BIHAR STATE ROAD DEVELOPMENT CORPORATION LIMITED
(A GOVT. OF BIHAR UNDERTAKING)

Development of Greenfield Bridge across River Ganges and its approaches connecting Bakhtiyarpur Bypass of NH-31 near village Karjan & NH-28 at Tajpur in the State of Bihar on DBFOT (Toll) basis

Concession Agreement
between
Bihar State Road Development Corporation Limited
And
Navayuga Jahnavi Toll Bridge Private Limited

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Concession Agreement

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Bihar State Road Development Corporation Ltd. ★ Patna ★

★ Navayuga Jahnavi Toll Bridge Pvt. Ltd. ★

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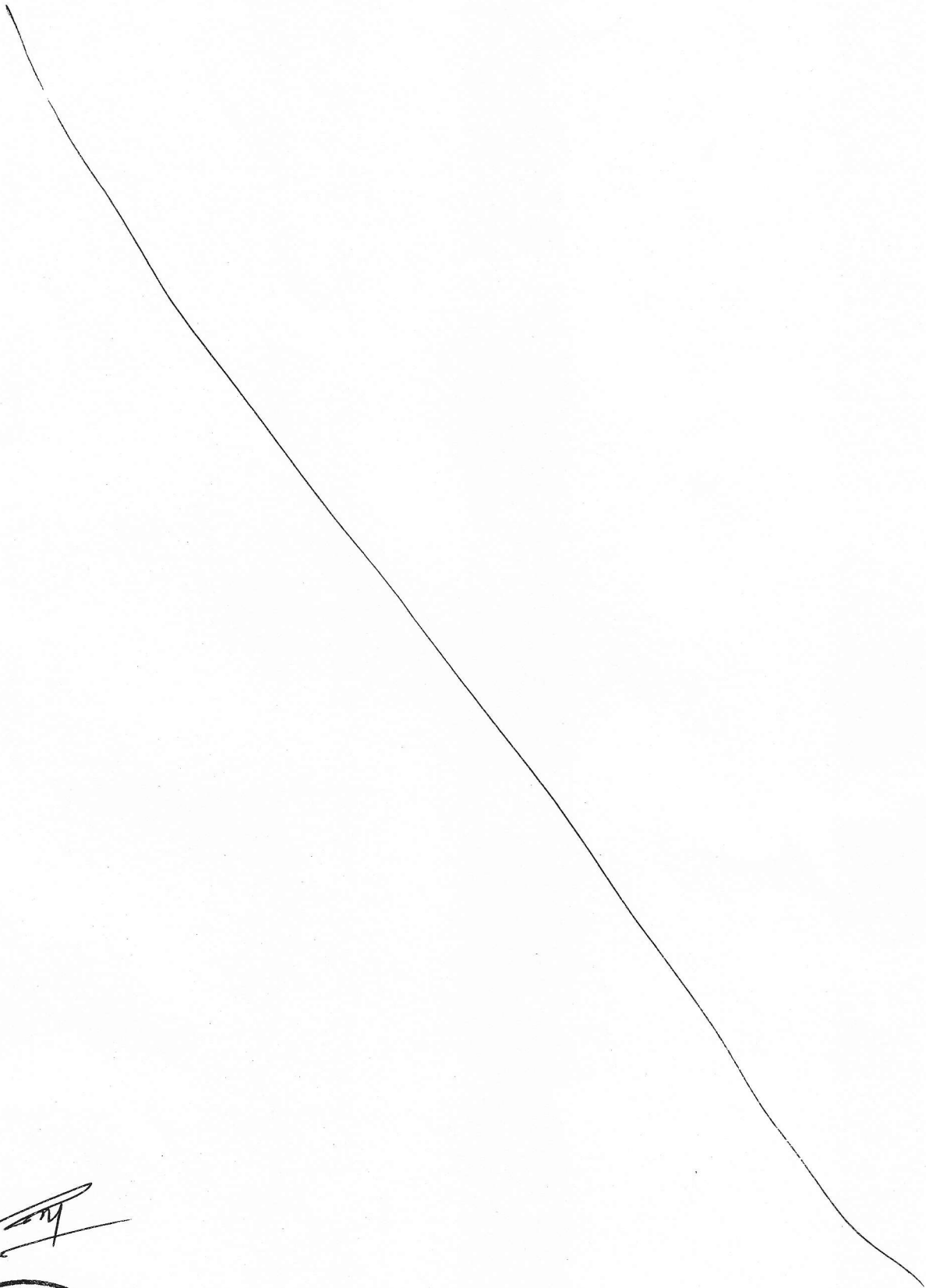
Part I

Preliminary

Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Toll Bridge Ltd.

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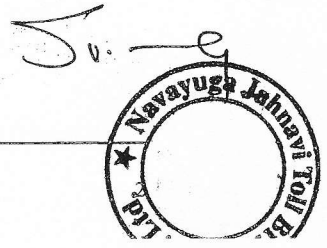
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Ltd.

भारतीय गैर न्यायिक

एक सौ रुपये

Rs. 100

रु. 100

ONE HUNDRED RUPEES

सत्यमेव जयते

भारत INDIA

INDIA NON JUDICIAL

बिहार BIHAR

E 791315

CONCESSION AGREEMENT

THIS AGREEMENT is entered into on this the 08th day of October, 2010.

BETWEEN

1 **The Bihar State Road Development Corporation Limited** having its principal office at Central Mechanical Workshop Campus (Near Airport), Sheikpura, Patna 800014 (hereinafter referred to as the "**Authority**") acting through Chief General Manager, which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) of One Part;

AND

2 **Navayuga Jahnavi Toll Bridge Private Limited**, a company incorporated under the provisions of the Companies Act, 1956 and having its registered office at #1259,Lakshmi Towers,Road No. 36,Jubilee Hills,Hyderabad-500033,Andhra Pradesh,India (hereinafter referred to as the "**Concessionaire**" which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns and substitutes) of the Other Part.

Bihar State Road Development Corporation Ltd.

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

WHEREAS:

(A) Bihar State Road Development Corporation Limited(a company duly incorporated under the companies act 1956) is mandated to Design, Build, Finance, operate, manage and Transfer the Highways & Bridges in Bihar State and has taken up the comprehensive program for the development of high traffic density corridors of roads/bridge on Design-Build-Finance-Operate Transfer (DBFOT) pattern in Public Private Partnership (PPP) mode in the state.

(B) The Government of Bihar (GOB) had resolved to develop a Greenfield alignment connecting NH-31 near Bakhtiyarpur & NH-28 at Tazpur with a bridge across river Ganges (approximately 45.393 km approach road and 5.55 km long bridge) in the state of Bihar by Four-Laning on Design-Build-Finance-Operate Transfer (DBFOT) basis (hereinafter referred to as "The Project") in accordance with the terms and conditions set forth in the Bidding Documents and Concession Agreement to be entered into.

(C) The Authority had accordingly invited proposals by its Notice/ Request for Qualification No. PR-7776D(N.N.)09-10 dated 09-01-2010 (the "**Request for Qualification" or "RFQ**") for short listing of bidders for construction, operation and maintenance of the above referred section on DBFOT basis and had shortlisted certain bidders including, inter alia, **Navayuga Engineering Company Limited**.

(D) The Authority had prescribed the technical and commercial terms and conditions, and invited bids (the "**Request for Proposals**" or "**RFP**") from the bidders shortlisted pursuant to the RFQ for undertaking the Project.

(E) After evaluation of the bids received, the Authority had accepted the bid of **Navayuga Engineering Company Limited** and issued its Letter of Award No.BSRDC Ltd-28/2009/1542 dated 21.08.2010 (hereinafter called the "**LOA**") to **Navayuga Engineering Company Limited** requiring, inter alia, the execution of this Concession Agreement within 60 (Sixty) days of the date of issue thereof.

(F) **Navayuga Engineering Company Limited** has since promoted and incorporated the Concessionaire as a limited liability company under the Companies Act 1956. and has requested the Authority to accept the Concessionaire as the entity which shall undertake and perform the obligations and exercise the rights of the **Navayuga Engineering Company Limited** under the LOA, including the obligation to enter into this Concession Agreement pursuant to the LOA for executing the Project.

(G) By its letter dated 08.09.2010., the Concessionaire has also joined in the said request of the **Navayuga Jahnavi Toll Bridge Private Limited** to the Authority to accept it as the entity which shall undertake and perform the obligations and exercise the rights of **Navayuga Engineering Company Limited** including the obligation to enter into this Concession Agreement

Bihar State Road Development Corporation Ltd.

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

pursuant to the LOA. The Concessionaire has further represented to the effect that it has been promoted by **Navayuga Engineering Company Limited** for the purposes hereof.

(H) The Authority has agreed to the said request of the **Navayuga Jahnavi Toll Bridge Private Limited,** Concessionaire and has accordingly agreed to enter into this Concession Agreement with the Concessionaire for execution of the Project on DBFOT basis, subject to and on the terms and conditions set forth hereinafter.

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

Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Toll Bridge Pvt. Ltd. ★

ARTICLE 1

DEFINITIONS AND INTERPRETATION

1.1 Definitions

The words and expressions beginning with capital letters and defined in this Agreement (including those in Article 48) shall, unless the context otherwise requires, have the meaning ascribed thereto herein, and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules.

1.2 Interpretation

1.2.1 In this Agreement, unless the context otherwise requires,

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(s) save and except as otherwise provided in this Agreement, any reference, at any time, to any agreement, deed, instrument, licence or document of any description shall be construed as reference to that

Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Ltd.

agreement, deed, instrument, licence or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Sub-clause shall not operate so as to increase liabilities or obligations of the Authority hereunder or pursuant hereto in any manner whatsoever;

(t) any agreement, consent, approval, authorisation, notice, communication, information or report required under or pursuant to this Agreement from or by any Party or the Independent Engineer shall be valid and effective only if it is in writing under the hand of a duly authorised representative of such Party or the Independent Engineer, as the case may be, in this behalf and not otherwise;

(u) the Schedules and Recitals to this Agreement 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; and

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

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

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

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

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

Bihar State Road Development Corporation Ltd.

Navayuga Jahnavi Tollway Pvt. Ltd.

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

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

(a) this Agreement; and

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

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

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

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

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

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

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

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

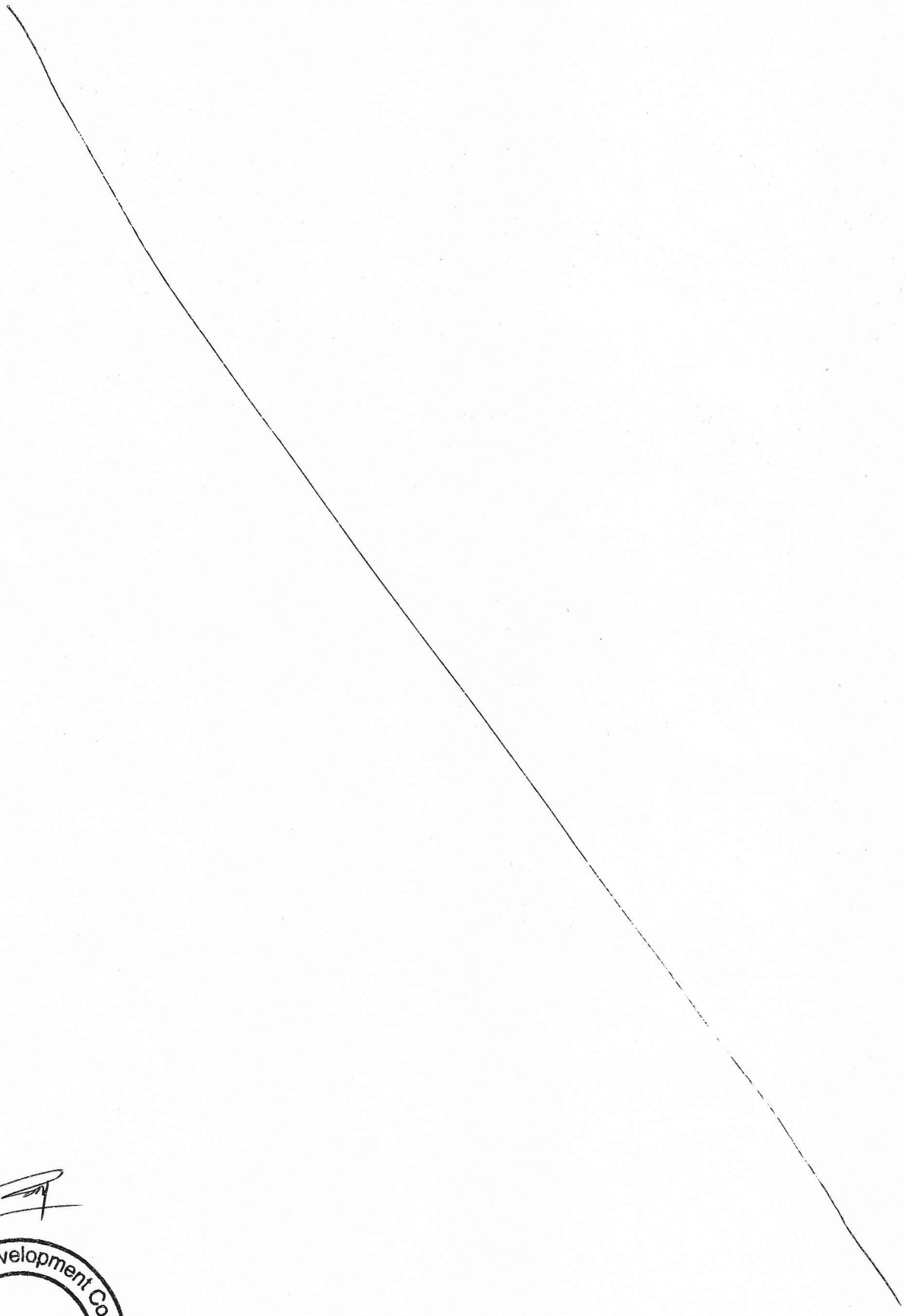
(f) between any value written in numerals and that in words, the latter shall prevail.

