this section shall be in accordance with the Indian and European Standards Specification (Latest edition) given under:

- IS:280-1978: Specifications for mild steel wire for General Engineering purposes
- IS:432-1966/82: Specifications for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
- IS:432 (Part I): Mild steel and medium tensile bars
- IS:432 (Part II): Hard drawn steel wire

- IS:456-1978: Code of practice for plain and reinforced concrete
- IS:814-1974: Specifications for covered electrodes for metal arc welding of structural steel
- IS:814 (Part I): For welding products other than sheets
- IS:814 (Part II): For welding sheets
- IS:1139-1966: Hot rolled mild steel medium tensile steel and high yield strength deformed bar for concrete reinforcement
- IS:1786-1979: Specifications for cold worked steel high yield strength deformed bars for concrete reinforcement
- IS:2502-1963: Code for practice for bending and fixing of bar for concrete reinforcement
- IS:5525-1979: Recommendations for detailing of reinforcement in reinforced concrete constructions
- IS:9417-1979: Recommendations for welding cold-worked bars for reinforcement concrete constructions
- BS EN 10080: Steel for the reinforcement of concrete. Weldable reinforcing steel. General
- BS 4449: Steel for the reinforcement of concrete – Weldable reinforcing steel
 - – Bar, coil and de-coiled product
- BS 4482: Steel wire for the reinforcement of concrete products. Specification
- BS 4483: Steel fabric for the reinforcement of concrete

38. Pavement

The Contractor shall furnish all materials, equipment and labour necessary for permanent roadwork. The design for the permanent roadwork will be provided by the Employer.

The Contractor shall design and furnish all materials, equipment and labour necessary for construction roads or tracks to other work sites, to spoil areas, to installation areas and to camps to the extent that he considers necessary for his activities. These roads shall be constructed at the minimum standard necessary for the Contractor to safely execute the Works. The layout and design for all temporary roadwork shall be provided by the Contractor and approved by the Employer before the work commences.

The Contractor shall place compacted and treated, if necessary, selected backfill, either from required excavations or approved borrow areas, to completed structures.

All permanent road work, materials, workmanship, quality, construction tolerances, testing and etc. shall be carried out in accordance with the “Specifications for Road and

Bridge Works” by Ministry of Road Transport and Highways (MoRT&H 2000), unless otherwise specified. This requirement applies to both the road outside the tunnel or portal buildings/structures as well as that inside these. The main Clauses of the “Specifications for Road and Bridge Works” (MoRT&H 2000) which shall be applied will be summarized in detail specification.

The concrete pavement work shall consist of construction of unreinforced, dowel jointed, plain cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the Work, as approved by the Employer’s Representative.

Concrete in rigid or rigid composite pavements shall be of the class C32/40 XF4.

Prior to commencement of any concrete works the base layer shall be checked of adequate bearing capacity. The check has to be in appropriate time prior to commencement hence measures shall be taken contemporary and no time delay may occur.

If the thickness of the base layer is not in the range of the tolerances the base layer shall be corrected. If this is not possible, the base layer shall be fully replaced.

The base layer shall be clean and free of deleterious material.

The concrete slab shall be laid in two layers. The surface layer shall be laid monolithically with the lower layer. The surface layer shall be not less than 50 mm thick.

Sampling and testing for and compliance with the specified characteristic core strength of designed concretes shall be undertaken by compressive strength testing in accordance with BS EN 13877-2 on cores cut from the full depth of the slab.

39. Water Proofing System

Sheet waterproofing membrane systems for the tunnel shall comprise of a geotextile fleece fixed to the primary lining substrate in combination with a sheet waterproofing membrane fastened to this.

Waterproofing shall be applied to crown and sidewalls above footing or invert arch level. The waterproofing membrane shall always be located between shotcrete support and final concrete lining. As the underground structures referred to be not immersed below a distinct groundwater table no membrane waterproofing will be provided for tunnel inverts.

The design life of the water proofing membrane shall be minimum 100 years.

Where the waterproofing system is to be divided into sectors, the water stops should be formed of material that can be welded to the sheet waterproofing membrane.

Additional drainage capacity shall be provided in case of water inflows in agreement with the Employer’s Representative by studded drainage membrane made from

thermoplastic material (dimpled sheet) attached prior to installation of the geotextile fleece or equivalent drainage layer approved by the Employer's Representative.

Waterproof membranes shall not be stored in direct sunlight prior to use. Waterproof membranes shall be protected from damage at all times especially during installation of reinforcement. The water proofing membrane shall have a signal layer to indicate damages due to handling and installation of reinforcement. The integrity of the signal layer shall be checked prior to concreting of final lining.

Fire protection measures during construction of water proofing system are required as but not limited to the following.

- The amount of membrane stored in the tunnel shall not exceed two working day's production to minimize the fire load stored underground.
- The installation length of the water proofing system in advance of the final lining shall not exceed 300 m, unless special measures are considered in agreement with the Employer's Representative.

The waterproof membrane shall consist of a continuous impermeable heat-welded sheet of one of the following materials:

- soft polyvinyl chloride (PVC) unreinforced
- flexible polyolefin (FPO/TPO) unreinforced

The membrane as supplied shall be of such dimensions and shape as will result in the minimum of on-site seam welds.

The installation of recycled membranes and/or membranes including DEHP (DOP) plasticizer is not permitted.

Schedule - E

(See Clauses 2.1 and 14.2)

Maintenance Requirements

1. Maintenance Requirements

- (i) The Contractor shall, at all times maintain the Project Highway in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.
- (ii) The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.
- (iii) All Materials, works and construction operations shall conform to the MORTH Specifications for Road and Bridge Works, and the relevant IRC publications. Where the specifications for a work are not given, Good Industry Practice shall be adopted.

2. Repair/rectification of Defects and deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Annex - I of this Schedule-E within the time limit set forth therein.

3. Other Defects and deficiencies

In respect of any Defect or deficiency not specified in Annex - I of this Schedule-E, the Authority's 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 Contractor within the time limit specified by the Authority's Engineer.

4. Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof.

5. Emergency repairs/restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project Highway poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

6. Daily inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project Highway and maintain a record thereof in a register to be kept in such form and manner as the Authority's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority and the Authority's Engineer at any time during office hours.

7. Pre-monsoon inspection / Post-monsoon inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and drainage system before [1st June] every year in accordance with the guidelines contained in IRC: SP35. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Authority's Engineer a compliance report. Post monsoon inspection shall be done by the [30th September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Authority's Engineer.

8. Repairs on account of natural calamities

All damages occurring to the Project Highway on account of a Force Majeure Event or wilful default or neglect of the Authority shall be undertaken by the Authority at its own cost. The Authority may instruct the Contractor to undertake the repairs at the rates agreed between the Parties.

Annex – I
(Schedule-E)

Repair/rectification of Defects and deficiencies

The Contractor shall repair and rectify the Defects and deficiencies specified in this Annex-I of Schedule-E within the time limit set forth in the table below.

Table -1: Maintenance Criteria for Pavements:

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specifications
		Desirable	Acceptable					
Flexible Pavement (Pavement of MCW, Service Road, Approaches of Grade structure, approaches of connecting roads, slip roads, lay byes etc. as applicable)	Potholes	Nil	< 0.1 % of area and subject to limit of 10 mm in depth	Daily	Length Measurement Unit like Scale, Tape, odometer etc.	IRC 82: 2015 and Distress Identification Manual for Long Term Pavement Performance Program, FHWA 2003 (http://www.tfhr.com/pavement/ltp/reports/03031/)	24-48 hours	MORT&H Specification 3004.2
	Cracking	Nil	< 5 % subject to limit of 0.5 sqm for any 50 m length	Daily			7-15 days	MORT&H Specification 3004.3
	Rutting	Nil	< 5 mm	Daily	Straight Edge		15 -30 days	MORT&H Specification 3004.2
	Corrugations and Shoving	Nil	< 0.1 % of area	Daily	Length Measurement Unit like		2-7 days	IRC:82- 2015
	Bleeding	Nil	< 1 % of area	Daily			3-7 days	MORT&H Specification 3004.4
	Raveling /Stripping	Nil	< 1 % of area	Daily	Scale, Tape, odometer etc.		7-15 days	IRC:82- 2015 read with IRC SP 81

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specifications
		Desirable	Acceptable					
	Edge Deformation/ Breaking	Nil	< 1 m for any 100 m section and width < 0.1 m at any location, restricted to 30 cm from the edge	Daily			7- 15 days	IRC:82- 2015
	Roughness BI	2000 mm/km	2400 mm/km	Bi- Annually	Class I Profilometer	Class I Profilometer : ASTM E950 (98)	180 days	IRC:82- 2015
	Skid Number	60SN	50SN	Bi- Annually	SCRIM (Sideway- force Coefficient Routine Investigation Machine or equivalent)	2004 –Standard Test Method for measuring Longitudinal Profile of Travelled Surfaces with Accelerometer Established Inertial Profiling Reference ASTM E1656 -94: 2000- Standard Guide for Classification of Automatic Pavement Condition Survey Equipment	180 days	BS: 7941-1: 2006
	Pavement Condition Index	3	2.1	Bi- Annually			180 days	IRC:82- 2015
	Other Pavement Distresses			Bi- Annually			2-7 days	IRC:82- 2015
	Deflection/ Remaining Life			Annual ly	Falling Weight Deflectometer	IRC 115: 2014	180 days	IRC:115- 2014
Rigid Pavement (Pavement of MCW, Service Road, Grade structure, approaches of connecting road, slip roads, lay byes etc. as applicable)	Roughness BI	2200m m/km	2400mm /km	Bi- Annually	Class I Profilometer	ASTM E950 (98) :2004 and ASTM E1656 -94: 2000	180 days	IRC:SP:83- 2008
	Skid	Skid Resistance no. at different speed of vehicles		Bi- Annual ly	SCRIM (Sideway- force	IRC:SP:83-2008	180 days	IRC:SP:83- 2008
		Minimum SN 36 33		traffic Speed (Km/h) 50 65	Coefficient Routine Investigation Machine or equivalent)			

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Inspection	Tools/Equipment	Standards and References for Inspection and Data Analysis	Time limit for Rectification/Repair	Maintenance Specifications
		Desirable	Acceptable					
		32		80				
		31		95				
		31		110				
Embankment/ Slope	Edge drop at shoulders	Nil	40m m	Daily	Length Measurement Unit like Scale, Tape, odometer etc.	IRC	7-15 days	MORT&H Specification 408.4
	Slope of camber/cross fall	Nil	<2% variation in prescribed slope of camber/cross fall	Daily			7-15 days	MORT&H Specification 408.4
	Embankment Slopes	Nil	<15 % variation in prescribe side slope	Daily			7-15 days	MORT&H Specification 408.4
	Embankment Protection	Nil	Nil	Daily	NA		7-15 days	MORT&H Specification
	Rain Cuts/Gullies in slope	Nil	Nil	Daily Specially During Rainy Season	NA		7-15 days	MORT&H Specification

In addition to the above performance criterion, the contractor shall strictly maintain the rigid pavements as per requirements in the following table

Table -2: Maintenance Criteria for Rigid Pavements:

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
CRACKING						

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
1	Single Discrete Cracks Not intersecting with any joint	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	Not applicable
			1	w < 0.2 mm. hair cracks		
			2	w = 0.2 - 0.5 mm, discernible from slow-moving car	Seal without delay	Seal, and stitch if L > 1m. Within 7days
			3	w = 0.5 - 1.5 mm, discernible from fast-moving car		
			4	w = 1.5 - 3.0 mm	Seal, and stitch if L > 1m. Within 7 days	Staple or Dowel Bar Retrofit, FDR for affected portion. Within 15days
			5	w > 3 mm.		
2	Single Transverse (or Diagonal) Cracks intersecting with one or more joints	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks	Route and seal with epoxy. Within 7 days	Staple or Dowel Bar Retrofit. Within 15days
			2	w = 0.2 - 0.5 mm, discernible from slow vehicle		
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle	Route, seal and stitch, if L > 1 m. Within 7 days	
			4	w = 3.0 - 6.0 mm	Dowel Bar Retrofit. Within 15 days	Full Depth Repair Dismantle and reconstruct affected. Portion with norms and specifications - See Para 5.5 & 9.2 Within 15days
			5	w > 6 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, as it may be full depth	
3	Single Longitudinal Cracks intersecting with one or more joints	w = width of crack L = length of crack d = depth of crack D = depth of slab	0	Nil, not discernible	No Action	
			1	w < 0.5 mm, discernible from slow moving vehicle	Seal with epoxy, if L > 1m. Within 7 days	Staple or dowel bar retrofit. Within 15days

			2	w = 0.5 - 3.0 mm, discernible	Route seal and stitch, if	
S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case d < D/2	For the case d > D/2
				from fast vehicle	L > 1 m. Within 15 days	-
			3	w = 3.0 - 6.0 mm	Staple, if L > 1 m. Within 15 days	Partial Depth Repair with stapling.
			4	w = 6.0 - 12.0 mm, usually associated with spalling		Within 15 days
			5	w > 12 mm, usually associated with spalling, and/or slab rocking under traffic	Not Applicable, as it may be full depth	Full Depth Repair Dismantle and reconstruct affected portion as per norms And specifications - See Para 5.6.4 Within 15 days
4	Multiple Cracks intersecting with one or more joints	w = width of crack	0	Nil, not discernible	No Action	
			1	w < 0.2 mm, hair cracks		
			2	w = 0.2 - 0.5 mm. discernible from slow vehicle	Seal, and stitch if L > 1 m. Within 15 days	
			3	w = 0.5 - 3.0 mm, discernible from fast vehicle		
			4	w = 3.0 - 6.0 mm panel broken into 2 or 3 pieces	Full depth repair within 15 days	Dismantle, Reinstall subbase, Reconstruct whole slab as per specifications within 30 days
			5	w > 6 mm and/or panel broken into more than 4 pieces		
5	Corner Break	w = width of crack L = length of crack	0	Nil, not discernible	No Action	-
			1	w < 0.5 mm; only 1 corner broken	Seal with low viscosity epoxy to	Seal with epoxy seal with epoxy
			2	w < 1.5 mm; L < 0.6 m, only one	secure broken parts	Within 7 days

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action		
					For the case $d < D/2$	For the case $d > D/2$	
				corner broken	Within 7 days		
			3	$w < 1.5$ mm; $L < 0.6$ m, two corners broken	Partial Depth (Refer Figure 8.3 of IRC:SP: 83-2008)	Full depth repair Reinstate sub-base, and reconstruct the slab as per norms and specifications within 30days	
			4	$w > 1.5$ mm; $L > 0.6$ m or three corners broken	Within 15 days		
			5	three or four corners broken			
6	Punch out (Applicable to Continuous Reinforced Concrete Pavement (CRCP) only)	w = width of crack L = length (m/m ²)	0	Nil, not discernible		No Action	
			1	$w < 0.5$ mm; $L < 3$ m/m ²	Applicable, as it may be full depth	Seal with low viscosity epoxy to secure broken parts. Within 15days	
			2	either $w > 0.5$ mm or $L < 3$ m/m ²			
			3	$w > 1.5$ mm and $L < 3$ m/m ²			
			4	$w > 3$ mm, $L < 3$ m/m ² and deformation			Full depth repair - Cut out and replace damaged area taking care not to damage reinforcement. Within 30days
			5	$w > 3$ mm, $L > 3$ m/m ² and deformation			
7	Raveling or Honeycomb type surface	r = area damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term	Long Term	
					No action.	Not Applicable	
			1	$r < 2$ %	Local repair of areas damaged and liable to be damaged. Within 15 days		
			2	$r = 2 - 10$ %			
			3	$r = 10-25\%$	Bonded Inlay, 2 or 3 slabs if affecting.		
			4	$r = 25 - 50$ %			

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
					Within 30 days	
			5	$r > 50\%$ and $h > 25$ mm	Reconstruct slabs, 4 or more slabs if affecting.	
					Within 30 days	
8	Scaling	r = damaged surface/total surface of slab (%) h = maximum depth of damage	0	Nil, not discernible	Short Term No action.	Long Term
			1	$r < 2\%$	Local repair of areas damaged and liable to be damaged.	
			2	$r = 2 - 10\%$		
					Within 7 days	Not Applicable
			3	$r = 10 - 20\%$	Bonded Inlay within 15 days	
			4	$r = 20 - 30\%$		
			5	$r > 30\%$ and $h > 25$ mm	Reconstruct slab within 30 days	
9	Polished Surface/Glazing	t = texture depth, sand patch test	0		No action.	Not Applicable
			1	$t > 1$ mm	Monitor rate of deterioration	
			2	$t = 1 - 0.6$ mm		
			3	$t = 0.6 - 0.3$ mm		
			4	$t = 0.3 - 0.1$ mm		
			5	$t < 0.1$ mm	Diamond Grinding 50% or more slabs in a continuous stretch of minimum 5 km.	
					Within 30 days	
10	Popout (Small Hole), Pothole Refer Para 8.4	n = number/m ²	0	$d < 50$ mm; $h < 25$ mm; $n < 1$ per 5 m ²	No action.	

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
		$= \frac{\text{diameter}}{\text{maximum depth}}$	1	$d = 50 - 100 \text{ mm}; h < 50 \text{ mm}; n < 1$ per 5 m^2	Partial depth repair 65 mm deep. Within 15 days	Not Applicable
			2	$d = 50 - 100 \text{ mm}; h > 50 \text{ mm}; n < 1$ per 5 m^2		
			3	$d = 100 - 300 \text{ mm}; h < 100 \text{ mm}; n < 1$ per 5 m^2		
			4	$d = 100 - 300 \text{ mm}; h > 100 \text{ mm}; n < 1$ per 5 m^2		
			5	$d > 300 \text{ mm}; h > 100 \text{ mm}; n > 1$ per 5 m^2		
Joint Defects						
11	Joint Seal Defects	loss or damage L = Length as % total joint length	0	Difficult to discern.	Short Term No action.	Long Term Not Applicable
			1	Discernible, $L < 25\%$ but of little immediate consequence with regard to ingress of water or trapping incompressible material.	Clean joint, inspect later.	
			3	Notable. $L > 25\%$ insufficient protection against ingress of water and trapping incompressible material.	Clean and reapply sealant in selected locations. Within 7 days	
			5	Severe; $w > 3 \text{ mm}$ negligible protection against ingress of water and trapping incompressible material.	Clean, widen and reseal the joint. Within 7 days	
			0	Nil. not discernible	No action.	

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
12	Spalling of Joints	w = width on either side of the joint L = length of spalled portion (as % joint length)	1	w < 10 mm	Apply low viscosity epoxy resin/ mortar in cracked portion.	Not Applicable
			2	w = 10 - 20 mm, L < 25%	Within 7 days	
			3	w = 20 - 40 mm, L > 25%	Partial Depth Repair. Within 15 days	
			4	w = 40 - 80 mm, L > 25%	30 - 50 mm deep, h = w + 20% of w, within 30 days	
			5	w > 80 mm, and L > 25%	50 - 100 mm deep repair. H = w + 20% of w. Within 30 days	
13	Faulting (or Stepping) in Cracks or Joints	f = difference of level	0	not discernible, < 1 mm	No action.	No action.
			1	f < 3 mm		
			2	f = 3 - 6 mm	Determine cause and observe, take action for diamond grinding	Replace the slab as appropriate.
			3	f = 6 - 12 mm	Diamond Grinding	Within 30days
			4	f = 12 - 18 mm	Raise sunken slab.	Replace the slab as appropriate.
			5	f > 18 mm	Strengthen subgrade and sub-base by grouting and raising sunken slab	Within 30days
14	Blowup or Buckling	h = vertical displacement from normal profile	0	Nil, not discernible	Short Term No Action	Long Term
			1	h < 6 mm		
			2	h = 6 - 12 mm	Install Signs to Warn Traffic	

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			3	$h = 12 - 25 \text{ mm}$	within 7 days	
			4	$h > 25 \text{ mm}$	Full Depth Repair. Within 30 days	
			5	shattered slabs, ie 4 or more pieces	Replace broken slabs. Within 30 days	
15	Depression	$h =$ negative vertical displacement from normal profile $L =$ length	0	Not discernible, $h < 5 \text{ mm}$	No action.	Not Applicable
			1	$h = 5 - 15 \text{ mm}$		
			2	$h = 15 - 30 \text{ mm}$, Nos $< 20\%$ joints	Install Signs to Warn Traffic within 7 days	
			3	$h = 30 - 50 \text{ mm}$		
			4	$h > 50 \text{ mm}$ or $> 20\%$ joints	Strengthen subgrade. Reinstate pavement at normal level	
			5	$h > 100 \text{ mm}$	if $L < 20 \text{ m}$. Within 30 days	
16	Heave	$h =$ positive vertical displacement from normal profile. $L =$ length	0	Not discernible. $h < 5 \text{ mm}$	Short Term No action.	Long Term
			1	$h = 5 - 15 \text{ mm}$	Follow up.	scrabble
			2	$h = 15 - 30 \text{ mm}$, Nos $< 20\%$ joints	Install Signs to Warn Traffic within 7 days	
			3	$h = 30 - 50 \text{ mm}$		
			4	$h > 50 \text{ mm}$ or $> 20\%$ joints	Stabilise subgrade.	
			5	$h > 100 \text{ mm}$	Reinstate pavement at normal level if length $< 20 \text{ m}$. Within 30 days	
17	Bump	$h =$ vertical displacement from normal profile	0	$h < 4 \text{ mm}$	No action	
			1	$h = 4 - 7 \text{ mm}$	Grind, in case of new construction within 7 days	Construction Limit for New Construction.