Bihar State Road Development Corporation Ltd. Patna

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Part II

The Concession



ARTICLE 2

SCOPE OF THE PROJECT

2.1 Scope of the Project

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

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

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

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

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ARTICLE 3

GRANT OF CONCESSION

3.1 The Concession

3.1.1 Subject to and in accordance with the provisions of this Agreement, the Applicable Laws and the Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, licence and authority to construct within the stipulated time frame fixed by the Authority, operate and maintain the Project (the "**Concession**") for a period of 30 (thirty) years commencing from the Appointed Date, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein:

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

(a) Right of Way, access and licence to the Site for the purpose of and to the extent conferred by the provisions of this Agreement;

(b) finance and construct the Project within the stipulated time frame fixed by the Authority;

(c) manage, operate and maintain the Project and regulate the use thereof by third parties;

(d) demand, collect an appropriate Fee (as per Notification issued by the Authority) from vehicles and persons liable for payment of Fee for using the Project or any part thereof and refuse entry of any vehicle if the Fee due is not paid;

(e) perform and fulfil all of the Concessionaire's obligations under and in accordance with this Agreement;

(f) bear and pay all costs, expenses and charges in connection with or incidental to the performance of the obligations of the Concessionaire under this Agreement; and

(g) neither assign, transfer or sublet or create any lien or Encumbrance on this Agreement, or the Concession hereby granted or on the whole or any part of the Project nor transfer, lease, license or part possession thereof, save and except as expressly permitted by this Agreement or the Substitution Agreement.

3.2 Waiver of [six laning]- Deleted

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ARTICLE 4

CONDITIONS PRECEDENT

4.1 Conditions Precedent

4.1.1 Save and except as expressly provided in Articles 4, 9, 10, 24, 34, 44 and 47, the respective rights and obligations of the Parties under this Agreement shall be subject to the satisfaction in full of the conditions precedent specified in this Clause 4.1 (the "**Conditions Precedent**").

4.1.2 The Concessionaire may, upon providing the Performance Security to the Authority in accordance with Article 9, at any time after [90 (ninety)] days from the date of this Agreement or on an earlier day acceptable to the Authority, by notice require the Authority to satisfy any or all of the Conditions Precedent set forth in this Clause 4.1.2 within a period of 30 (thirty) days of the notice, or such longer period not exceeding 60 (sixty) days as may be specified therein, and the Conditions Precedent required to be satisfied by the Authority prior to the Appointed Date shall be deemed to have been fulfilled when the Authority shall have:

(a) provided to the Concessionaire the Right of Way to the Site in accordance with the provisions of Clause 10.3.1; provided that the conditions set forth in Clause 10.3.2 shall also be satisfied on or prior to the Appointed Date;

(b) issued the Fee Notification;

(c) procured for the Concessionaire the Right of Way;

(d) procured approval of the Railway authorities in the form of a general arrangement drawing that would enable the Concessionaire to construct road overbridges/ underbridges at level crossings on the Project in accordance with the Specifications and Standards and subject to the terms and conditions specified in such approval; and

(e) procured all Applicable Permits relating to environmental protection and conservation of the Site:

Provided that the Authority may from time to time by notice extend, for up to an aggregate of 6 (six) months, the period for procuring the approval set forth in Sub-clause (d) and/ or Sub-clause (e) above and in that event the land to be covered by overbridges or the affected sections of the Project, as the case may be, shall be included in the Appendix referred to in Clause 10.3 and dealt with in accordance with the provisions thereof; and provided further that upon procurement of such approval, the Concessionaire shall be entitled to a period of 12 (twelve) months there from for completion of the overbridges. For the avoidance of doubt, the approval specified in Sub-clauses (d) and (e) above shall cease to be a Condition Precedent upon the extension of time under this Proviso.

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4.1.3 The Conditions Precedent required to be satisfied by the Concessionaire prior to the Appointed Date shall be deemed to have been fulfilled when the Concessionaire shall have:

(a) provided Performance Security to the Authority;

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

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

(d) procured all the Applicable Permits specified in Schedule-E unconditionally or if subject to conditions, then all such conditions shall have been satisfied in full and such Applicable Permits are in full force and effect;

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

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

(g) delivered to the Authority from the Consortium Members, their respective confirmation, in original, of the correctness of their representations and warranties setforth in Sub clauses (k), (l) and (m) of clause 7.1 of this Agreement; and

(h) delivered to the Authority a legal opinion from the legal counsel of the Concessionaire with respect to the authority of the Concessionaire to enter into this Agreement and the enforceability of the provisions thereof:

Provided that upon request in writing by the Concessionaire, the Authority may, in its discretion, waive any of the Conditions Precedent set forth in this Clause 4.1.3.

4.1.4 Each Party shall make all reasonable endeavours to satisfy the Conditions Precedent within the time stipulated and shall provide the other Party with such reasonable cooperation as may be required to assist that Party in satisfying the Conditions Precedent for which that Party is responsible.

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

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4.2 Damages for delay by the Authority

In the event that (i) the Authority does not procure fulfilment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.1% (zero point one per cent) of the Performance Security for each day's delay until the fulfilment of such Conditions Precedent, subject to a maximum of 20% (twenty percent) of the Performance Security.

4.3 Damages for delay by the Concessionaire

In the event that (i) the Concessionaire does not procure fulfilment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within a period of 180 (one hundred and eighty) days from the date of this Agreement, and (ii) the delay has not occurred as a result of breach of this Agreement by the Authority or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.2% (zero point two per cent) of the Performance Security for each day's delay until the fulfilment of such Conditions Precedent, subject to a maximum of 20% (twenty percent) of the Performance Security.

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ARTICLE 5

OBLIGATIONS OF THE CONCESSIONAIRE

5.1 Obligations of the Concessionaire

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

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

5.1.3 Subject to the provisions of Clauses 5.1.1 and 5.1.2, the Concessionaire shall discharge its obligations in accordance with Good Industry Practice and as a reasonable and prudent person.

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

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

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

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

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

(e) make reasonable efforts to facilitate the acquisition of land required for the purposes of the Agreement;

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

(g) not do or omit to do any act, deed or thing which may in any manner be violative of any of the provisions of this Agreement;

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

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

5.2 Obligations relating to Project Agreements

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

5.2.2 The Concessionaire shall submit to the Authority the drafts of all Project Agreements or any amendments or replacements thereto for its review and comments, and the Authority shall have the right but not the obligation to undertake such review and provide its comments, if any, to the Concessionaire within 15 (fifteen) days of the receipt of such drafts. Within 7 (seven) days of execution of any Project Agreement or amendment thereto, the Concessionaire shall submit to the Authority a true copy thereof, duly attested by a Director of the Concessionaire, for its record. For the avoidance of doubt, it is agreed that the review and comments hereunder shall be limited to ensuring compliance with the terms of this Agreement. It is further agreed that no review and/or observation of the Authority and/or its failure to review and/or convey its observations on any document shall relieve the Concessionaire of its obligations and liabilities under this Agreement in any manner nor shall the Authority be liable for the same in any manner whatsoever.

5.2.3 The Concessionaire shall not make any addition, replacement or amendments to any of the Financing Agreements without the prior written consent of the Authority if such addition, replacement or amendment has, or may have, the effect of imposing or increasing any financial liability or obligation on the Authority, and in the event that any replacement or amendment is made without such consent, the Concessionaire shall not enforce such replacement or amendment nor permit enforcement thereof against the Authority. For the avoidance of doubt, the Authority acknowledges and agrees that it shall not unreasonably withhold its consent for restructuring or rescheduling of the Debt Due.

5.2.4 The Concessionaire shall procure that each of the Project Agreements contains provisions that entitle the Authority to step into such agreement, in its sole discretion, in substitution of the Concessionaire in the event of Termination or Suspension (the **"Covenant"**). For the avoidance of doubt, it is expressly agreed that in the event the Authority does not exercise such rights of substitution within a period not exceeding 90 (ninety) days from the Transfer Date, the Project Agreements shall be deemed to cease to be in force and effect on the Transfer Date without any liability whatsoever on the

Authority and the Covenant shall expressly provide for such eventuality. The Concessionaire expressly agrees to include the Covenant in all its Project Agreements and undertakes that it shall, in respect of each of the Project Agreements, procure and deliver to the Authority an acknowledgment and undertaking, in a form acceptable to the Authority, from the counter party(ies) of each of the Project Agreements, whereunder such counter party(ies) shall acknowledge and accept the Covenant and undertake to be bound by the same and not to seek any relief or remedy whatsoever from the Authority in the event of Termination or Suspension.

5.2.5 Notwithstanding anything to the contrary contained in this Agreement, the Concessionaire agrees and acknowledges that selection or replacement of an O&M Contractor and execution of the O&M Contract shall be subject to the prior approval of the Authority from national security and public interest perspective, the decision of the Authority in this behalf being final, conclusive and binding on the Concessionaire, and undertakes that it shall not give effect to any such selection or contract without prior approval of the Authority. For the avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the Authority shall endeavour to convey its decision thereon expeditiously. It is also agreed that the Authority shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Concessionaire or its Contractors from any liability or obligation under this Agreement.

5.3 Obligations relating to Change in Ownership

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

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

(i) all acquisitions of Equity by an acquirer, either by himself or with any person acting in concert, directly or indirectly, including by transfer of the direct or indirect legal or beneficial ownership or control of any Equity, in aggregate of not less than 15% (fifteen per cent) of the total Equity of the Concessionaire; or

(ii) acquisition of any control directly or indirectly of the Board of Directors of the Concessionaire by any person either by himself or together with any person or persons acting in concert with him

shall constitute a Change in Ownership requiring prior approval of the Authority from national security and public interest perspective, the decision of the Authority in this behalf being final, conclusive and binding on the Concessionaire, and undertakes that it shall not give effect to any such acquisition of Equity or control of the Board of Directors of the Concessionaire without such prior approval of the Authority. For the

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avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the Authority shall endeavour to convey its decision thereon expeditiously. It is also agreed that the Authority shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Concessionaire from any liability or obligation under this Agreement.

For the purposes of this Clause 5.3.2:

(a) the expression "acquirer", "control" and "person acting in concert" shall have the meaning ascribed thereto in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeover) Regulations, 1997 or any statutory re-enactment thereof as in force as on the date of acquisition of Equity, or the control of the Board of Directors, as the case may be, of the Concessionaire;

(b) the indirect transfer or control of legal or beneficial ownership of Equity shall mean transfer of the direct or indirect beneficial ownership or control of any company or companies whether in India or abroad which results in the acquirer acquiring control over the shares or voting rights of shares of the Concessionaire; and

(c) power to appoint, whether by contract or by virtue of control or acquisition of shares of any company holding directly or through one or more companies (whether situate in India or abroad) the Equity of the Concessionaire, not less than half of the directors on the Board of Directors of the Concessionaire or of any company, directly or indirectly whether situate in India or abroad, having ultimate control of not less than 15% (fifteen per cent) of the Equity of the Concessionaire shall constitute acquisition of control, directly or indirectly, of the Board of Directors of the Concessionaire.

5.4 Employment of foreign nationals

The Concessionaire acknowledges, agrees and undertakes that employment of foreign personnel by the Concessionaire and/or its 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 and will always be of the Concessionaire and, notwithstanding anything to the contrary contained in this Agreement, refusal of or inability to obtain any such permits and approvals by the Concessionaire or any of its contractors or sub-contractors shall not constitute Force Majeure Event, and shall not in any manner excuse the Concessionaire from the performance and discharge of its obligations and liabilities under this Agreement.

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5.5 Employment of trained personnel

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

5.6 Sole purpose of the Concessionaire

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

5.7 Branding of the Project

The Project or any part thereof shall not be branded in any manner to advertise, display or reflect the name or identity of the Concessionaire or its shareholders. The Concessionaire undertakes that it shall not, in any manner, use the name or entity of the Project to advertise or display its own identity, brand equity or business interests, including those of its shareholders, save and except as may be necessary in the normal course of business. For the avoidance of doubt, it is agreed that the Concessionaire may display its own name at a spot where other public notices are displayed for the Users. It is further agreed that the Project shall be known, promoted, displayed and advertised by the name of *****.

5.8 Facilities for physically challenged and elderly persons

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

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ARTICLE 6

OBLIGATIONS OF THE AUTHORITY

6.1 Obligations of the Authority

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

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

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

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

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

(d) make best endeavours to procure that no local Tax, toll or charge is levied or imposed on the use of whole or any part of the Project;

(e) subject to and in accordance with the Applicable Laws, grant to the Concessionaire the authority to regulate traffic on the Project;

(f) assist the Concessionaire in procuring Police assistance for regulation of traffic, removal of trespassers and security on or at the Project ;

(g) not do or omit to do any act, deed or thing which may in any manner be violative of any of the provisions of this Agreement;

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

(i) upon written request from the Concessionaire and subject to the provisions of Clause 5.4, provide reasonable assistance to the Concessionaire and any expatriate personnel of the Concessionaire or

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its Contractors to obtain applicable visas and work permits for the purposes of discharge by the Concessionaire or its Contractors their obligations under this Agreement and the Project Agreements

6.2 Maintenance obligations prior to Appointed Date- Deleted

6.3 Obligations relating to Competing Roads

The Authority shall procure that during the subsistence of this Agreement, neither the Authority nor any Government Instrumentality shall, at any time before the 12th (twelfth) anniversary of the Appointed Date, construct or cause to be constructed any parallel Competing bridge Road connectivity which materially effect the traffic; provided that the restriction herein shall not apply if the average traffic on the Project in any year exceeds 90% (ninety percent) of its designed capacity specified in Clause 29.2.3. Upon breach of its obligations hereunder, the Authority shall be liable to payment of compensation to the Concessionaire under and in accordance with Clause 35.4.