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
			3	$h = 7 - 15 \text{ mm}$	Grind, in case of ongoing Maintenance within 15 days	Replace in case of new construction. Within 30days
			5	$h > 15 \text{ mm}$	Full Depth Repair. Within 30 days	Full Depth Repair. Within 30days
18	Lane to Shoulder Dropoff	$f = \text{difference of level}$	0	Nil, not discernible $< 3\text{mm}$	Short Term No action.	Long Term
			1	$f = 3 - 10 \text{ mm}$	Spot repair of shoulder	
			2	$f = 10 - 25 \text{ mm}$	within 7 days	
			3	$f = 25 - 50 \text{ mm}$	Fill up shoulder	For any 100 m stretch Reconstruct shoulder, if affecting 25% or more of stretch.
			4	$f = 50 - 75 \text{ mm}$	within 7 days	
			5	$f > 75 \text{ mm}$		
						Within 30days
Drainage						
19	Pumping	quantity of fines and water expelled through open joints and cracks Nos Nos/100 m stretch	0	not discernible	No Action	
			1 to 2	slight/ occasional Nos $< 10\%$	Repair cracks and joints Without delay.	Inspect and repair sub-drainage at distressed sections and upstream.
			3 to 4	appreciable/ Frequent 10 - 25%	Lift or jack slab within 30 days.	
			5	abundant, crack development $> 25\%$	Repair distressed pavement sections. Strengthen subgrade and subbase. Replace slab.	

S.No.	Type of Distress	Measured Parameter	Degree of Severity	Assessment Rating	Repair Action	
					For the case $d < D/2$	For the case $d > D/2$
					Within 30 days	
20	Ponding	Ponding on slabs due to blockage of drains	0-2	No discernible problem	No action.	
			3 to 4	Blockages observed in drains, but water flowing	Clean drains etc within 7 days, Follow up	Action required to stop water damaging
			5	Ponding, accumulation of water observed	-do-	foundation within 30 days.

Table -3: Maintenance Criteria for Safety Related Items and Other Furniture Items:

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
Highway	Availability of Safe Stopping Sight Distance	As per IRC SP :84-2014, a minimum of safe stopping sight distance shall be available throughout.	Monthly	Manual Measurement with Odometer along with video/ image backup	Removal of obstruction within 24 hours, in case of sight line affected by temporary objects such as trees, temporary encroachments. In case of permanent structure or design deficiency: Removal of obstruction/improvement of deficiency at the earliest Speed Restriction boards and suitable traffic calming measures such as transverse bar marking, blinkers, etc. shall be applied during the period of rectification.	IRC:SP 84-2014	
		Design Speed, kmph					
		Desirable Minimum Sight Distance (m)					
		Safe Stopping Sight Distance (m)					
		100					
		80					
		260					
		180					
Pavement Marking	Wear	<70% of marking remaining	Bi- Annually	Visual Assessment as per Annexure-F of IRC:35-2015	Re - painting	Cat-1 Defect within 24 hours Cat-2 Defect within 2 months-	IRC:35-2015
	Day time Visibility	During expected life Service Time Cement Road - 130mcd/m ² /lux Bituminous Road - 100mcd/m ² /lux	Monthly	As per Annexure-D of IRC:35-2015	Re - painting	Cat-1 Defect within 24 hours Cat-2 Defect within 2 months	IRC:35- 2015
	Night Time Visibility	Initial and Minimum Performance for Dry Retro reflectivity during night time:	Bi-Annually	As per Annexure-E of IRC:35-2015	Re - painting	Cat-1 Defect within 24 hours Cat-2 Defect within 2 months	IRC:35-2015
		Design Speed (RL) Retro Reflectivity (mcd/m ² /lux)					

Asset Type	Performance Parameter	Level of Service (LOS)		Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
			Initial (7 days)					
			Minimum Threshold level (TL) & warranty period required up to 2 years					
		Up to 65	200					
		65 to 100	250					
		Above 100	350					
		Initial and Minimum Performance for Night Visibility under wet condition (Retro reflectivity):						
		Initial 7 days Retro reflectivity: 100 mcd/m ² /lux Minimum Threshold Level: 50 mcd/m ² /lux						

	Skid Resistance	Initial and Minimum performance for Skid Resistance: Initial (7days): 55BPN Min. Threshold: 44BPN *Note: shall be considered under urban/city traffic condition encompassing the	Bi-Annually	As per Annexure-G of IRC:35-2015		Within 24 hours	IRC:35-2015

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
		locations like pedestrian crossings, bus bay, bus stop, cycle track intersection delineation, transverse bar markings etc					
Road Signs	Shape Position and	Shape and Position as per IRC:67- 2012. Signboard should be clearly visible for the design speed of the section.	Daily	Visual with video/image backup	Improvement of shape, in case if shape is Damaged.	48 hours in case of Mandatory Signs, Cautionary and Informatory Signs	IRC:67-2012

	Retro reflectivity	As per specifications in IRC:67-2012	Bi-Annually	Testing of each Signboard using Retro Reflectivity Measuring Device. In accordance with ASTM D 4956-09.	Relocation as per requirement of signboard	(Single and Dual post signs) 15 Days in case of Gantry/Cantilever Sign boards 48 hours in case of Mandatory Signs, Cautionary and Informatory Signs (Single and Dual post signs) 1 Month in case of Gantry/Cantilever	IRC:67-2012
Kerb	Kerb Height	As per IRC 86:1983 depending upon type of Kerb	Bi-Annually	Use of distance measuring tape	Raising Kerb Height	Within 1 Month	RC 86:1983
	Kerb Painting	Functionality: Functioning of Kerb painting as intended	Daily	Visual with video/image backup	Kerb Repainting	Within 7-days	RC 35:2015
Other Road	Reflective	Numbers and Functionality as				Within 2 months	IRC:SP:84-

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
Furniture	Pavement Markers (Road Studs)	per specifications in IRC:SP:84-2014 and IRC: 35-2015, unless specified in Schedule-B.	Daily	Counting	New Installation		2014, IRC:35-2015
	Pedestrian Guardrail	Functionality: Functioning of guardrail as intended	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:SP:84-2014
	Traffic Safety Barriers	Functionality: Functioning of Safety Barriers as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014, IRC:119-2015
	End Treatment of	Functionality: Functioning of	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014,
	Traffic Safety Barriers						IRC:119-2015
	Attenuators	Functionality: Functioning of	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:2014, IRC:119-2015
	Guard Posts and Delineators	Functionality: Functioning of Guard Posts and Delineators as intended	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC: 79 - 1981
	Overhead Sign Structure	Overhead sign structure shall be structurally adequate	Daily	Visual with video/image backup	Rectification	Within 15 days	IRC:67-2012
	Traffic Blinkers	Functionality: Functioning of Traffic Blinkers as intended	Daily	Visual with video/image backup	Rectification	Within 7 days	IRC:SP:84-2014
Highway Lighting System	Highway Lights	Illumination: Minimum 40 Lux illumination on the road surface	Daily	The illumination level shall be measured with	Improvement in Lighting System	24 hours	IRC:SP:84-2014

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
		No major failure in the lighting system	Daily	-	Rectification of failure	24 hours	IRC:SP:84-2014
		No minor failure in the lighting system	Monthly	-	Rectification of failure	8 hours	IRC:SP:84-2014
	Toll Plaza Canopy Lights	Minimum 40 Lux illumination on the road surface	Daily	The illumination level shall be measured with luxmeter	Improvement in Lighting System	24 hours	IRC:SP:84-2014
		No major/minor failure in the lighting system	Daily	-	Rectification of failure	8 hours	IRC:SP:84-2014
Trees Plantation including median plantation	Obstruction in a minimum head-room of 5.5 m above carriageway or obstruction in visibility of road signs	No obstruction due to trees	Monthly	Visual with video/image backup	Removal of trees	Immediate	IRC:SP:84-2014
	Deterioration in health of trees and bushes	Health of plantation shall be as per requirement of specifications & instructions issued by Authority from time to time	Daily	Visual with video/image backup	Timely watering and treatment. Or Replacement of Trees and Bushes.	Within 90 days	IRC:SP:84-2014
	Vegetation affecting sight line and road structures	Sight line shall be free	Daily	Visual with video/image backup	Removal of Trees	Immediate	IRC:SP:84-2014
Rest Areas	Cleaning of toilets		Daily	-	-	Every 4 hours	
	Defects in			-	Rectification	24 hours	

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	electrical, water and sanitary installations	-	Daily				
Other Project Facilities and Approach roads	Damage or deterioration in Approach Roads, pedestrian facilities, truck lay-bys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts and other works		Daily	-	Rectification	15 days	IRC:SP 84-2014
Pipe/box/slab culverts	Free waterway/unobstructed flow section	85% of culvert normal flow area to available.	2 times in a year (before and after rainy season)	Inspection by Bridge Engineer as per IRC SP:35-1990 and recording of depth of silting and area of vegetation.	Cleaning silt up soils and debris in culvert barrel after rainy season, removal of bushes and vegetation, U/s of barrel, under barrel and D/s of barrel before rainy season.	15 days before onset of monsoon and within 30 days after end of rainy season.	IRC 5-2015, IRC SP:40-1993 and IRC SP:13-2004
	Leak-proof expansion joints if any	No leakage through expansion joints	Bi-Annually	Physical inspection of expansion joints as per IRC SP:35-1990 if any, for leakage strains on walls at joints.	Fixing with sealant suitably	30 days or before onset of rains whichever comes earlier	IRC SP:40-1993 and IRC SP:69-2011
		Spalling of					

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Structurally sound	concrete not more than 0.25 sqm	Bi-Annually	Detailed inspection of all components of culvert as per IRC SP:35-1990 and recording	Repairs to spalling, cracking, delamination, rusting shall be followed as per IRC:SP:40-1993.	15 days	IRC SP 40-1993 and MORTH Specification s clause 2800
		Delamination of concrete not more than 0.25 sq.m.					
		Cracks wider than 0.3 mm not more than 1m aggregate length					
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3 sqm, damage to solid apron (concrete apron) not more than 1 sqm	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35-1990	Repairs to damaged aprons and pitching	30 days after defect observation or 2 weeks before onset of rainy season whichever is earlier.	IRC: SP 40-1993 and IRC:SP:13-2004.
Bridges including ROBs Flyover etc. as applicable	Riding quality or user comfort	No pothole in wearing coat on bridge deck	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC or wearing coat	15 days	MORT&H Specification 2811
Bridge - Super Structure	Bumps	No bump at expansion joint	Daily	Visual inspection as per IRC SP:35-1990	Repairs to BC on either side of expansion joints, profile correction course on approach slab in case of settlement to approach embankment	15 days	MORT&H Specification 3004.2 & 2811.
	User safety						

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	(condition of crash barrier and guard rail)	No damaged or missing stretch of crash barrier or pedestrian hand railing	Daily	Visual inspection and detailed condition survey as per IRC SP: 35-1990.	Repairs and replacement of safety barriers as the case may be	3days	IRC: 5-1998, IRC SP: 84-2014 and IRC SP: 40-1993.
	Rusted reinforcement Spalling of concrete Delamination	Not more than 0.25 sq.m Not more than 0.50 sq.m Not more than 0.50 sq.m	Bi- Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with anti-corrosive coating before carrying out the repairs to affected concrete portion with epoxy mortar / concrete.	15 days	IRC SP: 40-1993 and MORTH Specification n 1600.
	Cracks wider than 0.30 mm	Not more than 1m total length	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Grouting with epoxy mortar, investigating causes for cracks development and carry out necessary rehabilitation.	48 Hours	IRC SP: 40-1993 and MORTH Specification 2800.
				Detailed			

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Rainwater seepage through deck slab	Leakage - nil	Quarterly	condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Grouting of deck slab at leakage areas, waterproofing, repairs to drainage spouts	1 months	MORTH specifications 2600 & 2700.
	Deflection due to permanent loads and live loads	Within design limits.	Once in every 10 years for spans more than 40 m	Load test method	Carry out major rehabilitation works on bridge to retain original design loads capacity	6 months	IRC SP: 51-1999.
	Vibrations in bridge deck due to moving trucks	Frequency of vibrations shall not be more than 5 Hz	Once in every 5 years for spans more than 30m and every 10 years for spans between 15 to 30 m	Laser displacement sensors or laser vibro-meters	Strengthening structure of super	4 months	AASHTO LRFD specifications
	Leakage in Expansion joints	No damage to elastomeric sealant compound in strip seal expansion joint, no leakage of rain water through expansion joint in case of buried and asphalt plug and copper strip joint.	Bi-Annually	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Replace of expansion joint seal in	15 days	MORTH specifications 2600 and IRC SP: 40-1993.

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Debris and dust in strip seal expansion joint	No dust debris expansion or in joint gap.	Monthly	Detailed condition survey as per IRC SP:35-1990 using Mobile Bridge Inspection Unit	Cleaning of expansion joint gaps thoroughly	3 days	MORTH specification s 2600 and IRC SP: 40-1993.
	Drainage spouts	No down take pipe missing/broken below soffit of the deck slab. No silt, debris, clogging of drainage spout collection chamber.	Monthly	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	Cleaning of drainage spouts thoroughly. Replacement of missing/broken down take pipes with a minimum pipe extension of 500mm below soffit of slab. Providing sealant around the drainage spout if any leakages observed.	3 days	MORTH specification 2700.
Bridge-substructure	Cracks/spalling of concrete/rusted steel	No cracks, spalling of concrete and rusted steel	Bi-Annually	Detailed condition survey as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	All the corroded reinforcement shall need to be thoroughly cleaned from rusting and applied with defect noticed	30 days	IRC SP: 40-1993 and MORTH specification 2800.

		Delamination of bearing reinforcement not more	Bi-Annually	Detailed condition survey	In case of failure of even one bearing on	3 months	MORTH specification

Asset Type	Performance Parameter	Level of Service (LOS)	Frequency of Measurement	Testing Method	Recommended Remedial measures	Time limit for Rectification	Specification and Standards
	Bearings	than 5%, cracking or tearing of rubber not more than 2 locations per side, no rupture of reinforcement or rubber		as per IRC SP: 35-1990 using Mobile Bridge Inspection Unit	any pier/abutment, all the bearings on that pier/abutment shall be replaced, in order to get uniform load transfer on to bearings.		2810 and IRC SP: 40-199.
Bridge Foundations	Scouring around foundations	Scouring shall not be lower than maximum scour level for the bridge	Bi-Annually	Condition survey and visual inspection as per IRC SP:35-1990 Using Mobile Bridge Inspection Unit. In case of doubt, use Underwater camera Rivers.	Suitable protection works around pier/abutment	1 month	IRC SP: 40-1993, IRC 83-2014, MORTH specification 2500
	Protection works in good condition	Damaged of rough stone apron or bank revetment not more than 3	2 times in a year (before and after rainy season)	Condition survey as per IRC SP:35- 1990	Repairs to damaged aprons and pitching.	30 days after defect observation or 2	IRC: SP 40-1993 and IRC:SP:13-2004.

		sq.m, damage to solid apron (concrete apron) not more than 1 sq.m				weeks before onset of rainy season whichever is earlier.	

Note: Any Structure during the entire contract period which is found that does not complies with all requirements of this Table will be prepared, rehabilitated or even reconstructed under the scope of the contractor.

Table 4: Maintenance Criteria for Hill Roads

In addition to above, for hill roads the following provisions for maintenance is also to done.

Hill Roads		
(i)	Damage to Retaining wall/ Breast wall	7 (Seven) days
(ii)	Landslides requiring clearance	12 (Twelve) hours
(iii)	Snow requiring clearance	24 (Twenty-Four) hours

Note: For all tables 1 to 5 above, latest BIS & IRC standards (even those not indicated herewith) along with MoRT&H specifications shall be binding for all maintenance activities.

A. Flexible Pavement

Nature of Defect or deficiency		Time limit for repair/ rectification
(b) Granular earth shoulders, side slopes, drains and culverts		
(i)	Variation by more than 1 % in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days
(ii)	Edge drop at shoulders exceeding 40 mm	7 (seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (seven) days
(v)	Damage to or silting of culverts and side drains	7 (seven) days
(vi)	Desilting of drains in urban/semi- urban areas	24 (twenty-four) hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
(c) Road side furniture including road sign and pavement marking		
(i)	Damage to shape or position, poor visibility or loss of retro-reflectivity	48 (forty-eight) hours
(ii)	Painting of km stone, railing, parapets, crash barriers	As and when required/ Once every year
(iii)	Damaged/missing signs road requiring replacement	7 (seven) days
(iv)	Damage to road mark ups	7 (seven) days
(d) Road lighting		
(i)	Any major failure of the system	24 (twenty-four) hours
(ii)	Faults and minor failures	8 (eight) hours
(e) Trees and plantation		
(i)	Obstruction in a minimum head- room of 5 m above carriageway or obstruction in visibility of road signs	24 (twenty-four) hours
(ii)	Removal of fallen trees from carriageway	4 (four) hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (thirty) days

(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(f) Rest area		
(i)	Cleaning of toilets	Every 4 (four) hours
(ii)	Defects in electrical, water and sanitary installations	24 (twenty-four) hours
(g) [Toll Plaza]		
(h) Other Project Facilities and Approach roads		
(i)	Damage in approach roads, pedestrian facilities, truck lay- byes, bus-bays, bus-shelters, cattle crossings, [Traffic Aid Posts, Medical Aid Posts] and service roads	15 (fifteen) days
(ii)	Damaged vehicles or debris on the road	4 (four) hours
(iii)	Malfunctioning of the mobile crane	4 (four) hours
Bridges		
(a) Superstructure		
(i)	Any damage, cracks, spalling/ scaling Temporary measures Permanent measures	within 48 (forty-eight) hours within 15 (fifteen) days or as specified by the Authority's Engineer
(b) Foundations		
(i)	Scouring and/or cavitation	15 (fifteen) days
(c) Piers, abutments, return walls and wing walls		
(i)	Cracks and damages including settlement and tilting, spalling, scaling	30 (thirty) days
(d) Bearings (metallic) of bridges		
(i)	Deformation, damages, tilting or shifting of bearings	15 (fifteen) days Greasing of metallic bearings once in a year
(e) Joints		
(i)	Malfunctioning of joints	15 (fifteen) days
(f) Other items		
(i)	Deforming of pads in elastomeric bearings	7 (seven) days
(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	3 (three) days
(iii)	Damage or deterioration in kerbs, parapets, handrails and crash barriers	3 (three) days (immediately within 24 hours if posing danger to safety)
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	7 (seven) days
(v)	Damage to wearing coat	15 (fifteen) days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	30 (thirty) days
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	15 (fifteen) days
(g) Hill Roads		

(i)	Damage to retaining wall/breast wall	7 (seven) days
(ii)	Landslides requiring clearance	12 (twelve) hours
(iii)	Snow requiring clearance	24 (twenty-four) hours

[Note: Where necessary, the Authority may modify the time limit for repair/rectification, or add to the nature of Defect or deficiency before issuing the bidding document, with the approval of the competent authority.]