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Toll Bridge Pvt. Ltd. ★ Nagvusa Jahanavi

ARTICLE 7

REPRESENTATIONS AND WARRANTIES

7.1 Representations and Warranties of the Concessionaire

The Concessionaire represents and warrants to the Authority that:

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

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

(c) it has the financial standing and capacity to undertake the Project in accordance with the terms of this Agreement;

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

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

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

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

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

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impairment of its ability to perform any of its obligations under this Agreement;

(i) it has no knowledge of any violation or default with respect to any order, writ, injunction or decree of any court or 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;

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

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

Provided further that any such request made under art 7.1(k) and / or art 48, at the option of the authority, may be required to be accompanied by a suitable no objection letter from lenders.(l)
the selected bidder and its Associates have the financial standing and resources to fund the required Equity and to raise the debt necessary for undertaking and implementing the Project in accordance with this Agreement;

(m) the selected bidder is duly organised and validly existing under the laws of the jurisdiction of its incorporation, and has requested the Authority to enter into this Agreement with the Concessionaire pursuant to the Letter of Award, and has agreed to and unconditionally accepted the terms and conditions set forth in this Agreement;

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

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(o) 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;

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

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

7.2 Representations and Warranties of the Authority

The Authority represents and warrants to the Concessionaire that:

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

(b) it has taken all necessary actions under 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 the right, power and authority to manage and operate the Project up to the Appointed Date;

(h) it has good and valid right to the Site, and has power and authority to grant a licence in respect thereto to the Concessionaire; and

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(i) upon the Concessionaire paying the Concession Fee and complying with the covenants herein, it shall not at any time during the term hereof, interfere with peaceful exercise of the rights and discharge of the obligations by the Concessionaire, subject to and in accordance with the provisions of this Agreement.

(j) impose, collect, appropriate the toll as provided in this Agreement.

7.3 Disclosure

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

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ARTICLE 8

DISCLAIMER

8.1 Disclaimer

8.1.1 The Concessionaire acknowledges that prior to the execution of this Agreement, the Concessionaire has, after a complete and careful examination, made an independent evaluation of the Request for Qualification, Request for Proposals, Scope of the Project, Specifications and Standards, Site, local conditions, physical qualities of ground, subsoil and geology, traffic volumes 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 7.2, 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 Concessionaire confirms that it shall have no claim whatsoever against the Authority in this regard.

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

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

8.1.4 In the event that either Party becomes aware of any mistake or error relating to any of the matters set forth in Clause 8.1.1 above, that Party shall immediately notify the other Party, specifying the mistake or error.

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

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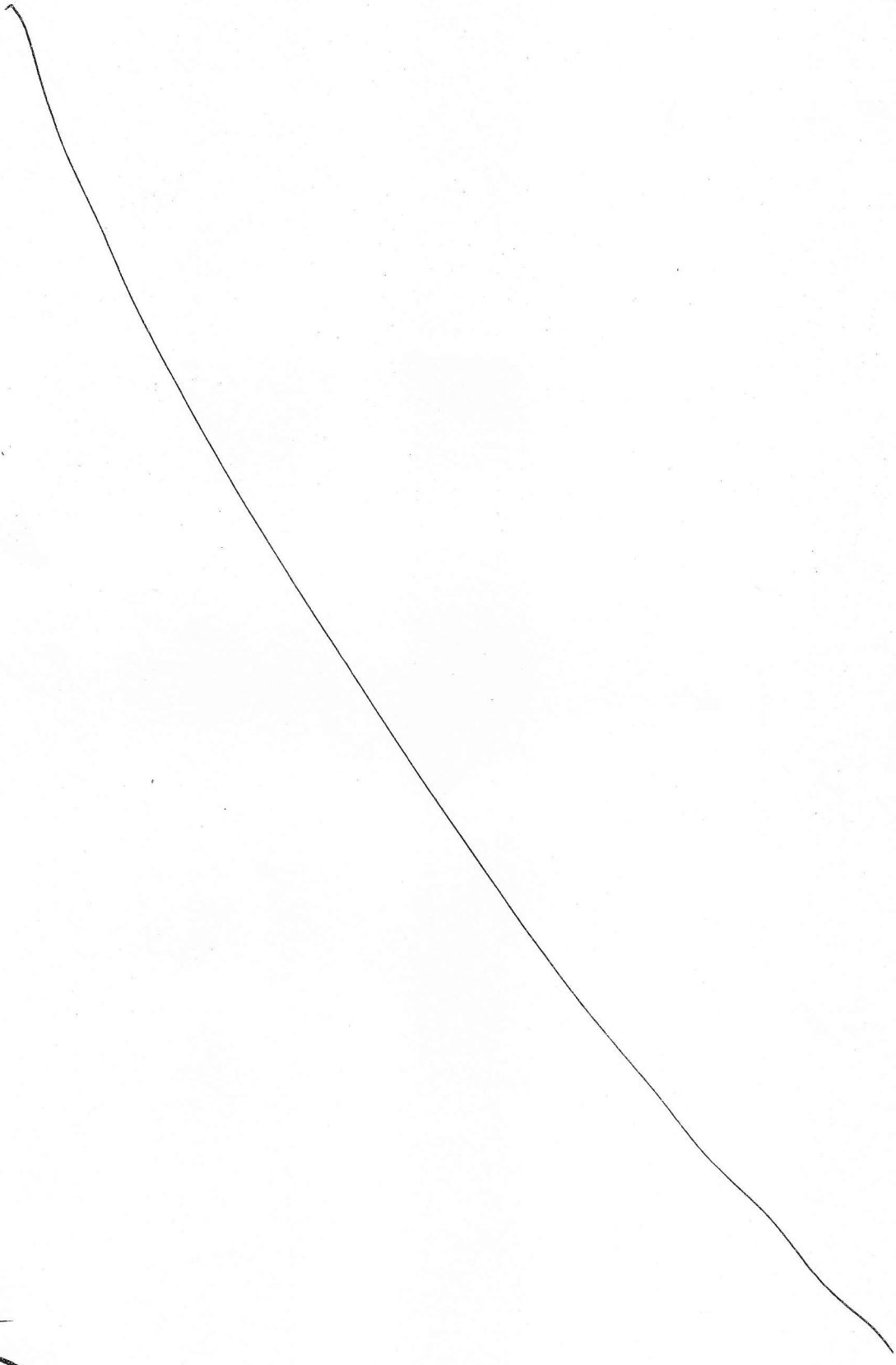
Part III
Development and Operations



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ARTICLE 9

PERFORMANCE SECURITY

9.1 Performance Security

9.1.1 The Concessionaire shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority no later than 180 (one hundred and eighty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Scheduled Commercial Bank for a sum equivalent to Rs. 75.137crore (Rupees Seventy five crore thirteen lacs and seven thousand) in the form set forth in Schedule-F (the "**Performance Security**"). Until such time the Performance Security is provided by the Concessionaire pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security pursuant hereto, the Authority shall release the Bid Security to the Concessionaire.

9.1.2 Notwithstanding anything to the contrary contained in this Agreement, in the event Performance Security is not provided by the Concessionaire within a period of 180 (one hundred and eighty) days from the date of this Agreement, the Authority may encash the Bid Security and appropriate the proceeds thereof as Damages, and thereupon all rights, privileges, claims and entitlements of the Concessionaire under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Concessionaire, and the Concession Agreement shall be deemed to have been terminated by mutual agreement of the Parties.

9.2 Appropriation of Performance Security

Upon occurrence of a Concessionaire Default, 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 Concessionaire Default. Upon such encashment and appropriation from the Performance Security, the Concessionaire 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 Concessionaire shall, within the time so granted, replenish or furnish fresh Performance Security as aforesaid failing which the Authority shall be entitled to terminate this Agreement in accordance with Article 37. Upon replenishment or furnishing of a fresh Performance Security, as the case may be, as aforesaid, the Concessionaire shall be entitled to an additional Cure Period of 90 (ninety) days for remedying the Concessionaire Default, and in the event of the Concessionaire not curing its default within such Cure Period, the Authority shall be entitled to encash and appropriate such Performance Security as Damages, and to terminate this Agreement in accordance with Article 37.

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9.3 Release of Performance Security

The Performance Security shall remain in force and effect for a period of one year from the Appointed Date, but shall be released earlier upon the Concessionaire expending on Project construction an aggregate sum that is not less than 20% (twenty per cent) of the Total Project Cost; provided the Concessionaire is not in breach of this Agreement. Upon request made by the Concessionaire for release of the Performance Security along with the particulars which establish satisfaction of the requirements specified under this Clause 9.3, the Authority shall release the Performance Security forthwith.

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ARTICLE 10

RIGHT OF WAY

10.1 The Site

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

10.2 Licence, Access and Right of Way

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

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

10.2.4 It is expressly agreed that the Licence granted hereunder shall terminate automatically and forthwith, without the need for any action to be taken by the Authority to terminate the Licence, upon the Termination of this Agreement for any reason whatsoever.

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

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any duly authorised officer of the Authority, and the Concessionaire consents to it being registered for this purpose.

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

10.3 Procurement of the Site

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

10.3.2 Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointed Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include more than 20% (twenty per cent) of the total area of the Site required and necessary for developing the Project, and in the event Financial Close is delayed solely on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payment of Damages under and in accordance with the provisions of Clause 4.2.

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

10.3.4 The Authority shall make best efforts to provide and grant the Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Rs. 50 (Rupees fifty) per day for every 1,000 (one thousand) square metres or part thereof, commencing from

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the 91st (ninety first) day of the Appointed Date and until such Right of Way is procured.

10.3.5 Upon receiving Right of Way in respect of any land included in the Appendix, the Concessionaire shall complete the Construction Works thereon within a reasonable period to be determined by the Independent Engineer in accordance with Good Industry Practice; provided that the issue of Provisional Certificate shall not be affected or delayed on account of vacant access to any part of the Site not being granted to the Concessionaire or any construction on such part of the Site remaining incomplete on the date of Tests on account of the delay or denial of such access thereto. For the avoidance of doubt, it is expressly agreed that Construction Works on all lands for which Right of Way is granted within 90 (ninety) days of the Appointed Date shall be completed before the Project Completion Date. It is further agreed that the obligation of the Concessionaire to complete the affected Construction Works shall subsist so long as the Authority continues to pay the Damages specified herein, and upon the Authority ceasing to pay such Damages after giving 60 (sixty) days' notice thereof to the Concessionaire, the obligation of the Concessionaire to complete such works on such part of the Site shall cease forthwith. It is also expressly agreed that completion of the respective Construction Works within the time determined by the Independent Engineer hereunder shall be deemed to be Project Milestones for the purposes of levy and recovery of Damages under and in accordance with the provisions of Clause 12.4.2.

10.3.6 The Concessionaire shall, if so required by the Authority, procure on behalf of the Authority, on the terms and to the extent specified by the Authority, the additional land required for Toll Plazas, Traffic Aid Posts, Medical Aid Posts, under passes and over passes or for construction of works specified in Change of Scope Order issued under Article 16, in accordance with this Agreement and upon procurement, such land shall form part of the Site and vest in the Authority; provided that the Concessionaire may, by notice given to the Authority no later than 60 (sixty) days from the Appointed Date or the date of Change of Scope Order, as the case may be, require the Authority to initiate and undertake proceedings for acquisition of such land under the provisions of the Section 17 (Emergent/ Urgent circumstances) of Land Acquisition Act, 1894 and the Authority shall take all such steps as may be reasonably necessary for such land acquisition forthwith; provided further that the cost of land acquired under this Clause 10.3.6 shall be borne by the Authority in accordance with the Act; provided also that the land to be acquired by the Authority hereunder, prior to the Appointed Date, shall be deemed to be included in the Appendix referred to in this Clause 10.3 and dealt with in accordance with the provisions thereof. For the avoidance of doubt, it is agreed that the minimum area of land to be acquired for the Toll Plazas and approach roads thereof shall conform to the provisions of Schedule - B and Schedule - C. It is further agreed that the Authority may, at any time after the Bid Date, *suo moto* acquire the land required hereunder.

10.3.7 The Concessionaire may procure at its cost and expense and on its own the land that may be required by it for Additional Facilities and the Authority

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shall have no obligation or liability in respect thereof. For the avoidance of doubt, the Concessionaire shall seek prior consent of the Authority to connect any Additional Facility to the Project and such consent shall not be unreasonably withheld.

10.4 Site to be free from Encumbrances

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

10.5 Protection of Site from encroachments

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

10.6 Special/temporary right of way

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

10.7 Access to the Authority and Independent Engineer

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

10.8 Geological and archaeological finds

It is expressly agreed that mining, geological or archaeological rights do not form part of the licence granted to the Concessionaire under this Agreement and the Concessionaire hereby acknowledges that it shall not have any mining rights or interest in the underlying minerals, fossils, antiquities, structures or other remnants or things either of particular geological or

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archaeological interest and that such rights, interest and property on or under the Site shall vest in and belong to the Authority or the concerned Government Instrumentality. The Concessionaire shall take all reasonable precautions to prevent its workmen or any other person from removing or damaging such interest or property and shall inform the Authority forthwith of the discovery thereof and comply with such instructions as the concerned Government Instrumentality may reasonably give for the removal of such property. For the avoidance of doubt, it is agreed that any reasonable expenses incurred by the Concessionaire hereunder shall be reimbursed by the Authority. It is also agreed that the Government shall procure that the instructions hereunder are issued by the concerned Government Instrumentality within a reasonable period.