Table 5: Repair/Rectification of Defects and deficiencies in the Tunnel

The Contractor shall repair and rectify the Defects and deficiencies specified in this Annex-I of Schedule-E within the time limit set forth in the table below.

Nature of Defect or deficiency		Time Limit for repair/rectification
(a)	Tunnel lighting (Street lighting and Telecom ATMS)	
(i)	Any major failure of the system	24 hrs
	Faults and minor failures	8hrs
(b)	Tunnel Ventilation System	
(i)	Any major Failure of the system	No Major Failure
(ii)	Faults and minor failures	Immediate
(c)	Tunnel Traffic Control System	
(i)	Any major Failure of the system	No Major Failure
(ii)	Faults and minor failures	Immediately within 1 hour
(d)	Tunnel Power Supply System (Mains)	
(i)	Any major Failure of the system	No Major Failure
(ii)	Faults and minor failures	½ hour
(e)	Tunnel CCTV Monitoring System	
(i)	Any major Failure of the system	No Major Failure
(ii)	Faults and minor failures	1 hour
(f)	Tunnel Fire Safety System	Contingency plan involving routine checkup so as to ensure that there is no major failure
(i)	Any major Failure of the system	No Major Failure

Note: For all tables 1 to 5 above, latest BIS & IRC standards (even those not indicated herewith) along with MoRTH specifications shall be binding for all maintenance activities

Schedule - F

(See Clause 4.1 (vii)(a))

Applicable Permits

1. Applicable Permits

- (i) The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits:
 - (a) Permission of the State Government for extraction of boulders from quarry;
 - (b) Permission of Village Panchayats and Pollution Control Board for installation of crushers;
 - (c) Licence for use of explosives;
 - (d) Permission of the State Government for drawing water from river/reservoir;
 - (e) Licence from inspector of factories or other competent Authority for setting up batching plant;
 - (f) Clearance of Pollution Control Board for setting up batching plant;
 - (g) Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;
 - (h) Permission of Village Panchayats and State Government for borrow earth; and
 - (i) Any other permits or clearances required under Applicable Laws.
- (ii) Applicable Permits, as required, relating to environmental protection and conservation shall have been procured by the Authority in accordance with the provisions of this Agreement.

Schedule – G

(See Clauses 7.1 and 19.2)

Annex-I

(See Clause 7.1)

Form of Bank Guarantee

[Performance Security/Additional Performance Security]

The Managing Director,

NHIDCL,

3rd Floor, PTI Building, 4, Parliament Street,

New Delhi-110001

WHEREAS:

- (A) _____ [name and address of contractor] (hereinafter called the “**Contractor**”) and [name and address of the authority], (hereinafter called the “**Authority**”) have entered into an agreement (hereinafter called the “**Agreement**”) for the construction of the ***** section of [National Highway No. **] on Engineering, Procurement and Construction (the “**EPC**”) basis, subject to and in accordance with the provisions of the Agreement
- (B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the {Construction Period/ Defects Liability Period and Maintenance Period} (as defined in the Agreement) in a sum of Rs cr. (Rupees _____ crore) (the “**Guarantee Amount**”).
- (C) We, ... through our branch at (the “**Bank**”) have agreed to furnish this bank guarantee (*hereinafter called the **Guarantee***) by way of Performance Security.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor’s obligations during the {Construction Period/ Defects Liability Period and Maintenance Period} under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of [General Manager in the National Highways & Infrastructure Development Corporation Ltd], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder

8. The Guarantee shall cease to be in force and effect on ****\$. Unless a demand or claim under this Guarantee is made in writing before expiry of the Guarantee, the Bank shall be discharged from its liabilities hereunder.
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.
11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.
12. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.
13. This guarantee shall also be operatable at our.....Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.
14. 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 [MoRT&H/NHAI/NHIDCL/State PWD/BRO], details of which is as under:

S.No.	Particulars	Details
1	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Syndicate Bank transport Bhawan, 1st Parliament Street, New Delhi-110001

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)

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.

Annex – II

(Schedule - G)

(See Clause 19.2)

Form for Guarantee for Advance Payment

The Managing Director,

NHIDCL,

3rd Floor, PTI Building, 4, Parliament Street,

New Delhi-110001

WHEREAS:

- (A) [name and address of contractor] (hereinafter called the “**Contractor**”) has executed an agreement (hereinafter called the “**Agreement**”) with the [name and address of the authority], (hereinafter called the “**Authority**”) for the construction of the ***** section of [National Highway No. **] on Engineering, Procurement and Construction (the “**EPC**”) basis, subject to and in accordance with the provisions of the Agreement
- (B) In accordance with Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing @Bank Rate + 3% advance payment (herein after called “**Advance Payment**”) equal to 10% (ten per cent) of the Contract Price; and that the Advance Payment shall be made in two installments subject to the Contractor 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 repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} installment of the Advance Payment is Rs.----- cr. (Rupees ----- crore) and the amount of this Guarantee is Rs. ----- cr. (Rupees ----- crore) (the “**Guarantee Amount**”).
- (C) We, ... through our branch at (the “**Bank**”) have agreed to furnish this bank guarantee (hereinafter called the “**Guarantee**”) 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 instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein

- 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 Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the installment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
2. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.
 3. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
 4. 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 Advance Payment 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 Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
 5. 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 Advance Payment.
 6. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

7. The Guarantee shall cease to be in force and effect on ****. 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.
8. 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.
9. 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 authorized 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.
10. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.
11. 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.
12. 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 [MoRT&H/NHAI/NHIDCL/State PWD/BRO], details of which is as under:

S.No.	Particulars	Details
1	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Syndicate Bank transport Bhawan, 1st Parliament Street, New Delhi-110001

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.

Schedule - H

See Clauses 10.1 (iv) and 19.3

Contract Price Weightages

- 1.1 The Contract Price for this Agreement is **Rs..... Crores**
- 1.2 Proportions of the Contract Price for different stages of Construction of the Project Highway shall be as specified below:

Item	Weightage in percentage to the Contract Price	Stage of Payment	Percentage Weightage
1	2	3	4
Road works including culverts, widening and repair of culverts.	2.81%	B.1 - Reconstruction/New 2-lane realignment/bypass (Flexible pavement)	
		(1) Earthwork up to top of sub-grade	67.81%
		(2) Sub-Base Course	26.09%
		(3) Non-Bituminous Base Course	0.00%
		(4) Bituminous Base Course	0.00%
		(5) Wearing Coat	2.92%
		D - Re-Construction and New culverts on existing road, realignments, bypasses:	
		(1) Culverts (length < 6m)	3.18%
Major Bridge (Length > 60m) works and ROB/RUB/Elevated sections/Flyovers including Viaducts, if any	0.00%	A.1- Widening and repairs of Major Bridges	0.00%
		A.2- New Major Bridges	0.00%

Item	Weightage in percentage to the Contract Price	Stage of Payment	Percentage Weightage
1	2	3	4
Tunnel	1.45%	A. Investigation & Design	
		A1 Investigation	60%
		A2 Detailed Design	40%
	3.99%	B. Portals	
		B1- Temporary Dewatering Arrangement	42.10%
		B2- Open Excavation and Earthwork (Loose excavation, rock excavation, etc.)	25.20%
		B3- Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh)	7.63%
		B4- Permanent Dewatering	1.13%
		B5-Concrete Works at portal	0.00%
		B6- Pavement	2.75%
		B7-Construction of buildings	21.19%
	70.50%	C. Tunnel	
		C1- Temporary Dewatering Arrangement	0.00%
		C2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting	19.99%
		C3- Permanent Dewatering Arrangement,	12.52%
		C4- Primary Support Measures (Bolts & Anchors, Shotcrete & Wire Mesh)	17.85%
		C5-Concrete Works	39.77%
		C6-Instrumentation and Monitoring	0.53%
		C7-Pavement	9.34%

Item	Weightage in percentage to the Contract Price	Stage of Payment	Percentage Weightage
1	2	3	4
	15.23%	D. Electro and Mechanical Equipment	100%
	3.07%	E. Ventilation System	100%
	2.42%	F. Site Facility	100%
Other Works	0.53%	(i) Toll Plaza	0.00%
		(ii) Road side drains	15.38%
		(iii) Road signs, markings, km stone, safety Devices etc.	6.19%
		(iv) Utility Duct	6.05%
		(v) Metal Beam & Parapet Along Valley Side	11.60%
		(vi) Project facilities	0.00%
		a) Bus bay	0.00%
		b) Truck Lay byes	0.00%
		c) Rest areas & View Point	0.00%
		d) Junction	0.00%
		(e) Dumping Zone	0.00%
		(f) Road side plantation	0.00%
		(vii) Repair of protection works other than approaches to the bridges, elevated sections/ flyovers/grade separators and ROBs/RUBs.	0.00%
		(viii) Protection work	
		(a) (i) Retaining Wall in Masonry	19.71%
		(ii) Retaining Wall in RCC	0.00%
		(b) Breast wall	0.00%
		(c) Blast Wall	19.97%
		(d) Soil Nailing	0.00%
		(e) Gabion Wall	8.51%
		(ix) Snow Clearance	12.59%

1.3 Procedure of estimating the value of work done

1.3.1 Road works Procedure for estimating the value of road work done shall be as follows:

Table 1.3.1

Stage of Payment	Percent age - Weightage	Payment Procedure
B.1 - Reconstruction/New 2-lane realignment/bypass (Flexible pavement)	2.81%	
(1) Earthwork up to top of the sub-grade	67.81%	Unit of measurement is linear length. Payment of each stage shall be made on pro rata basis on completion of a stage in full length i.e. completion of each re-alignment section in full length or 10% (Ten percent) of length.
(2) Sub-base Course	26.09%	
(3) Non-Bituminous Course	0.00%	
(4) Bituminous Base Course	0.00%	
(5) Wearing Coat	2.92%	
D - Re-Construction and New culverts on existing road, realignments, bypasses:		
(1) Culverts (length < 6m)	3.18%	Cost of each culvert shall be determined on pro rata basis with respect to the total number of culverts. Payment shall be made on the completion of each culvert.

For example, if the total length of bituminous work to be done is 100 km, the cost per km of bituminous work shall be determined as follows:

$$\text{Cost per km} = P \times \text{weightage for road work} \times \text{weightage for bituminous work} \times (1/L)$$

Where P= Contract Price

L = Total length in km

Similarly, the rates per km for other stages shall be worked out accordingly.

Note: The length affected due to law and order problems or litigation during execution due to which the Contractor is unable to execute the work, may be deducted from the total project length for payment purposes. The total length calculated here is only for payment purposes and will not affect and referred in other clauses of the Contract Agreement.

1.3.2 Minor Bridges and Underpasses/Overpasses.

Procedure for estimating the value of Minor bridge and Underpasses/Overpasses shall be as stated in table 1.3.2:

Table 1.3.2

<u>Stage of Payment</u>	<u>Weightage</u>	<u>Payment Procedure</u>
1	2	3
A.1-Widening and repair of minor bridges	0.000%	Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length of the minor bridges. Payment shall be made on the completion of widening & repair works of a minor bridge.
(length > 6m and < 60m)		
A.2- New minor bridges		
(i) Foundation +Sub- Structure: On completion of the foundation work including foundations for wing and return walls, abutments, piers up to the abutment/pier cap.	0.000%	(i) Foundation +Sub- Structure: Cost of each minor bridge shall be determined on pro rata basis with respect to the total linear length (m) of the minor bridges. Payment against foundation + sub-structure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of foundation +substructure of each bridge subject to completion of at least two foundations along with sub-structure up to abutment/pier cap level of each bridge. In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(ii) Super-structure: On completion of the superstructure in all respects including wearing coat, bearings, expansion joints, handrails, crash barriers, road signs & markings, tests on completion etc. complete in all respect.	0.000%	(ii) Super-structure: Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super-structure of at least one span in all respects as specified in the column of "Stage of Payment" in this sub-clause.
(iii) Approaches: On completion of approaches including Retaining walls, stone pitching, protection works complete in all respect and fit for use.	0.000%	(iii) Approaches: Payment shall be made on pro-rata basis on completion of a stage i.e. completion of approaches in all respect as specified in the column of "Stage of Payment" in this sub-clause.

1.3.3 Major Bridge works, ROB/RUB and Structures.

Procedure for estimating the value of Major Bridge works, ROB/RUB and Structures shall be as stated in table 1.3.3:

Table 1.3.3

<u>Stage of Payment</u>	<u>Weightage</u>	<u>Payment Procedure</u>
1	2	3
A.2- New Major Bridges		
(i) Foundation	0.00%	(i) Foundation: Cost of each Major Bridge shall be determined on pro rata basis with respect to the total linear length (m) of the Major Bridge. Payment against foundation shall be made on prorata basis on completion of a stage i.e. not less than 25% of the scope of foundation of the major Bridge subject to completion of at least two foundations of the major Bridge.
(ii) Sub-structure	0.00%	(ii) Sub-Structure:
(a) On completion of Abutment /Pier Shaft (upto Abutment/Pier Cap bottom), wing walls , return walls, guide bunds, if any		Payment against Substructure shall be made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of substructure of the major bridge subject to completion of at least two sub-structures of abutments/piers up to abutment/pier cap level of the major bridge.
(b) on completion of Pier Cap segments		
(c) On completion of Abutment/Pier cap level		
(iii) Wing walls/return walls	0.000%	(iii) Wing walls/return walls: Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(iv) Super-structure: (including bearings)	0.000%	(iv) Super-structure:
(a) on pre -casting of girders (Subject to verification by A.E.)		Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super-structure including bearings of at least one span in all respects as specified.
(b) On erection of girders, casting of cross girders , end diaphragms, bearings and complete cast -in situ deck slab.		

<u>Stage of Payment</u>	<u>Weightage</u>	<u>Payment Procedure</u>
1	2	3
(v) Wearing Coat including expansion joints	0.00%	(v) Wearing Coat: Payment shall be made on completion of wearing coat including expansion joints complete in all respects as specified.
(vi) Miscellaneous Items like handrails, crash barriers, road markings etc.	0.00%	(vi) Miscellaneous: Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vii) Guide Bunds, River Training works etc.	0.000%	(vii) Guide Bunds, River Training works: Payments shall be made on completion of all guide bunds/river training works etc. complete in all respects as specified.
(viii) Approaches (including Retaining walls, stone pitching and protection works)	0.00%	(viii) Approaches: Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified.
C.2 -New Elevated Section/Flyovers/ Grade Separators/Rotary		
(i) Foundation	0.00%	(i) Foundation: Cost of each structure shall be determined on pro rata basis with respect to the total linear length (m) of the structure. Payment against foundation shall be made on prorata basis on completion of a stage i.e. not less than 25% of the scope of foundation of the Structure subject to completion of at least two foundations of the Structure. In case where load testing is required for foundation, the trigger of first payment shall include load testing also where specified.
(ii) Sub-structure	0.00%	(ii) Sub-Structure: Payment against Substructure shall be

<u>Stage of Payment</u>	<u>Weightage</u>	<u>Payment Procedure</u>
1	2	3
		made on pro-rata basis on completion of a stage i.e. not less than 25% of the scope of substructure of the Structure subject to completion of at least two sub-structures of abutments/piers up to abutment/pier cap level of the Structure.
(iii) Super-structure (including bearings)	0.00%	(iii) Super-structure: Payment shall be made on pro-rata basis on completion of a stage i.e. completion of super-structure including bearings of at least one span in all respects as specified.
(a) on pre -casting of girders (Subject to verification by A.E.)		
(b) On erection of girders, casting of cross girders , end diaphragms, bearings and complete cast -in situ deck slab.		
(iv) Wearing Coat including expansion joints.	0.00%	(iv) Wearing Coat: Payment shall be made on completion of wearing coat including expansion joints complete in all respects as specified.
(v) Miscellaneous Items like handrails, crash barriers, road markings etc.	0.00%	(v) Miscellaneous: Payments shall be made on completion of all miscellaneous works like hand rails, crash barriers, road markings etc. complete in all respects as specified.
(vi) Wing walls/return walls	0.000%	(vi) Wing walls/return walls: Payments shall be made on completion of all wing walls/return walls complete in all respects as specified.
(vii) Approaches (including Retaining walls, stone pitching and protection works)	0.000%	(vii) Approaches: Payments shall be made on completion of both approaches including stone pitching, protection works, etc. complete in all respects as specified.

1.3.4 Tunnel

Proportions of the Contract Price for different stages of Construction of the Project Tunnel shall be as specified below:

Table 1.3.4

Stage of Payment	Weightage	Payment Procedure
A-Investigation and Design	1.45%	
A1 Investigation	60.00%	Unit of measurement in submission of Detailed Design and Investigation report complete payment shall be made on the completion of a stage.
A2 Design	40.00%	
B-Portal	3.99%	
B1- Temporary Dewatering Arrangement	42.10%	Unit of measurement is completion of portal in all respect. The payment shall be made on the completion of a stage in portals area. Note- Payment against item B1 shall be made on completion of portal in all respect.
B2- Open Excavation and Earthwork (Loose excavation, rock excavation, etc.)	25.20%	
B3- Primary support measures (Bolts & Anchors, Shotcrete & Wire Mesh)	7.63%	
B4- Permanent Dewatering	1.13%	
B5-Concrete Works at portal	0.00%	
B6- Pavement	2.75%	
B7-Construction of buildings	21.19%	
C. Tunnel	70.50%	
C1- Temporary Dewatering Arrangement	0.00%	Unit of measurement is linear length-meter. Payment of each stage shall be made on pro rata basis of completion of a stage in a continuous length of 50 meter of individual tube.
C2- Underground Excavation for tunnel in Support Category dominating the Face Area including Drilling and Grouting	19.99%	
C3- Permanent Dewatering Arrangement,	12.52%	
C4- Primary Support Measures (Bolts & Anchors, Shotcrete & Wire Mesh)	17.85%	
C5-Concrete Works	39.77%	

Stage of Payment	Weightage	Payment Procedure
C6-Instrumentation and Monitoring	0.53%	
C7-Pavement	9.34%	
D- Electro and Mechanical Equipment	15.23%	
Electro and Mechanical Equipment	100%	On delivery, installation and commissioning of E&M equipment in the ratio of 20:40:40.
E-Ventilation System	3.07%	
Ventilation System	100%	On delivery, installation and commissioning of E&M equipment in the ratio of 20:40:40.
F- Site Facility Costs	2.42%	
Site Facility Costs	100%	30% of the cost shall be paid after completing the portals excavation and support installation work and on the commencement of mined tunnel excavation. The 50% of Balance amount shall be paid on the basis of tunnel progress with respect to the excavation and supports installation on quarterly basis and 50% of the balance amount in quarterly instalments in each year over the remaining construction period.

1.3.5 Other works.

Procedure for estimating the value of other works done shall be as stated in table 1.3.5.

Table 1.3.5

Stage of Payment	Weightage	Payment Procedure
(i) Toll plaza	0.00%	Unit of measurement is each completed toll plaza. Payment of each toll plaza shall be made on pro rata basis with respect to the total of all toll plazas.
(ii) Road side drains	15.38%	Unit of measurement is linear length in km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10 % (Ten Percent) of the total length.
(iii) Road signs, markings, km stones, safety devices etc.	6.19%	
(iv) Utility Duct	6.05%	
(v) Metal Beam & Parapet Along Valley Side	11.60%	
(vi) Project Facilities.		
a) Bus bay	0.00%	Payment shall be made on pro rata basis for completed facilities.
b) Truck Lay byes	0.00%	
c) Way side Amenities & View Point	0.00%	
d) Junction	0.00%	
(e) Dumping Zone	0.00%	
(f) Road side plantation	0.00%	
(vii) Repair of protection works other than approaches to the bridges, elevated sections/ flyovers/grade separators and ROB/RUBs.	0.000%	-
(viii) Protection work		
(a) (i) Retaining Wall in Masonry	19.71%	Unit of measurement is linear length in Km. Payment shall be made on pro rata basis on completion of a stage in a length of not less than 10% (ten percent) of the total length.
(ii) Retaining Wall in RCC	0.00%	
(b) Breast Wall	0.00%	
(c) Blast Wall	19.97%	
(d) Soil Nailing	0.00%	
(e) Gabion Wall	8.51%	
(ix) Snow Clearance	12.59%	Payment shall be made in the month of May after clearance of snow on proportionate to physical progress of civil work.