10.9 Additional Land for [Six-Laning]-Deleted

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ARTICLE 11

UTILITIES, ASSOCIATED ROADS AND TREES

11.1 Existing utilities and roads

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

11.2 Shifting of obstructing utilities

The Concessionaire shall, subject to Applicable Laws and with assistance of the Authority, undertake shifting of any utility including electric lines, water pipes and telephone cables, to an appropriate location or alignment within or outside the Site if and only if such utility causes or shall cause a material adverse effect on the construction, operation or maintenance of the Project. The cost of such shifting shall be borne by the Authority or by the entity owning such utility, if the Authority so directs, and in the event of any delay in shifting thereof, the Concessionaire shall be excused for failure to perform any of its obligations hereunder if such failure is a direct consequence of delay on the part of the entity owning such electric lines, water pipes or telephone cables, as the case may be.

11.3 New utilities and roads

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

11.3.2 The Authority may, by notice require the Concessionaire to connect any adjoining road to the Project, and the connecting portion thereof falling within the Site shall be constructed by the Concessionaire at the Authority's cost in accordance with Article 16. The maintenance of such connecting portion shall be undertaken by the Concessionaire in accordance with the provisions of Clause 17.1.3.

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11.3.3 The Authority may by notice require the Concessionaire to connect, through a paved road, any adjoining service station, hotel, motel or any other public facility or amenity to the Project, whereupon the connecting portion thereof that falls within the Site shall be constructed and maintained by the Concessionaire upon advance payment of the cost to be made by the beneficiary entity in accordance with the amount and period as determined by the Independent Engineer. For the avoidance of doubt, any connecting road constructed prior to the Appointed Date and falling within the Site shall be maintained by the Concessionaire upon advance payment to be made by the beneficiary entity in accordance with the provisions of this Clause.

11.4 Felling of trees

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

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ARTICLE 12

CONSTRUCTION OF THE PROJECT

12.1 Obligations prior to commencement of construction

Prior to commencement of Construction Works, the Concessionaire shall:

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

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

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

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

12.2 Maintenance during Construction Period- Deleted

12.3 Drawings

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

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

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

(c) Within 15 (fifteen) days of the receipt of the Drawings, the Independent Engineer shall review the same and convey its observations to the Concessionaire with particular reference to their conformity or otherwise with the Scope of the Project and the Specifications and Standards. The Concessionaire shall not be obliged to await the observations of the Independent Engineer on the

Drawings submitted pursuant hereto beyond the said 15 (fifteen) days period and may begin or continue Construction Works at its own discretion and risk;

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

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

(f) Without prejudice to the foregoing provisions of this Clause 12.3, the Concessionaire shall submit to the Authority for review and comments, its Drawings relating to alignment of the Project, finished road level, location and layout of the Toll Plaza[s] and general arrangement drawings of major bridges, flyovers and grade separators, and the Authority shall have the right but not the obligation to undertake such review and provide its comments, if any, within 30 (thirty) days of the receipt of such Drawings. The provisions of this Clause 12.3 shall apply *mutatis mutandis* to the review and comments hereunder; and

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

12.4 [Four-Laning] of the Project Highway- Deleted

12.5 [Six-Laning] of the Project Highway- Deleted

12.6 Termination due to failure to complete [Six-Laning]- Deleted

12.7 Commissioning of the Project

12.7.1 On or after the Appointed Date, the Concessionaire shall undertake construction works to ensure commissioning of the project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The [1642nd (sixteen hundred and forty Seconth) day] from the Appointed Date shall be the scheduled date for completion of the Project (the "**Scheduled Commissioning Date**") and the

Concessionaire agrees and undertakes that all the construction activities related to the Project shall be completed on or before the Scheduled Commissioning Date.

12.7.2 The Concessionaire shall construct the Project in accordance with the Project Completion Schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule-G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one per cent) of the amount of Performance Security for delay of each day until such Milestone is achieved; provided that if any or all Project Milestones or the Scheduled Commissioning Date are extended in accordance with the provisions of this Agreement, the dates set forth in Schedule-G shall be deemed to be modified accordingly and the provisions of this Agreement shall apply as if Schedule-G has been amended as above; provided further that in the event Project Completion Date is achieved on or before the Scheduled Commissioning Date, the Damages paid under this Clause 12.4.2 shall be refunded by the Authority to the Concessionaire, but without any interest thereon. For the avoidance of doubt, it is agreed that recovery of Damages under this Clause 12.4.2 shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.

12.7.3 In the event that all the construction activities related to the Project is not completed within 540 (five hundred and forty) days from the Scheduled Commissioning Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.

12.8 Construction of service roads by the Authority

The Authority shall, at any time after the [8th (eighth)] anniversary of the Appointed Date, be entitled in its discretion to undertake at its cost, construction of service roads on the Project in accordance with the specifications and standards applicable to other district roads (ODRs) in the State. Such construction shall be undertaken without causing undue disruption to traffic and upon its completion, the Concessionaire shall have the obligation to maintain the service roads in accordance with Good Industry Practice and regulate the use thereof in accordance with the provisions of this Agreement.

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ARTICLE 13

MONITORING OF CONSTRUCTION

13.1 Monthly progress reports

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

13.2 Inspection

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

13.3 Tests

13.3.1 For determining that the Construction Works conform to the Specifications and Standards, the Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests, at such time and frequency and in such manner as may be specified by the Independent Engineer from time to time, in accordance with Good Industry Practice for quality assurance. The size of sample for such tests shall, to the extent possible, not exceed 10% (ten per cent) of the quantity and/or number of tests prescribed by IRC and/or MOSRTH for the construction works undertaken by the Authority through their contractors. The Concessionaire shall, with due diligence, carry out or cause to be carried out all the tests in accordance with the instructions of the Independent Engineer and furnish the results thereof to the Independent Engineer. One half of the costs incurred on such tests, and to the extent certified by the Independent Engineer as reasonable, shall be reimbursed by the Authority to the Concessionaire. For the avoidance of doubt, the costs to be incurred on any Test which is undertaken for determining the rectification of any defect or deficiency in construction shall be borne solely by the Concessionaire.

13.3.2 In the event that results of any tests conducted under this Clause 13.3 establish any defects or deficiencies in the Construction Works, the Concessionaire shall carry out remedial measures and furnish a report to the Independent Engineer in this behalf. The Independent Engineer shall require the Concessionaire to carry out or cause to be carried out tests to determine

that such remedial measures have brought the Construction Works into compliance with the Specifications and Standards, and the procedure set forth in this Clause 13.3 shall be repeated until such Construction Works conform to the Specifications and Standards. For the avoidance of doubt, it is agreed that tests pursuant to this Clause 13.3 shall be undertaken in addition to and independent of the tests that shall be carried out by the Concessionaire for its own quality assurance in accordance with Good Industry Practice. It is also agreed that a copy of the results of such tests shall be sent by the Concessionaire to the Independent Engineer forthwith.

13.4 Delays during construction

Without prejudice to the provisions of Clause 12.4.2, if the Concessionaire does not achieve any of the Project Milestones or the Independent Engineer shall have reasonably determined that the rate of progress of Construction Works is such that all the construction activities related to the Project is not likely to be achieved by the Scheduled Commissioning Date, it shall notify the Concessionaire to this effect, and the Concessionaire shall, within 15 (fifteen) days of such notice, by a communication inform the Independent Engineer in reasonable detail about the steps it proposes to take to expedite progress and the period within which it shall achieve the Project Completion Date.

13.5 Suspension of unsafe Construction Works

13.5.1 Upon recommendation of the Independent Engineer to this effect, the Authority may by notice require the Concessionaire to suspend forthwith the whole or any part of the Construction Works if, in the reasonable opinion of the Authority, such work threatens the safety of the Users and pedestrians.

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

13.5.3 Subject to the provisions of Clause 34.7, all reasonable costs incurred for maintaining and protecting the Construction Works or part thereof during the period of suspension (the "**Preservation Costs**"), shall be borne by the Concessionaire; provided that if the suspension has occurred as a result of any breach of this Agreement by the Authority, the Preservation Costs shall be borne by the Authority.

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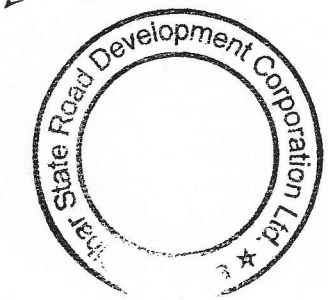
13.5.4 If suspension of Construction Works is for reasons not attributable to the Concessionaire, the Independent Engineer shall determine any extension of the dates set forth in the Project Completion Schedule to which the Concessionaire is reasonably entitled, and shall notify the Authority accordingly whereupon the Authority shall extend such Project Completion Schedule dates in accordance with the recommendations of the Independent Engineer. In the event that the Scheduled Commissioning Date is extended pursuant hereto, the Concession Period shall be deemed to be extended by a period equal in length to the period of extension of the Scheduled Commissioning Date.

13.6 Video recording

During the Construction Period, the Concessionaire 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 Construction Works in that quarter. The first such video recording shall be provided to the Authority within 7 (seven) days of the Appointed Date and thereafter, no later than 15 (fifteen) days after the close of each quarter.





ARTICLE 14

COMPLETION CERTIFICATE

14.1 Tests

14.1.1 At least 30 (thirty) days prior to the likely completion of the Project, the Concessionaire shall notify the Independent Engineer of its intent to subject the Project to Tests. The date and time of each of the Tests shall be determined by the Independent Engineer in consultation with the Concessionaire, and notified to the Authority who may designate its representative to witness the Tests. The Concessionaire shall provide such assistance as the Independent Engineer may reasonably require for conducting the Tests. In the event of the Concessionaire and the Independent Engineer failing to mutually agree on the dates for conducting the Tests, the Concessionaire shall fix the dates by not less than 10 (ten) days notice to the Independent Engineer.

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

14.2 Completion Certificate

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

14.3 Provisional Certificate

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

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work remaining incomplete if the delay in completion thereof is attributable to the Authority.

14.3.2 The Parties hereto expressly agree that a Provisional Certificate under this Clause 14.3 may, upon request of the Concessionaire to this effect, be issued for operating part of the Project, if at least 75% (seventy five per cent) of the total length of the Project has been completed. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part.

14.4 Completion of Punch List items

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

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

14.5 Withholding of Provisional Certificate

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

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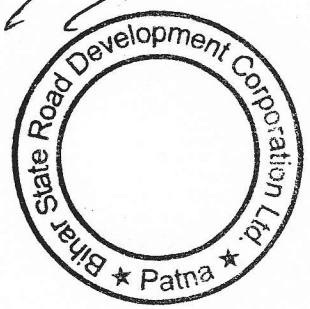
such defects or deficiencies and thereupon Tests shall be undertaken in accordance with this Article 14. Such procedure shall be repeated as necessary until the defects or deficiencies are rectified.

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

14.6 Rescheduling of Tests

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





ARTICLE 15

ENTRY INTO COMMERCIAL SERVICE

15.1 Commercial Operation Date (COD)

The Project shall be deemed to be complete when the Completion Certificate or the Provisional Certificate, as the case may be, is issued under the provisions of Article 14, and accordingly the commercial operation date of the Project shall be the date on which such Completion Certificate or the Provisional Certificate is issued (the "**COD**"). The Project shall enter into commercial service on COD whereupon the Concessionaire shall be entitled to demand and collect Fee in accordance with the provisions of Article 27.

15.2 Damages for delay

Subject to the provisions of Clause 12.4, if COD does not occur prior to the 91st (ninety first) day from the Scheduled Commissioning Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one per cent) of the amount of Performance Security for delay of each day until COD is achieved.

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ARTICLE 16

CHANGE OF SCOPE

16.1 Change of Scope

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

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

16.2 Procedure for Change of Scope

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

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

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

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

16.2.3 Upon receipt of information set forth in Clause 16.2.2, if the Authority decides to proceed with the Change of Scope, it shall convey its preferred

option to the Concessionaire, and the Parties shall, with assistance of the Independent Engineer, thereupon make good faith efforts to agree upon the time and costs for implementation thereof. Upon reaching an agreement, the Authority shall issue an order (the "**Change of Scope Order**") requiring the Concessionaire to proceed with the performance thereof. In the event that the Parties are unable to agree, the Authority may, by issuing a Change of Scope Order, require the Concessionaire to proceed with the performance thereof pending resolution of the Dispute, or carry out the works in accordance with Clause 16.5.

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

16.3 Payment for Change of Scope

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

16.3.2 Notwithstanding anything to the contrary contained in Clause 16.3.1, all costs arising out of any Change of Scope Order issued during the Construction Period shall be borne by the Concessionaire, subject to an aggregate ceiling of 0.25% (zero point two five per cent) of the Total Project Cost. Any costs in excess of the ceiling shall be reimbursed by the Authority in accordance with Clause 16.3.1. In the event that the total cost arising out of Change of Scope Orders (if any) issued prior to the Project Completion Date is less than 0.25% (zero point two five per cent) of the Total Project Cost, the difference thereof shall be credited by the Concessionaire to the Safety Fund within a period of 180 (one hundred and eighty) days of the Project Completion Date. For the avoidance of doubt, it is agreed that the aforesaid 0.25% (zero point two five per cent) of the Total Project Cost shall, to the extent borne by the Concessionaire, be deemed to form part of the actual capital cost of the Project.

16.4 Restrictions on certain works

16.4.1 Notwithstanding anything to the contrary contained in this Article 16, the Authority shall not require the Concessionaire to undertake any works or

services if such works or services are likely to delay completion of the Project; provided that in the event that the Authority considers such works or services to be essential, it may issue a Change of Scope Order, subject to the condition that the works forming part of or affected by such Order shall not be reckoned for purposes of determining completion of the Project and issuing the Provisional Certificate.