2. Procedure for payment for Maintenance

2.1 The cost for maintenance shall be as stated in Clause 14.1.1.

2.2 Payment for Maintenance shall be made in quarterly instalments in accordance with the provisions of Clause 19.7.

Schedule - I

(See Clause 10.2 (iv))

Drawings

1 . Drawings

In compliance of the obligations set forth in Clause 10.2 of this Agreement, the Contractor shall furnish to the Authority's Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-I.

2 . Additional Drawings

If the Authority's 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 Contractor to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Contractor shall promptly prepare and furnish such drawings to the Authority's Engineer, as if such drawings formed part of Annex-I of this Schedule-I.

Annex – I

(Schedule - I)

List of Drawings

[Note: The Authority shall describe in this Annex-I, all the Drawings that the Contractor is required to furnish under Clause 10.2.]

1. The Project drawings, as defined in Clause 1.1, Definitions, Article 1, Definitions and Interpretation, Part-I: Preliminary, of the Contract Agreement shall consist:
 - (a) Working Drawings of all the components/elements of the Project as determined by Authority Engineer/Authority, and
 - (b) As-built drawings for the Project components/elements as determined by AE/Authority. As-built drawings shall be duly certified by Authority Engineer.
2. A minimum list of the drawings of the various components/elements of the Project and project facilities required to be submitted by the Contractor is given below:

A. GENERAL LAYOUT PLAN

Plan & Profile Cross Sections

Drawings of horizontal alignment, vertical profile and cross sections Drawings of cross drainage works

Drawings of traffic diversion plans and traffic control measures Drawings of road drainage measures

Drawings of typical details slope protection measures Drawings of landscaping and horticulture

Drawings of street lighting

B. BRIDGE

General Arrangement Drawing

Detailed Drawings of Structures/Bridges

C. STANDARD DRAWINGS

Detail of Mandatory Regulatory Signs

Detail of Mandatory Regulatory Signs & Compulsory Direction Control and Other Signs

Detail of Informatroy Signs, Detail of Cautionary Signs-TS, Detail of cautionary warning signs,

Details of route marking (chevron marking), Details of road marking

Details of directional signs

Details Toe drain

Details of pitching, filter material, chute drain and energy dissipation basin-std

Details of double head metal beam crash barrier

Details for 200 meter 1 km & km post

Detail for boundary stone & guard post Drain retaining wall & kerb

Gabion wall

Schedule - J

(See Clause 10.3 (ii))

Project Completion Schedule

1. Project Completion Schedule

During Construction period, the Contractor shall comply with the requirements set forth in this Schedule-J for each of the Project Milestones and the **Scheduled Completion Date**. Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the Authority of such compliance along with necessary particulars thereof.

2. Project Milestone-I

- (i) Project Milestone-I shall occur on the date falling on the **320th** day from the Appointed Date (the “**Project Milestone- I**”).
- (ii) Prior to the occurrence of Project Milestone-I, the Contractor shall have commenced construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 10% (ten per cent) of the Contract Price.

3. Project Milestone-II

- (i) Project Milestone-II shall occur on the date falling on the **548th** day from the Appointed Date (the “**Project Milestone- II**”).
- (ii) Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 35% (thirty five per cent) of the Contract Price **and should have started construction of all bridges**

4. Project Milestone-III

- (i) Project Milestone-III shall occur on the date falling on the **776th** day from the Appointed Date (the “**Project Milestone- III**”).
- (ii) Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the Project Highway and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 70% (seventy per cent) of the Contract Price and **should have started construction of all project facilities.**

5. Scheduled Completion Date

- (i) The Scheduled Completion Date shall occur on the **913th** day from the Appointed Date.
- (ii) On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement.

6. Extension of time

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.

Schedule - K

(See Clause 12.1 (ii))

Tests on Completion

1. Schedule for Tests

- (i) The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Authority's Engineer and the Authority of its intent to subject the Project Highway to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish to the Authority's Engineer and the Authority detailed inventory and particulars of all works and equipment forming part of Works.
- (ii) The Contractor shall notify the Authority's Engineer of its readiness to subject the Project Highway to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Authority's Engineer shall, in consultation with the Contractor, 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 Authority's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 12 and this Schedule-K.

2. Tests

- (i) Visual and physical test: The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include [***].
- (ii) Riding quality test: Riding quality of each lane of the carriageway shall be checked with the help of a Network Survey Vehicle (NSV) fitted with latest equipments and the maximum permissible roughness for purposes of this Test shall be [2,000 (two thousand)] mm for each kilometre.
- (iii) Tests for bridges: All major and minor bridges 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 Nondestructive Testing Techniques, at two spots in every span, to be chosen at random by the Authority's Engineer. Bridges with a span of 15 (fifteen) metres or more shall also be subjected to load testing.
- (iv) Other tests: The Authority's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the Project Highway with Specifications and Standards, except tests as specified in clause 5, but shall include measuring the reflectivity of road markings and road signs; and measuring the illumination level (lux) of lighting using requisite testing equipment.

- (v) Environmental audit: The Authority's Engineer shall carry out a check to determine conformity of the Project Highway with the environmental requirements set forth in Applicable Laws and Applicable Permits.
- (vi) Safety Audit: The Authority's Engineer shall carry out, or cause to be carried out, a safety audit to determine conformity of the Project Highway with the safety requirements and Good Industry Practice.

3. Agency for conducting Tests

All Tests set forth in this Schedule-K shall be conducted by the Authority's Engineer or such other agency or person as it may specify in consultation with the Authority.

4. Completion Certificate

Upon successful completion of Tests, the Authority's Engineer shall issue the Completion Certificate in accordance with the provisions of Article 12.

- 5. The Authority Engineer will carry out tests with following equipment at his own cost in the presence of contractor's representative.

Sr. No.	Key metrics of Asset	Equipment to be used	Frequency of condition survey
1	Surface defects of pavement	Network Vehicle (NSV) Survey	At least twice a year (As per survey months defined for the state basis rainy season)
2	Roughness of pavement	Network Vehicle (NSV) Survey	At least twice a year (As per survey months defined for the state basis rainy season)
3	Strength of pavement	Falling Weight Deflectometer (FWD)	At least once a year
4	Bridges	Mobile Bridge Inspection Unit (MBU)	At least twice a year (As per survey months defined for the state basis rainy season)
5	Road signs	Retro-reflectometer	At least twice a year (As per survey months defined for the state basis rainy season)

The first testing with the help of NSV shall be conducted at the time of issue of Completion Certificate.

Schedule - L

(See Clause 12.2)

Completion Certificate

- 1 I, ... (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated (the "Agreement"), for **Construction of Twin Tube Uni-directional Tunnel at Nilgrar on Srinagar-Leh section of NH-1 in the UT of Jammu & Kashmir [Package-2B of Z-Morh-Zojila section]** (the "Project Highway") on Engineering, Procurement and Construction (EPC) basis through (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement, and I am satisfied that the Project Highway can be safely and reliably placed in service of the Users thereof.
- 2 It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Highway have been completed, and the Project Highway is hereby declared fit for entry into operation on this the day of 20, Scheduled Completed Date for which was the day of 20....

SIGNED, SEALED AND DELIVERED

For and on behalf of the Authority's Engineer by:

(Signature) (Name)

(Designation) (Address)

Schedule - M*(See Clauses 14.6, 15.2 and 19.7)***Payment Reduction for Non-Compliance****1. Payment reduction for non-compliance with the Maintenance Requirements**

- (i) Monthly lump sum payments for maintenance shall be reduced in the case of noncompliance with the Maintenance Requirements set forth in Schedule-E.
- (ii) Any deduction made on account of non-compliance with the Maintenance Requirements shall not be paid even after compliance subsequently. The deductions shall continue to be made every month until compliance is done.
- (iii) The Authority's Engineer shall calculate the amount of payment reduction on the basis of weightage in percentage assigned to non-conforming items as given in Paragraph 2.

2. Percentage reductions in lump sum payments on monthly basis

- (i) The following percentages shall govern the payment reduction:

S. No.	Item/Defect/Deficiency	Percentage
(a) Carriageway/Pavement		
(i)	Potholes, cracks, other surface defects	15%
(ii)	Repairs of Edges, Rutting	5%
(b) Road, Embankment, Cuttings, Shoulders		
(i)	Edge drop, inadequate cross fall, undulations, settlement, potholes, ponding, obstructions	10%
(ii)	Deficient slopes, raincuts, disturbed pitching, vegetation growth, pruning of trees	5%
(c) Bridges and Culverts		
(i)	Desilting, cleaning, vegetation growth, damaged pitching, flooring, parapets, wearing course, footpaths, any damage to foundations	20%
(ii)	Any Defects in superstructures, bearings and sub-structures	10%
(iii)	Painting, repairs/replacement kerbs, railings, parapets, guideposts/crash barriers	5%
(d) Roadside Drains		
(i)	Cleaning and repair of drains	5%
(e) Road Furniture		
(i)	Cleaning, painting, replacement of road signs, delineators, road markings, 200 m/km/5 th km stones	5%
(f) Miscellaneous Items		
(i)	Removal of dead animals, broken down/accident vehicles, fallen trees, road blockades or malfunctioning of mobile crane	10%
(ii)	Any other Defects in accordance with paragraph 1.	5%
(g) Defects in Other Project Facilities		5%

- (ii) The amount to be deducted from monthly lump-sum payment for non-compliance of particular item shall be calculated as under:

$$R = P/100 \times (M1 \text{ or } M2) \times L1/L$$

Where,

P= Percentage of particular item/Defect/deficiency for deduction

M1= Monthly lump-sum payment in accordance para 1.2 above of this Schedule

M2= Monthly lump-sum payment in accordance para 1.2 above of this Schedule

L1= Non-complying length L = Total length of the road,

R= Reduction (the amount to be deducted for non-compliance for a particular item/Defect/deficiency

The total amount of reduction shall be arrived at by summation of reductions for such items/Defects/deficiency or non-compliance.

For any Defect in a part of one kilometer, the non-conforming length shall be taken as one kilometer.

Schedule - N

(See Clause 18.1 (i))

Selection of Authority's Engineer

1. Selection of Authority's Engineer

- (i) The provisions of the Model Request for Proposal for Selection of Technical Consultants, issued by the Ministry of Finance in May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an Authority's Engineer.
- (ii) In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, the Authority shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

2. Terms of Reference

The Terms of Reference for the Authority's Engineer (the "TOR") shall substantially conform with Annex 1 to this Schedule N.