16.4.2 Notwithstanding anything to the contrary contained in this Article 16, the Concessionaire shall be entitled to nullify any Change of Scope Order if it causes the cumulative costs relating to all the Change of Scope Orders to exceed 5% (five per cent) of the Total Project Cost in any continuous period of 3 (three) years immediately preceding the date of such Change of Scope Order or if such cumulative costs exceed 20% (twenty per cent) of the Total Project Cost at any time during the Concession Period.

16.5 Power of the Authority to undertake works

16.5.1 Notwithstanding anything to the contrary contained in Clauses 16.2 and 16.3, the Authority may, after giving notice to the Concessionaire and considering its reply thereto, award such works or services to any person on the basis of open competitive bidding; provided that the Concessionaire shall have the option of matching the first ranked bid in terms of the selection criteria, subject to payment of 2% (two per cent) of the bid amount to the Authority[$], and thereupon securing the award of such works or services. For the avoidance of doubt, it is agreed that the Concessionaire shall be entitled to exercise such option only if it has participated in the bidding process and its bid does not exceed the first ranked bid by more than 10% (ten percent) thereof. It is also agreed that the Concessionaire shall provide assistance and cooperation to the person who undertakes the works or services hereunder.

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

16.6 Reduction in Scope of the Project

16.6.1 If the Concessionaire shall have failed to complete any Construction Works on account of Force Majeure or for reasons solely attributable to the Authority, the Authority may, in its discretion, require the Concessionaire to pay 80% (eighty percent) of the sum saved therefrom, and upon such payment to the Authority, the obligations of the Concessionaire in respect of such works shall be deemed to have been fulfilled. For the avoidance of doubt, it is agreed that in the event such reduction in Scope of the Project causes or will cause a reduction in net after-tax return of the Concessionaire, the Parties shall meet, as soon as reasonably practical, and agree on a full or partial waiver of the aforesaid payment of 80% (eighty per cent) so as to

[$] The Authority shall transfer 75% (seventy five percent) of the amount so received to the first ranked bidder whose bid shall have been matched by the Concessionaire.

place the Concessionaire in the same financial position as it would have enjoyed had there been no reduction in Scope of the Project. It is further agreed that the liability of the Authority under this Clause 16.6 shall not extend beyond waiver of the aforesaid 80% (eighty per cent). It is also agreed that in the event of a dispute, the Dispute Resolution Procedure shall apply.

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

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ARTICLE 17

OPERATION AND MAINTENANCE

17.1 O&M obligations of the Concessionaire

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

(a) permitting safe, smooth and uninterrupted flow of traffic on the Project during normal operating conditions;

(b) collecting and appropriating the Fee;

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

(d) carrying out periodic preventive maintenance of the Project;

(e) undertaking routine maintenance including prompt repairs of potholes, cracks, joints, drains, embankments, structures, pavement markings, lighting, road signs and other traffic control devices;

(f) undertaking major maintenance such as resurfacing of pavements, repairs to structures, and repairs and refurbishment of tolling system and other equipment;

(g) preventing, with the assistance of concerned law enforcement agencies, any unauthorised use of the Project;

(h) preventing, with the assistance of the concerned law enforcement agencies, any encroachments on the Project;

(i) protection of the environment and provision of equipment and materials therefore;

(j) operation and maintenance of all communication, control and administrative systems necessary for the efficient operation of the Project;

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

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

17.1.2 The Concessionaire shall remove promptly from the Project all surplus construction machinery and materials, waste materials (including hazardous materials and waste water), rubbish and other debris (including, without limitation, accident debris) and keep the Project in a clean, tidy and orderly condition, and in conformity with the Applicable Laws, Applicable Permits and Good Industry Practice.

17.1.3 The Concessionaire shall maintain, in conformity with Good Industry Practice, all stretches of approach roads, over-passes, under-passes or other structures situated on the Site but not forming part of the carriageway.

17.2 Maintenance Requirements

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

17.3 Maintenance Manual

17.3.1 No later than 180 (one hundred and eighty) days prior to the Scheduled Commissioning Date, the Concessionaire shall, in consultation with the Independent Engineer, evolve a repair and maintenance manual (the "**Maintenance Manual**") for the regular and preventive maintenance of the Project in conformity with the Specifications and Standards, Maintenance Requirements, Safety Requirements and Good Industry Practice, and shall provide 5 (five) copies thereof to the Authority and 2 (two) copies to the Independent Engineer. The Maintenance Manual shall be revised and updated once in every 3 (three) years and the provisions of this Clause 17.3 shall apply, *mutatis mutandis*, to such revision.

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

17.4. Monitoring Manual

17.4.1. Not later than 90 (ninty) days prior to the Scheduled Commissioning Date, the Concessionaire shall, in consultation with the Independent Engineer, evolve a monitoring manual (the "**Monitoring Manual**") for the regular and preventive monitoring of the Project in conformity with the Monitoring Requirements and Good Industry Practice, and shall provide 5 (five) copies thereof to the Authority and 2 (two) copies to the Independent Engineer. The Maintenance Manual shall be revised and updated once every 5 (five) years

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and the provisions of this Clause 17.4 shall apply, *mutatis mutandis*, to such revision.

17.4.2 Without prejudice to the provision of Clause 17.4.1, the Monitoring Manual shall, in particular, include provisions for maintenance of Project Assets and shall provide for life cycle monitoring, routine monitoring and reactive monitoring which may be reasonably necessary for maintenance and repair of the Project Assets, including replacement thereof, such that its overall condition conforms to Good Industry Practice

17.5 Maintenance Programme

17.5.1 No later than 45 (forty five) days prior to the beginning of each Accounting Year during the Operation Period, the Concessionaire shall provide to the Authority and the Independent Engineer, its proposed annual programme of preventive, urgent and other scheduled maintenance (the "**Maintenance Programme**") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements. Such Maintenance Programme shall include:

(a) preventive maintenance schedule;

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

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

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

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

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

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

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

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

17.6 Monitoring Programme

17.6.1 Not later than 45 (forty five) days prior to the beginning of each Accounting Year during the Operation Period, the Concessionaire shall provide to the Authority and the Independent Engineer, its proposed annual programme of

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preventive, urgent and other scheduled monitoring (the "**Monitoring Programme**") to comply with the Monitoring Requirements, Monitoring Manuals and Safety Requirements. Such Monitoring Programme shall include:

(a) strain measurement;

(b) deflection measurement;

(c) temperature measurement;

(d) corrosion measurement;

(e) crack detection and crack widths; and

(f) support settlement measurement;

This monitoring to be done by the professionally qualified and trained people at a gap of not exceeding 6 months.

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

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

17.7 Third Party Quality Control

In order to ensure the quality and effectiveness of the rehabilitation work, monitoring is to be carried out both during the rehabilitation work and subsequently during the concession period by the concessionaire. Independent verification of the monitoring would be done through a third party quality control. For this purpose, a separate agency shall be appointed by the authority for carrying out independent monitoring for the bridge performance. The concessionaire shall be required to fully cooperate with agency and facilitate them in use of instrumentation equipment, taking samples, transportation and other testing and monitoring activities including access to documents/monitoring record/manual at no extra time and cost to the authority.

17.8 Safety, vehicle breakdowns and accidents

17.8.1 The Concessionaire 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 including the setting up of temporary traffic cones and lights, and removal of obstruction

and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good Industry Practice.

17.8.2 The Concessionaire's responsibility for rescue operations on the Project shall be limited to an initial response to any particular incident until such time that the competent authority takes charge and shall include prompt removal of vehicles or debris or any other obstruction, which may endanger or interrupt the smooth flow of traffic.

17.9 De-commissioning due to Emergency

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

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

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

17.10 Lane closure

17.10.1 The Concessionaire shall not close any lane of the Project for undertaking maintenance or repair works except with the prior written approval of the Independent Engineer. Such approval shall be sought by the Concessionaire through a written request to be made at least 7 (seven) days before the proposed closure of lane and shall be accompanied by particulars thereof. Within 3 (three) days of receiving such request, the Independent Engineer shall grant permission with such modifications as it may deem necessary and a copy of such permission shall be sent to the Authority.

17.10.2 The provisions of Clause 17.7.1 shall not apply to de-commissioning under Clause 17.6.1 or to closure of any lane for a period not exceeding 2 (two) hours in a day at any time of the day and 6 (six) hours in a day at a time specified by the Independent Engineer as off-peak hours when the flow of traffic is comparatively lower.

17.10.3 Upon receiving the permission pursuant to Clause 17.7.1, the Concessionaire shall be entitled to close the designated lane for the period

specified therein, and in the event of any delay in re-opening such lane, the Concessionaire shall pay Damages to the Authority calculated at the rate of 0.1% (zero point one per cent) of the Average Daily Fee for every stretch of 250 (two hundred and fifty) metres, or part thereof, for each day of delay until the lane has been re-opened for traffic.

17.11 Damages for breach of maintenance obligations

17.11.1 In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 0.5% (zero point five per cent) of Average Daily Fee, and (b) 0.1% (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer.

Notwithstanding anything contained in this agreement, should the actual traffic exceed the designed capacity, during any year or part thereof and the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled, from such date, to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 5% (five percent)of average daily fee, and (b) 1% (one percent) of the cost of such repair or rectification as estimated by the Independent Engineer, for the balance period of the concession.

Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.

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

17.12 Authority's right to take remedial measures

17.12.1 In the event the Concessionaire does not maintain and/or repair the Project or any part thereof in conformity with the Maintenance Requirements, the Maintenance Manual or the Maintenance Programme, as the case may be, and fails to commence remedial works within 15 (fifteen) days of receipt of the O&M Inspection Report or a notice in this behalf from the Authority or the Independent Engineer, as the case may be, the Authority shall, without prejudice to its rights under this Agreement including Termination thereof, be entitled to undertake such remedial measures at the risk and cost of the Concessionaire, and to recover its cost from the Concessionaire. In addition

to recovery of the aforesaid cost, a sum equal to 20% (twenty per cent) of such cost shall be paid by the Concessionaire to the Authority as Damages.

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

17.13 Overriding powers of the Authority

17.13.1 If in the reasonable opinion of the Authority, the Concessionaire is in material breach of its obligations under this Agreement and, in particular, the Maintenance Requirements, and such breach is causing or likely to cause material hardship or danger to the Users, the Authority may, without prejudice to any of its rights under this Agreement including Termination thereof, by notice require the Concessionaire to take reasonable measures immediately for rectifying or removing such hardship or danger, as the case may be.

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

17.13.3 In the event of a national emergency, civil commotion or any other act specified in Clause 34.3, the Authority may take over the performance of any or all the obligations of the Concessionaire to the extent deemed necessary by it or as directed by the Government, and exercise such control over the Project or give such directions to the Concessionaire as may be deemed necessary; provided that the exercise of such overriding powers by the Authority shall be of no greater scope and of no longer duration than is reasonably required in the circumstances which caused the exercise of such overriding power by the Authority. For the avoidance of doubt, it is agreed that the consequences of such action shall be dealt in accordance with the provisions of Article 34. It is also agreed that the Concessionaire shall comply with such instructions as the Authority may issue in pursuance of the provisions of this Clause 17.10, and shall provide assistance and cooperation to the Authority, on a best effort basis, for performance of its obligations hereunder.

Bihar State Road Development Corporation Ltd.

Navayuga Jahnaa Bridge Pvt. Ltd.

17.14 Restoration of loss or damage to Project

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

17.15 Modifications to the Project

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

17.16 Excuse from performance of obligations

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

(a) an event of Force Majeure;

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

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

Notwithstanding the above, the Concessionaire shall keep all unaffected parts of the Project open to traffic provided they can be operated safely.

17.17 Barriers and diversions

The Authority shall procure that during the Operation Period, no barriers are erected or placed by any Government Instrumentality on the Project except for reasons of Emergency, national security, law and order or collection of inter-state taxes. The Authority shall also make best endeavours to procure that no Government Instrumentality shall undertake or cause to be undertaken, except for reasons of Emergency, national security or law and order, any diversions of traffic from, or closing down of approach roads to the Project that may cause a material adverse effect on the flow of traffic to and from the Project.

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17.18 Advertising on the Site

The Concessionaire shall not undertake or permit any form of commercial advertising, display or hoarding at any place on the Site if such advertising, display or hoarding shall be visible to the Users while driving on such project; provided that this restriction shall not apply to the Toll Plaza[s], rest areas, bus shelters and telephone booths located on the Project reach if the advertising thereon does not, in the opinion of the Authority, distract the Users or violates extant guidelines of MoSRTH. All advertising on the Project shall also conform to Good Industry Practice. For the avoidance of doubt, it is agreed that the rights of the Concessionaire hereunder shall be subject to Applicable Laws, as in force and effect from time to time, and no compensation shall be claimed on account thereof.





ARTICLE 18

SAFETY REQUIREMENTS

18.1 Safety Requirements

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

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

18.2 Expenditure on Safety Requirements

All costs and expenses arising out of or relating to Safety Requirements shall be borne by the Concessionaire to the extent such costs and expenses form part of the works and services included in the Scope of the Project, and works and services, if any, not forming part of the Scope of the Project shall be undertaken in accordance with the provisions of Article 16. Costs and expenses on works and services not covered hitherto before and arising out of Safety Requirements shall, subject to the provisions of Clause 16.3.2, be borne from out of a dedicated safety fund (the "**Safety Fund**") to be funded, owned and operated by the Authority or a substitute thereof.

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ARTICLE 19

MONITORING OF OPERATION AND MAINTENANCE

19.1 Monthly status reports

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

19.2 Inspection

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

19.3 Tests

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

19.4 Remedial measures

19.4.1 The Concessionaire shall repair or rectify the defects or deficiencies, if any, set forth in the O&M Inspection Report or in the test results referred to in Clause 19.3 and furnish a report in respect thereof to the Independent Engineer and the Authority within 15 (fifteen) days of receiving the O&M Inspection Report or the test results, as the case may be; provided that where the remedying of such defects or deficiencies is likely to take more than 15 (fifteen) days, the Concessionaire shall submit progress reports of the repair works once every week until such works are completed in conformity with this Agreement.