3. Appointment of Government entity as Authority's Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Authority's Engineer; provided that such entity shall be a body corporate having as one of its primary functions 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 Authority's Engineer.

Annex – I

(Schedule - N)

Terms of Reference for Authority's Engineer

1. Scope

- (i) These Terms of Reference (the “**TOR**”) for the Authority’s Engineer are being specified pursuant to the EPC Agreement dated (the “**Agreement**”), which has been entered into between the [name and address of the Authority] (the “**Authority**”) and(the “**Contractor**”)# for **Construction of Twin Tube Uni-directional Tunnel at Nilgrar on Srinagar-Leh section of NH-1 in the UT of Jammu & Kashmir [Package-2B of Z-Morh-Zojila section]** on Engineering, Procurement, Construction (EPC) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

- In case the bid of Authority’s Engineer is invited simultaneously with the bid of EPC project, then the status of bidding of EPC project only to be indicated

- (ii) The TOR shall apply to construction and maintenance of the Project Highway.

2. Definitions and interpretation

- (i) The words and expressions beginning with or in capital letters 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.
- (ii) 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.
- (iii) The rules of interpretation stated in Article 1 of the Agreement shall apply, mutatis mutandis, to this TOR.

3. General

- (i) The Authority’s Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.
- (ii) The Authority’s Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the Authority before determining:
- (a) any Time Extension;
- (b) any additional cost to be paid by the Authority to the Contractor;

- (c) the Termination Payment; or
 - (d) issuance of Completion Certificate or
 - (e) any other matter which is not specified in (a), (b), (c) or (d) above and which creates a financial liability on either Party.
- (iii) The Authority's Engineer shall submit regular periodic reports, at least once every month, to the Authority in respect of its duties and functions under this Agreement. Such reports shall be submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month.
- (iv) The Authority's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel; provided, however, that it shall not delegate the authority to refer any matter for the Authority's prior approval in accordance with the provisions of Clause 18.2.
- (v) The Authority's Engineer shall aid and advise the Authority on any proposal for Change of Scope under Article 13.
- (vi) 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 Authority's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

4. Construction Period

- (i) During the Construction Period, the Authority's Engineer shall review and approve the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1 (vi). The Authority's Engineer shall complete such review and approval and send its observations to the Authority and the Contractor within 15 (fifteen) days of receipt of such Drawings; provided, however that in case of a Major Bridge or Structure, the aforesaid period of 15 (fifteen) days may be extended upto 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.
- (ii) The Authority's Engineer shall review and approve any revised Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Drawings.
- (iii) The Authority's Engineer shall review and approve the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty one) days stating the modifications, if any, required thereto.
- (iv) The Authority's Engineer shall complete the review and approve of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its

comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

- (v) The Authority's Engineer shall grant written approval to the Contractor, where necessary, for interruption and diversion of the flow of traffic in the existing lane(s) of the Project Highway for purposes of maintenance during the Construction Period in accordance with the provisions of Clause 10.4.
- (vi) The Authority's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the Authority and the Contractor within 7 (seven) days of receipt of such report.
- (vii) The Authority's Engineer shall inspect the Construction Works and the Project Highway and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the Authority's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.
- (viii) The Authority's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the Authority's Engineer may require.
- (ix) For determining that the Works conform to Specifications and Standards, the Authority's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4 (ix), 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 MORTH (the "Quality Control Manuals") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance.
- (x) The Authority's Engineer shall test check at least 50 (fifty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.
- (xi) The timing of tests referred to in Paragraph 4 (ix), and the criteria for acceptance/rejection of their results shall be determined by the Authority's 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 Contractor for its own quality assurance in accordance with Good Industry Practice.
- (xii) In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the Authority's Engineer shall require the Contractor to carry out remedial measures.
- (xiii) The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project Highway, whether because of an accident,

unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

- (xiv) In the event that the Contractor fails to achieve any of the Project Milestones, the Authority's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Authority's Engineer shall determine that completion of the Project Highway is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Contractor, the Authority's Engineer shall review the same and send its comments to the Authority and the Contractor forthwith.
- (xv) The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.2.
- (xvi) Authority's Engineer may recommend to the Authority suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has carried out remedial measure, the Authority's Engineer shall inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked.
- (xvii) In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the Authority's Engineer to inspect such works, the Authority's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.
- (xviii) The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate, as the case may be. For carrying out its functions under this Paragraph 4 (xviii) and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

5. Maintenance Period

- (i) The Authority's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the Contractor.
- (ii) The Authority's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the Authority and the Contractor.
- (iii) The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project Highway 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 Contractor in this behalf.

- (iv) In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- E, the Authority's 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.
- (v) The Authority's Engineer shall examine the request of the Contractor for closure of any lane(s) of the Project Highway for undertaking maintenance/repair thereof, and shall grant permission with such modifications, as it may deem necessary, within 5 (five) days of receiving a request from the Contractor. Upon expiry of the permitted period of closure, the Authority's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Contractor to the Authority under Clause 14.5.

6. Determination of costs and time

- (i) The Authority's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.
- (ii) The Authority's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.
- (iii) The Authority's Engineer shall consult each Party in every case of determination in accordance with the provisions of Clause 18.5.

7. Payments

- (i) The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2 (iv) (d).
- (ii) Authority's Engineer shall -
 - (a) within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and
 - (b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the Authority and the Contractor an Interim Payment Certificate certifying the amount due and payable to the Contractor, after adjustments in accordance with the provisions of Clause 19.10.
- (iii) The Authority's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the

Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.

- (iv) The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause 19.16.

8. Other duties and functions

The Authority's Engineer shall perform all other duties and functions as specified in the Agreement.

9. Miscellaneous

- (i) A copy of all communications, comments, instructions, Drawings or Documents sent by the Authority's Engineer to the Contractor pursuant to this TOR, and a copy of all the test results with comments of the Authority's Engineer thereon, shall be furnished by the Authority's Engineer to the Authority forthwith.
- (ii) The Authority's 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.
- (iii) Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the Authority, reflecting the Project Highway as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project Highway and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Authority against receipt thereof.
- (iv) The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.
- (v) The Authority's Engineer shall inform the Authority and the Contractor of any event of Contractor's Default within one week of its occurrence.

Schedule - 0

(See Clauses 19.4 (i), 19.6 (i), and 19.8 (i))

Forms of Payment Statements

1. Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

- (a) the estimated amount for the Works executed in accordance with Clause 19.3 (i) subsequent to the last claim;
- (b) amounts reflecting adjustments in price for the aforesaid claim;
- (c) the estimated amount of each Change of Scope Order executed subsequent to the last claim;
- (d) amounts reflecting adjustment in price, if any, for (c) above in accordance with the provisions of Clause 13.2 (iii) (a);
- (e) total of (a), (b), (c) and (d) above;
- (f) Deductions:
 - i. Any amount to be deducted in accordance with the provisions of the Agreement except taxes;
 - ii. Any amount towards deduction of taxes; and
 - iii. Total of (i) and (ii) above.
- (g) Net claim: (e) – (f) (iii);
- (h) The amounts received by the Contractor upto the last claim:
 - i. For the Works executed (excluding Change of Scope orders);
 - ii. For Change of Scope Orders, and
 - iii. Taxes deducted

2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

- (a) the monthly payment admissible in accordance with the provisions of the Agreement;
- (b) the deductions for maintenance work not done;
- (c) net payment for maintenance due, (a) minus (b);
- (d) amounts reflecting adjustments in price under Clause 19.12; and
- (e) amount towards deduction of taxes

3. Contractor's claim for Damages

Note: The Contractor shall submit its claims in a form acceptable to the Authority.

Schedule - P

(See Clause 20.1)

Insurance

1. Insurance during Construction Period

- (i) The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the Completion Certificate, the following insurances for any loss or damage occurring on account of Non Political Event of Force Majeure, malicious act, accidental damage, explosion, fire and terrorism:
 - (a) insurance of Works, Plant and Materials and an additional sum of [15 (fifteen)] per cent of such replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature; and
 - (b) insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.
- (ii) The insurance under sub para (a) and (b) of paragraph 1(i) above shall cover the Authority and the Contractor against all loss or damage from any cause arising under paragraph 1.1 other than risks which are not insurable at commercial terms.

2. Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain insurance cover of not less than 15% of the Contract Price for the Works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and which arises from a cause occurring prior to the issue of the Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

3. Insurance against injury to persons and damage to property

- (i) The Contractor shall insure against its liability for any loss, damage, death or bodily injury, or damage to any property (except things insured under Paragraphs 1 and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this Agreement. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number of occurrences.

The insurance cover shall be not less than: Rs. [*****]

- (ii) The insurance shall be extended to cover liability for all loss and damage to the Authority's property arising out of the Contractor's performance of this Agreement excluding:
 - (a) the Authority's right to have the construction works executed on, over, under, in or through any land, and to occupy this land for the Works; and
 - (b) damage which is an unavoidable result of the Contractor's obligations to execute the Works.

4. Insurance to be in joint names

The insurance under paragraphs 1 to 3 above shall be in the joint names of the Contractor and the Authority.

Schedule-Q

(See Clause 14.10)

Tests on Completion of Maintenance Period

1. Riding Quality test:

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 [2,200 (two thousand and two hundred only)] mm for each kilometre.

2. Visual and physical test:

The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include measurement of cracking, rutting, stripping and potholes and shall be as per the requirement of maintenance mentioned in Schedule-E.

Schedule-R

(See Clause 14.10)

Taking Over Certificate

I, ... (Name and designation of the Authority's Representative) under and in accordance with the Agreement dated (the "**Agreement**"), for **Construction of Twin Tube Uni-directional Tunnel at Nilgrar on Srinagar-Leh section of NH-1 in the UT of Jammu & Kashmir [Package-2B of Z-Morh-Zojila section]** (the "**Project Highway**") on Engineering, Procurement and Construction (EPC) basis through (Name of Contractor), hereby certify that the Tests on completion of Maintenance Period in accordance with Article 14 of the Agreement have been successfully undertaken to determine compliance of the Project Highway with the provisions of the Agreement and I hereby certify that the Authority has taken over the Project highway from the Contractor on this day

SIGNED, SEALED AND DELIVERED

(Signature)

(Name and designation of Authority's Representative)

(Address)

******* End of the Document *******