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

19.5 Monthly Fee Statement

During the Operation Period, the Concessionaire shall furnish to the Authority, within 7 (seven) days of completion of each month, a statement of Fee substantially in the form set forth in Schedule-M (the "**Monthly Fee Statement**"). The Concessionaire shall also furnish to the Authority such other information as the Authority may reasonably require, at specified intervals, in discharge of its statutory functions.

19.6 Reports of unusual occurrence

The Concessionaire shall, prior to the close of each day, send to the Authority and the Independent Engineer, by facsimile or e-mail, a report stating accidents and unusual occurrences on the Project reach relating to the safety and security of the Users and Project. A weekly and monthly summary of such reports shall also be sent within three days of the closing of each week and month, as the case may be. For the purposes of this Clause 19.6, accidents and unusual occurrences on the Project shall include:

(a) death or injury to any person;

(b) damaged or dislodged fixed equipment;

(c) any obstruction on the Projectreach, which results in slow down of the services being provided by the Concessionaire;

(d) disablement of any equipment during operation;

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

(f) smoke or fire;

(g) flooding of the Project; and

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

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ARTICLE 20

TRAFFIC REGULATION

20.1 Traffic regulation by the Concessionaire

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

20.2 Police assistance

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

20.3 Buildings for Traffic Aid Posts

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

20.4 Recurring expenditure on Police assistance

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

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ARTICLE 21

EMERGENCY MEDICAL AID

21.1 Medical Aid Posts

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

21.2 Buildings for Medical Aid Posts

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

21.3 Recurring expenditure on Medical Aid Posts

On or before COD, the Concessionaire shall provide to the State Medical Department or a substitute thereof to be designated by the Authority one ambulance in good working condition along with chauffeurs for round-the-clock ambulance services as set forth in Clause 21.1 and meet the operating costs of such ambulance including the salaries and allowances of the chauffeurs. The Concessionaire shall also reimburse to the State Medical Department (or a substitute thereof to be designated by the Authority) the actual expenditure incurred by it in each Accounting Year on the medical equipment, and the pay and allowances of up to 2 (two) medical personnel deployed exclusively for the Medical Aid Posts and ambulance, and shall maintain the Medical Aid Post buildings in accordance with Good Industry Practice. For the avoidance of doubt, it is agreed that the Concessionaire shall not be liable for any other expenditure incurred by the State Medical Department or a substitute thereof to be designated by the Authority.

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ARTICLE 22

TRAFFIC CENSUS AND SAMPLING

22.1 Traffic census

The Concessionaire shall install, maintain and operate electronic/computerised traffic counters at each of the Toll Plaza[s] and collect data relating to the number and types of vehicles using the Project. The Concessionaire shall also install, maintain and operate weighing platforms (weigh-in-motion type) for recording, on a sample basis, the weight of commercial goods vehicles using the Project reach. A weekly statement of such data shall be compiled and furnished forthwith by the Concessionaire to the Authority substantially in the form specified in Schedule-N.

22.2 Traffic survey

The Authority may require the Concessionaire to conduct, during each year of the Concession Period, a detailed traffic survey at such frequency and on such days as the Authority may specify, provided that the cumulative period of such survey shall not exceed 14 (fourteen) days in a year. The Concessionaire shall, at its own cost, carry out or cause to be carried out, the survey in the form and manner reasonably specified by the Authority and furnish a detailed report thereof within 15(fifteen) days of the completion of each survey. For the avoidance of doubt, the Authority may also conduct traffic surveys, in such manner as it deems fit and at its own cost, through any agency designated by it for this purpose.

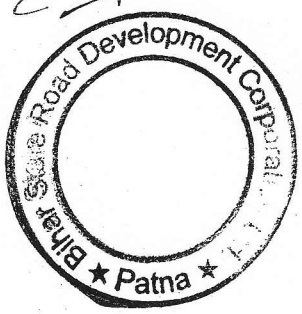
22.3 Traffic sampling

22.3.1 For determining the actual traffic on the Project, the Authority shall be entitled to inspect the relevant records of the Concessionaire, and may, at its own cost, undertake traffic sampling substantially in the manner set forth in Schedule-O at such frequency as it may deem appropriate, but in no case for less than a continuous period of 7 (seven) days. The Concessionaire shall provide such assistance as the Authority may reasonably require for such traffic sampling.

22.3.2 If the traffic sampling pursuant to this Clause 22.3 demonstrates that the actual traffic is more than the traffic reported by the Concessionaire, the traffic determined by the traffic sampling shall be deemed to be the traffic for purposes of this Agreement and in the event of any Dispute relating to the traffic sampling, the Dispute Resolution Procedure shall apply. For the avoidance of doubt, Realisable Fee for any comparable period shall be calculated with reference to the traffic determined hereunder.

22.4 Computer systems and network

The Concessionaire shall install, operate and maintain a computer system with round-the-clock connections to the networks of the Authority and other related entities for exchange of data and information useful or necessary for efficient and transparent regulation and management of traffic. For this purpose, it shall follow such protocol for Electronic Data Interchange (the "**EDI**") as the Authority may specify. For the avoidance of doubt, it is agreed that the form specified in Schedule-N may be modified by the Authority from time to time for conforming to the requirements and output of EDI.





ARTICLE 23

INDEPENDENT ENGINEER

23.1 Appointment of Independent Engineer

The Authority shall appoint a consulting engineering firm from a panel of 10 (ten) firms or bodies corporate, constituted by the Authority substantially in accordance with the selection criteria set forth in Schedule-P, to be the independent consultant under this Agreement (the "**Independent Engineer**"). The appointment shall be made no later than 90 (ninety) days from the date of this Agreement and shall be for a period of 3 (three) years. On expiry or termination of the aforesaid period, the Authority may in its discretion renew the appointment, or appoint another firm from a fresh panel constituted pursuant to Schedule-P to be the Independent Engineer for a term of 3 (three) years, and such procedure shall be repeated after expiry of each appointment.

23.2 Duties and functions

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

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

23.3 Remuneration

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

23.4 Termination of appointment

23.4.1 The Authority may, in its discretion, terminate the appointment of the Independent Engineer at any time, but only after appointment of another Independent Engineer in accordance with Clause 23.1.

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

appointment of the Independent Engineer is terminated hereunder, the Authority shall appoint forthwith another Independent Engineer in accordance with Clause 23.1.

23.5 Authorised signatories

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

23.6 Dispute resolution

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

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Part IV
Financial Covenants

Bihar State Road Development Corporation Ltd. Patna

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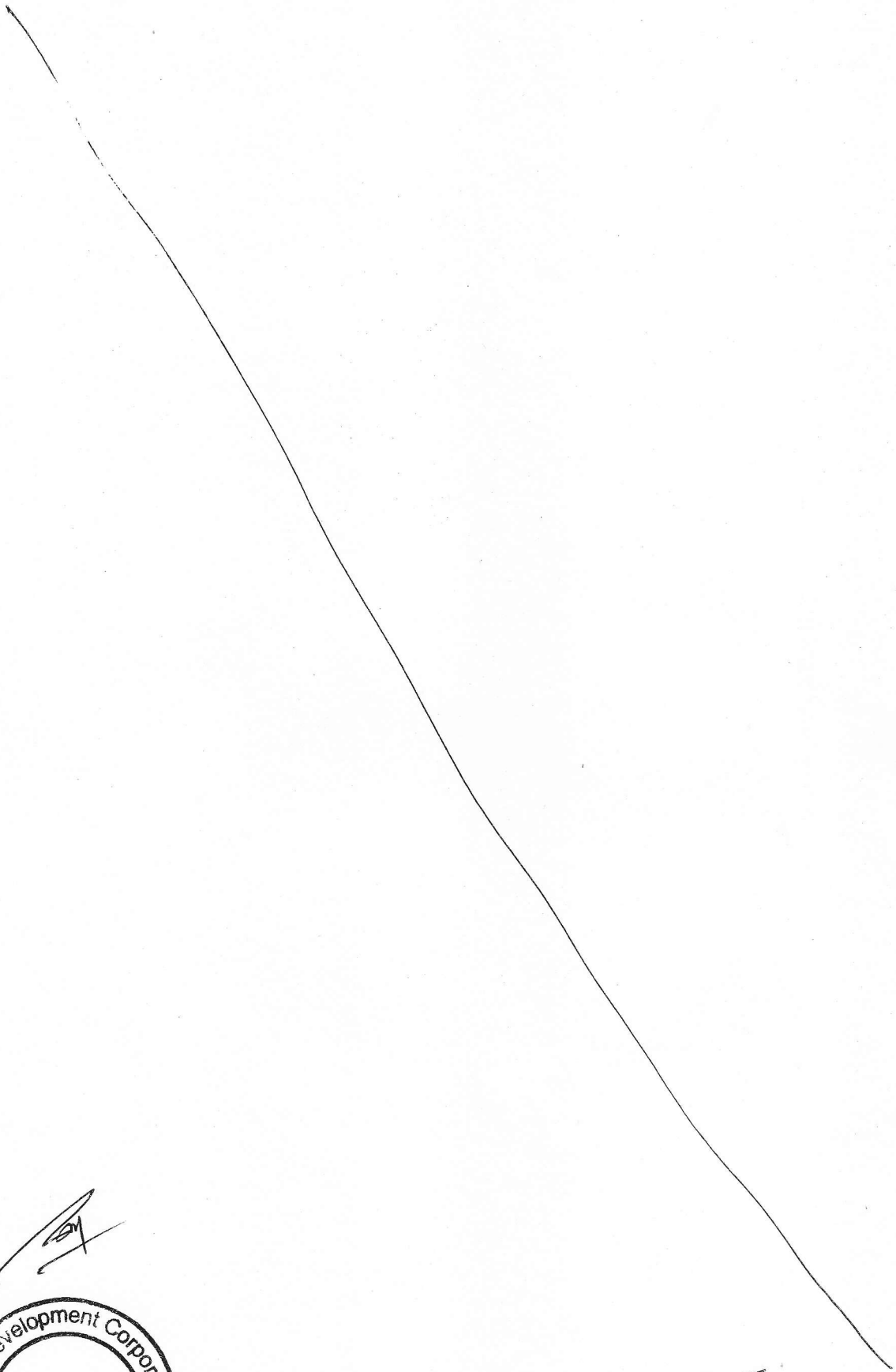

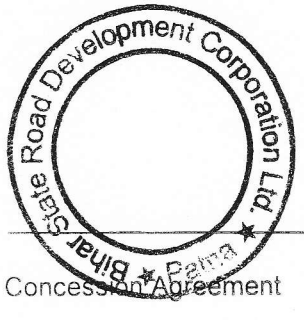
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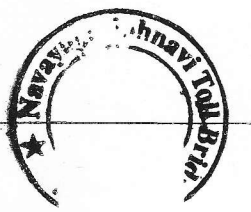

ARTICLE 24

FINANCIAL CLOSE

24.1 Financial Close

24.1.1 The Concessionaire hereby agrees and undertakes that it shall achieve Financial Close within 180 (one hundred and eighty) days from the date of this Agreement and in the event of delay, it shall be entitled to a further period not exceeding 120 (one hundred and twenty) days, subject to payment of Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one per cent) of the Performance Security for each day of delay; provided that the Damages specified herein shall be payable every week in advance and the period beyond the said 180 (one hundred and eighty) days shall be granted only to the extent of Damages so paid; provided further that no Damages shall be payable if such delay in Financial Close has occurred solely as a result of any default or delay by the Authority in procuring satisfaction of the Conditions Precedent specified in Clause 4.1.2 or due to Force Majeure.

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

24.2 Termination due to failure to achieve Financial Close

24.2.1 Notwithstanding anything to the contrary contained in this Agreement, but subject to Clause 34.6.1, in the event that Financial Close does not occur, for any reason whatsoever, within the period set forth in Clause 24.1.1, all rights, privileges, claims and entitlements of the Concessionaire under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Concessionaire, and the Concession Agreement shall be deemed to have been terminated by mutual agreement of the Parties. For the avoidance of doubt, it is agreed that in the event the Parties hereto have, by mutual consent, determined the Appointed Date to precede the Financial Close, the provisions of this Clause 24.2.1 shall not apply.

24.2.2 Upon Termination under Clause 24.2.1, the Authority shall be entitled to encash the Bid Security and appropriate the proceeds thereof as Damages: provided, however, if Financial Close has not occurred solely as a result of the Authority being in default of any of its obligations under Clause 4.1.2, it shall, upon Termination, return the Bid Security forthwith along with Damages equal to 25% (twenty-five per cent) thereof. For the avoidance of doubt, it is expressly agreed that if the Bid Security shall have been substituted by Performance Security, the Authority shall be entitled to encash therefrom an amount equal to Bid Security.

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BIHAR STATE ROAD DEVELOPMENT CORPORATION LIMITED
(A GOVT. OF BIHAR UNDERTAKING)

Development of Greenfield Bridge across River Ganges and its approaches connecting Bakhtiyarpur Bypass of NH-31 near village Karjan & NH-28 at Tajpur in the State of Bihar on DBFOT (Toll) basis

Concession Agreement
between
Bihar State Road Development Corporation Limited
And
Navayuga Jahnavi Toll Bridge Private Limited

Volume- II
Part – I : Schedules

Schedules

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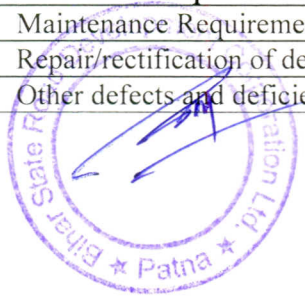



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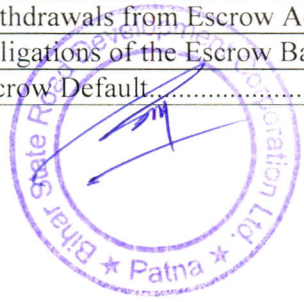



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Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

SCHEDULE – A
(See Clause 10.1)

SITE OF THE PROJECT

1 The Site

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

1.2 An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Concessionaire, and such inventory shall form part of the memorandum referred to in Clause 10.3.1 of the Agreement.

1.3 Additional land required for Toll Plazas, Traffic Aid Posts, Medical Aid Posts and vehicle rescue posts or for construction of works specified in the Change of Scope Order issued under Clause 16.2.3 of this Agreement shall be acquired in accordance with the provisions of Clause 10.3.6 of this Agreement. Upon acquisition, such land shall form part of the Site and vest in the Authority.

2 Additional Land for [Six-Laning]-deleted

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Annex - I

(Schedule-A)

Site for the Project

[**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.]

1. Site

The existing site of the Project does not comprise of any existing facility as this is a proposed Greenfield Bridge and approach road project. Presently there is only natural stream of river Ganga, barren and agricultural land, canals, railway lines and some minor settlement areas.

The site of the Four-Lane Greenfield Bridge and its approaches is a missing link between NH-31 near Karjan village of Bakhtiyarpur and NH-28 at Tajpur. The proposed facility comprises of 4 lane Bridge across River Ganga (5.55 km long) and 45.393 km long approach road including RoB, major & minor bridges.

The land along the proposed approach road is a combination of barren land and cultivated land with some built-up, commercial pockets in terms of small urban development. Some part of land is passing through flood plains of Ganga and being used as agricultural land. There are shrubs along the banks of Ganga. The project road is not passing through any reserved forest area.

The list of villages enroute are listed as under:

1	Karjan Village
2	Jamalpur Village
3	Athmalgola
4	Bingama Village
5	Chak Saho Village
5	Chak Raj Ali Village
7	Ismailpur Village
8	Nandini Lagunia Rly Station
9	Ramnagar Chokdar Village
10	Bhagwatipur Village
11	Hundi Tajpur Village
12	Bazidpur Village
13	Pachbhinda Village
14	Dadanpur Village
15	Harpur Bhendi Village
16	Chandauli Village
17	Rajkhand Village
18	Asari Village Village
19	End of Approach on NH-28 at Tajpur

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2. Land

S. No.	Chainage (In km)		Total ROW (In m)	Remarks
	From	To		
1.	N/A	N/A	N/A	Since this is a proposed Greenfield alignment so there is no existing facility.

60m Right of Way is required to be acquired for Four-Lane Greenfield Bridge and its approaches. However in area of high embankment near bridge abutment, 90 m ROW is to be acquired.

3. Carriageway

There is no existing carriageway since this is a proposed Greenfield alignment.

4. Major Bridges

S.No	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

5. Railway Over Bridges

S.No.	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

6. Grade Separators

S.No	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

7. Minor Bridges

S. No.	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

8. Total number of structures

Since this is a proposed Greenfield alignment so there is no existing facility.

9. Bus bays and Truck Lay byes

Since this is a proposed Greenfield alignment so there is no existing facility.

10. Permanent Bridge, Bye Pass or Tunnel costing Rs. 50 crore or more

Since this is a proposed Greenfield alignment so there is no existing facility.

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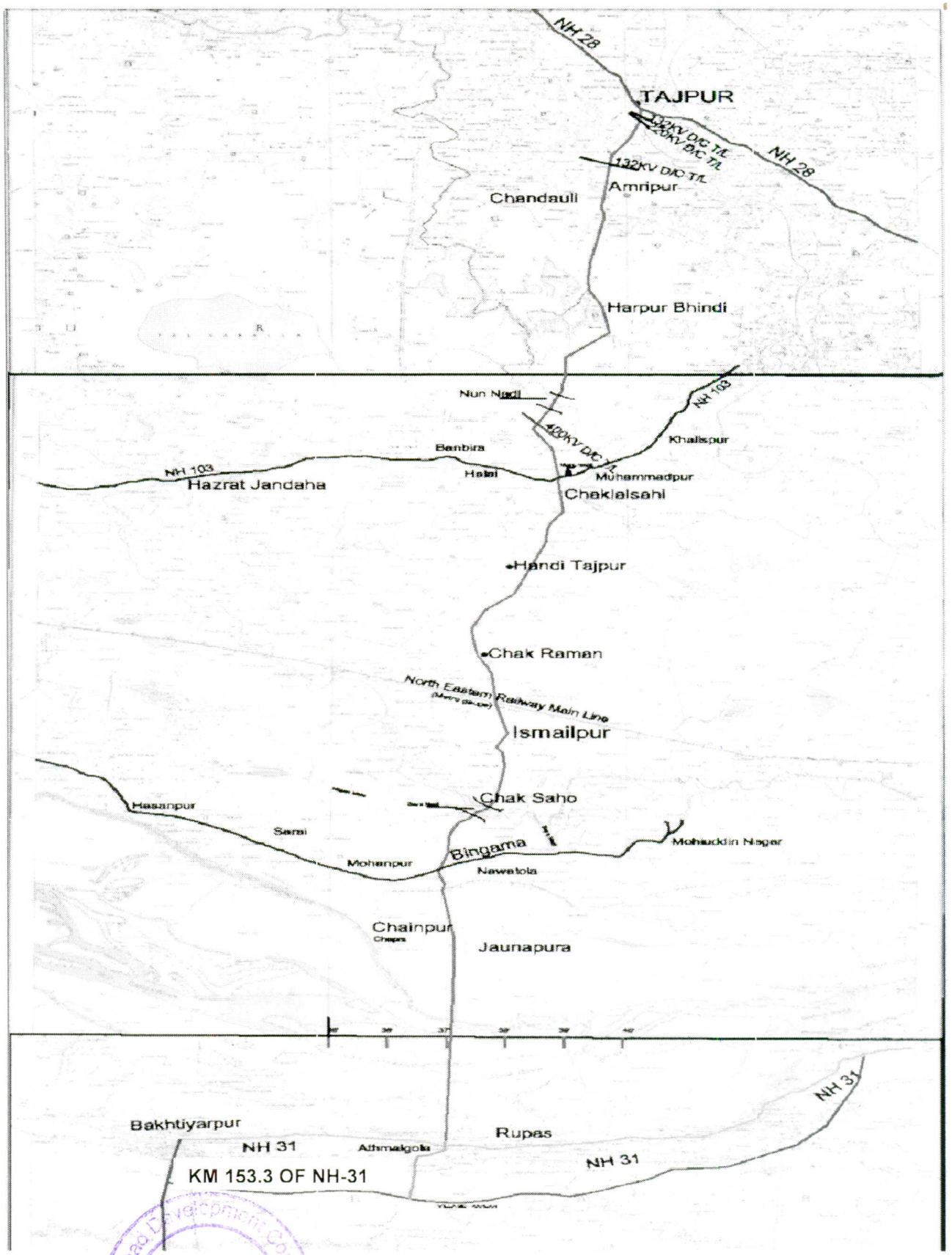


KEY PLAN

State Road Development Corporation Ltd. Bihar Patna

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Annex - II

(Schedule-A)

Site for [Six-Laning]

Six-laning is beyond the purview of the present study.

SCHEDULE - B

(See Clause 2.1)

DEVELOPMENT OF THE PROJECT

1 Development of the Project

Development of the Project shall include construction of the Greenfield bridge and its approaches connecting NH-31 (Proposed Bypass) & NH-28 as described in this Schedule-B and in Schedule-C.

2 Construction of the Project

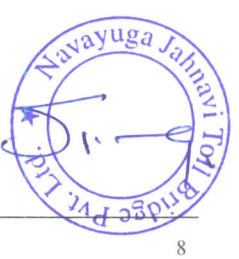
2.1 Construction of the Project shall include construction of the Greenfield bridge and its approaches connecting NH-31 (Proposed Bypass) & NH-28 as described in Annex-I of this Schedule-B and Annex-I of Schedule-C.

2.2 Construction of the Project shall be completed by the Concessionaire in conformity with the Specifications and Standards set forth in Annex-I of Schedule-D.

3 [Six-Laning]

Six-laning is beyond the purview of present study





Annex - I
(Schedule-B)

Description of the Project

1 Width of Carriageway

1.1 The paved carriageway shall be 18 metres wide excluding the median:

Provided that in the urban and semi-urban sections, the carriageway shall, subject to availability of Right of Way, have four lane (18 m wide excluding median) with service roads and foot paths. Since this is a proposed Greenfield alignment, it has been so planned that there is no constriction of carriageway width even at the urban stretches.

The service road locations are enlisted as under:

Sr. No.	Design Chainage	Side	Length (km)
1	12+750 to 13+400	both	1.30
2	13+875 to 14+700	both	1.65
3	18+025 to 19+000	both	1.95
4	25+675 to 26+675	both	2.00
5	31+275 to 32+225	both	1.90
6	45+350 to 45+975	both	1.25

The improvements given above are the minimum required.

1.2 Except as otherwise provided in this Agreement, the width of the paved carriageway shall conform to Clause 1.1 above.

1.3 **Bridges**

The new bridge across river Ganga, viaduct on both sides of approaches to bridge and structures other than Ganga bridges shall be developed in accordance with Manual of Specification & Standard for 4 laning of National Highways through Public Private Partnership & then prevailing IRC/MoRT&H standards & guidelines.

The proposed Greenfield Bridge and its approach viaduct shall have following salient features:

1. The total length of bridge is 5550m comprising of 2250m as navigational spans and 3250m as non navigational spans. Beyond 5500m length of bridge, embankment and spans for length 1075m & 430 m towards South & North side respectively has been proposed.
2. Double D- well foundations approximately 65m deep are proposed based on scour considerations. However, if bidders propose to adopt

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the pile foundation, the proposal shall be duly supported with all design details & calculations conforming to the hydraulic & structural design requirements, construction methodology etc. as per the latest IRC guidelines & best international practice subject to approval from Authority / Govt. of Bihar." In such case, the concessionaire shall be solely responsible for undertaking all the necessary surveys, investigations and detailed designs in accordance with good industry practice and due diligence, and shall have no claim against the authority for any loss, damage, risk, costs, liabilities or obligations arising out of or in relation to the project report and other information provided by the Authority. The project reports & other information as provided by the Authority shall be used by the Concessionaire only for its own reference

3. The substructure having appropriate shape and supported on foundations shall be proposed

4. The four lane segmental/cast-in-situ balanced cantilever superstructure comprising of two 2-lane carriageway is supported on foundations

5. 11.75m Deck width has been proposed both for each 2 lane bridge across Ganga and approach viaduct. The deck width comprise of 0.250m for railing, 1.5m for walk way, 0.5m for two crash barriers and 9.0 m for carriageway.

1.4 Proposed Flyovers, Underpass and RoB

Other than bridge on Ganga and approach viaduct, the following major structures are proposed on the alignment. Details of Flyover, Underpass and RoB on the corridor are as listed in the following Table.

Sr. No.	Proposed Chainage	Span configuration	Deck width	Location	Type of structure
1	Km 3+350 (Centre of proposed Bakhtiyarpur Bypass of NH-31)	50	2 X 11.75	Near Kasampur Dhari Village (Over proposed Bakhtiyarpur bypass of NH-31, km 0.00 at existing NH-31)	Grade Separator
2	Km 2+650	1X20	2 X 11.75	Minor Stream near Village Kasampur Dhari (Over proposed Bakhtiyarpur bypass of NH-31, km 0.00 at existing NH-31)	Minor Bridge

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3	Km 1+330	1X20+1X45+1X20	2 X 11.75	Jamalpur (Patna-Howrah Main line) Towards Bakhtiyarpur Bypass of NH-31, km 0.00 at existing NH-31	Rail Over Bridge
4	Km 0+000 (Centre of Existing NH-31)	50	2 X 11.75	Near Rupas Village on existing NH 31.	Grade Separator
5	Km 16+000	3X21	2 X 11.75	Across River Baya	Major Bridge
6	Km 21+086	1 X30 + 1 X45 + 1X 30	2 X 11.75	Ismailpur (on North Eastern Railway main line)	Rail Over Bridge crossing North Eastern line
7	Km 31+725	1 x 45	2 X 11.75	Chaklalsahi on NH-103	Grade Separator
8	Km 34+750	1 X30 + 1 X45 + 1X 30	2 X 11.75	Across River Nun	Major Bridge

Note:

i. Chainages referred to in this section are Design road chainages along the project road alignment. The extended length of southern approach for 3.35 km in length has been considered

ii. Increase in spans due to change in skew angle of Proposed bridges, cross-drainage structures, flyovers, underpasses, overpasses or any other structure, shall be deemed to be included in the scope of the project.

The requirements given above are the minimum requirement for smooth flow of traffic. Any additional requirements as per Manual of specifications & Standards for 4 laning of National Highways through Public Private Partnership shall be carried out in consultation with Independent Engineer. The same shall not constitute a change in scope of work. However any additional works suggested by Independent Engineer based on site requirements shall neither form a change in scope of work nor qualify for variation.

1.5 Proposed Vehicular Underpasses/Cattle Crossing / Pedestrian Underpass/Culverts

The locations and size of all proposed underpasses are tabulated below:

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Sr. No.	Chainage (Km)	Opening Size (m)	Location	Type
1	Km 0+350 (Centre of Existing NH-31)	10.5 x 5	Existing NH-31 to Jamalpur (Over proposed Bakhtiyarpur bypass of NH 31, km 0.00 at existing NH 31)	Vehicular
2	Km 0+850 (Centre of Existing NH-31)	10.5 x 5	Existing NH-31 to Atmalgola & Kalyanpur village (Over proposed Bakhtiyarpur bypass of NH 31, km 0.00 at existing NH 31)	Vehicular
3	Km 13+165	10.5 x 5	Mehnar to Mohiuddiinagar	Vehicular
4	Km 14+282	10.5 x 5		Vehicular
5	Km 18+360	10.5 x5.5	Chakrajali to Sivaisinghpur	Vehicular
6	Km 19+760	4 x 3	Ismailpur to Saidpur	Pedestrian /Cattle
7	Km 23+370	4 x 3	Shahpur to Chakraman	Pedestrian /Cattle
8	Km 26+025	10.5 x 5	Jorpura to Bhagawatipur	Vehicular
9	Km 28+730	4 x 3	Lodhipur to Ohakandsa	Pedestrian /Cattle
10	Km 30+110	4 x 3	Bazidpur to Inerwara	Pedestrian /Cattle
11	Km 31+725	10.5 x 5	Pachbhinda to Muhammadpur	Vehicular
12	Km 38+240	4 x 3		Pedestrian /Cattle
13	Km 43+000	10.5 x 5	Chandauli to Morba	Vehicular
14	Km 44+000	4 x 3	Amritpur to Chandauli	Pedestrian /Cattle

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15	Km 45+673	10.5 X 5		Vehicular
16	Km 47+000	10.5 x 5	Tajpur to Patori	Vehicular

The provision and location of culverts shall be as per the plan and profile drawings of the project forming part of RFP documents, and codal provisions of the standards and specifications as applicable.

The requirements given above are the minimum requirement. Any additional requirements as per Manual of Specifications & Standards for 4 laning of National Highways through Public Private Partnership shall be carried out in consultation with Independent Engineer. The same shall not constitute a change in scope of work. However any additional works suggested by Independent Engineer based on site requirements shall neither form a change in scope of work nor qualify for variation.

2 Project Facilities

Project facilities shall be constructed in conformity with Annex-I of Schedule-C.

3 Specifications and Standards

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

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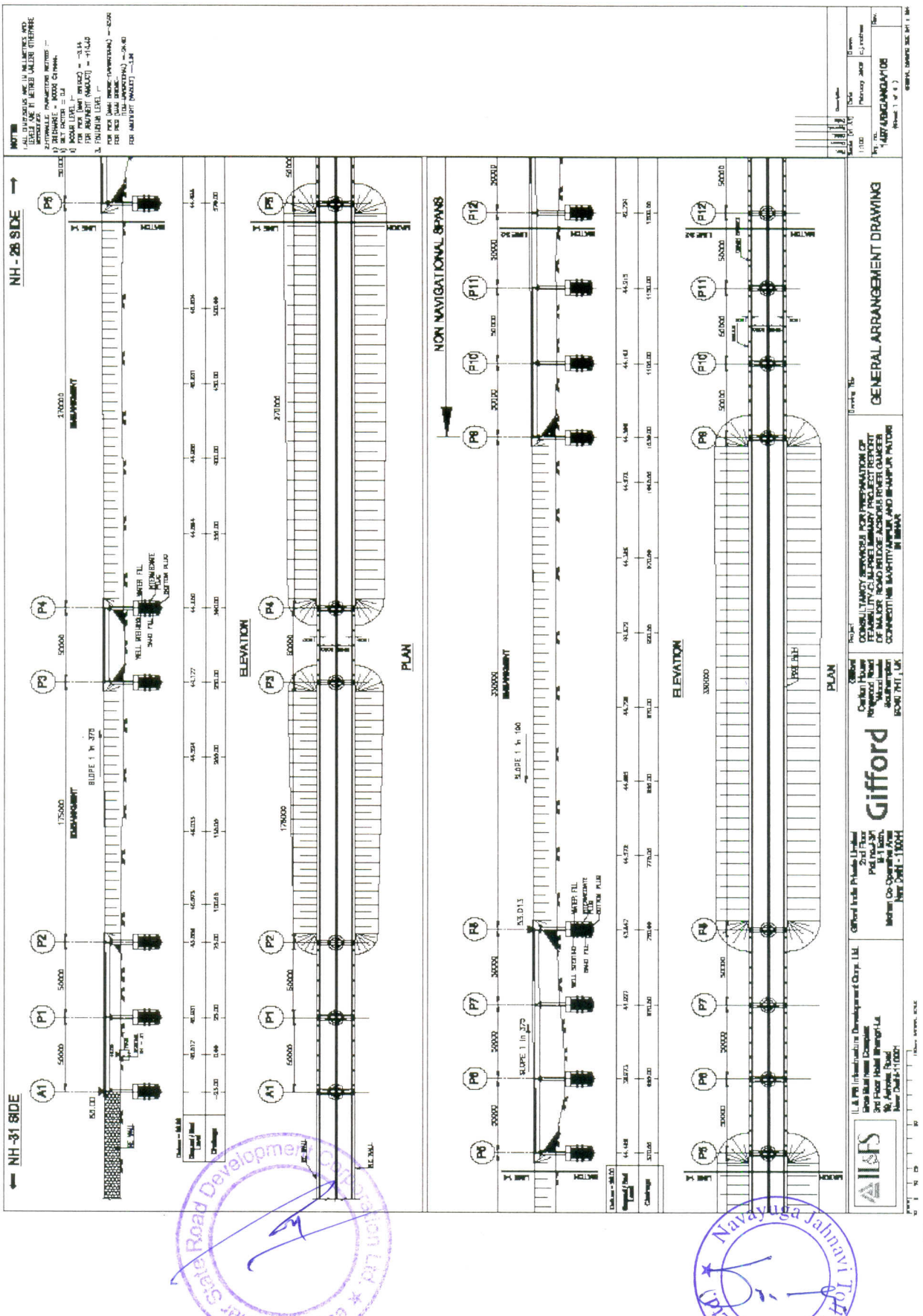
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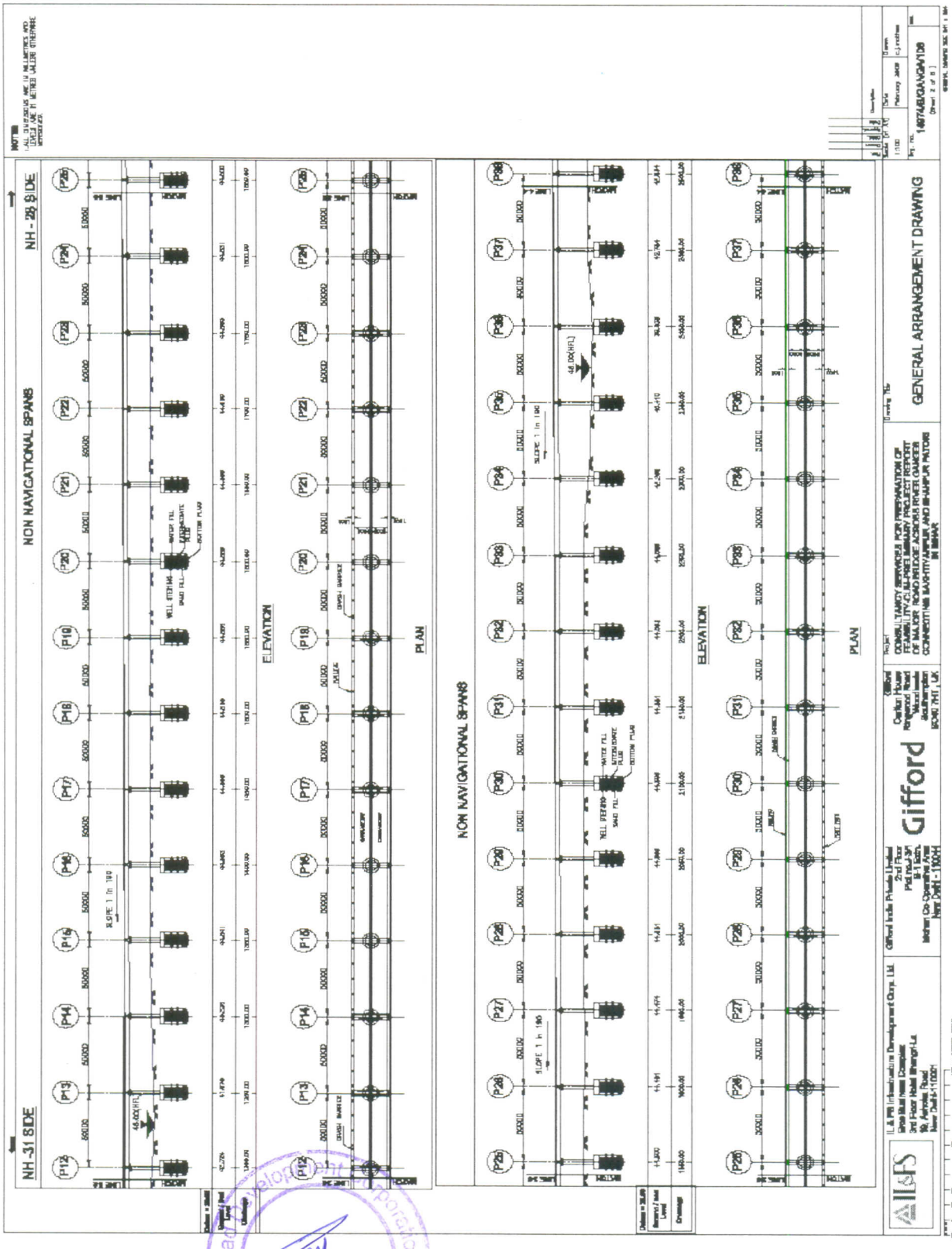
NH-31 SIDE
ELEVATION
PLAN
NON NAVIGATIONAL SPANS
GENERAL ARRANGEMENT DRAWING
Gifford


NH-31 SIDE
NON NAVIGATIONAL SPANS
NH - 28 SIDE
ELEVATION
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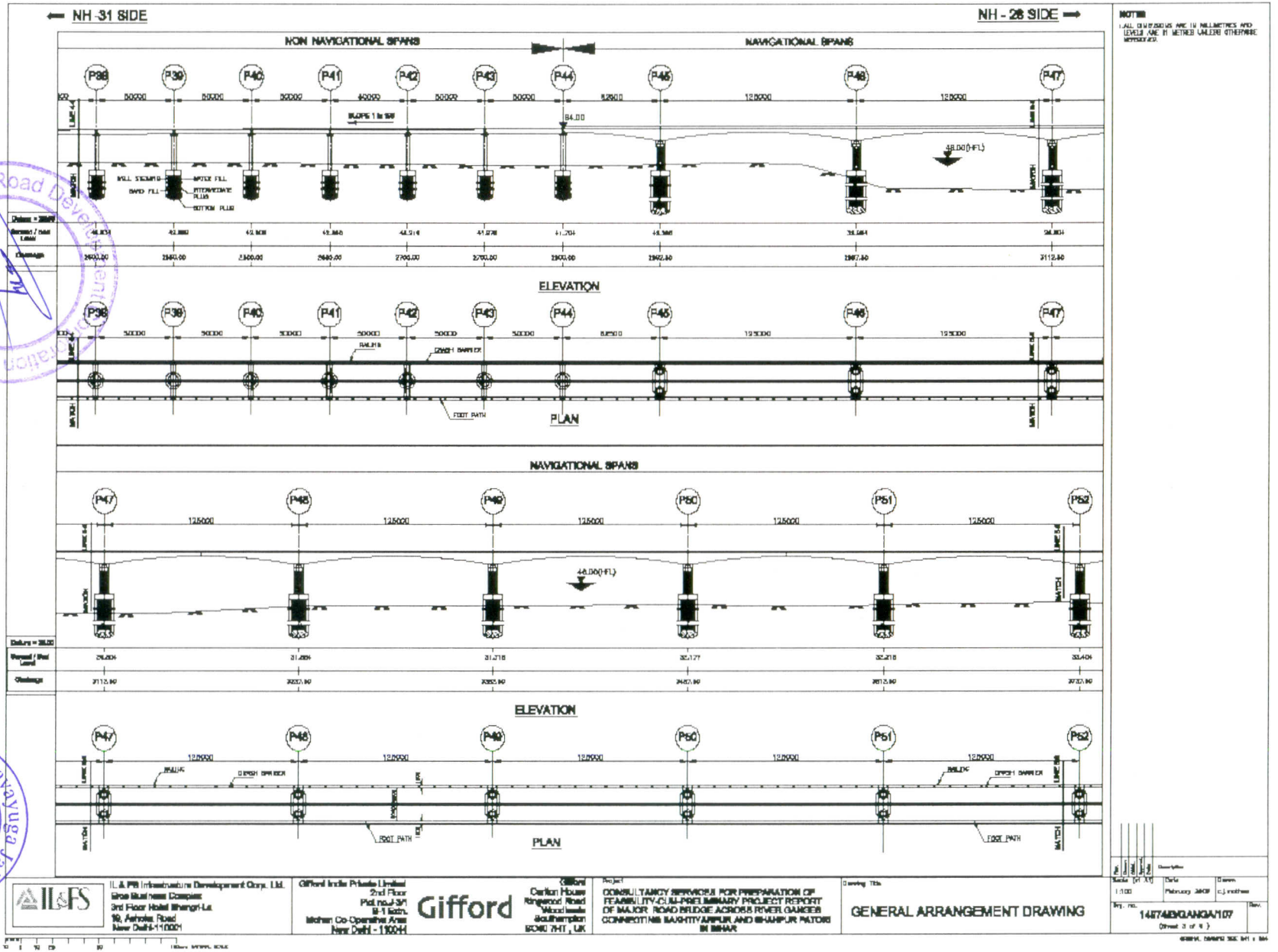
NON NAVIGATIONAL SPANS
ELEVATION
PLAN
GENERAL ARRANGEMENT DRAWING
Gifford



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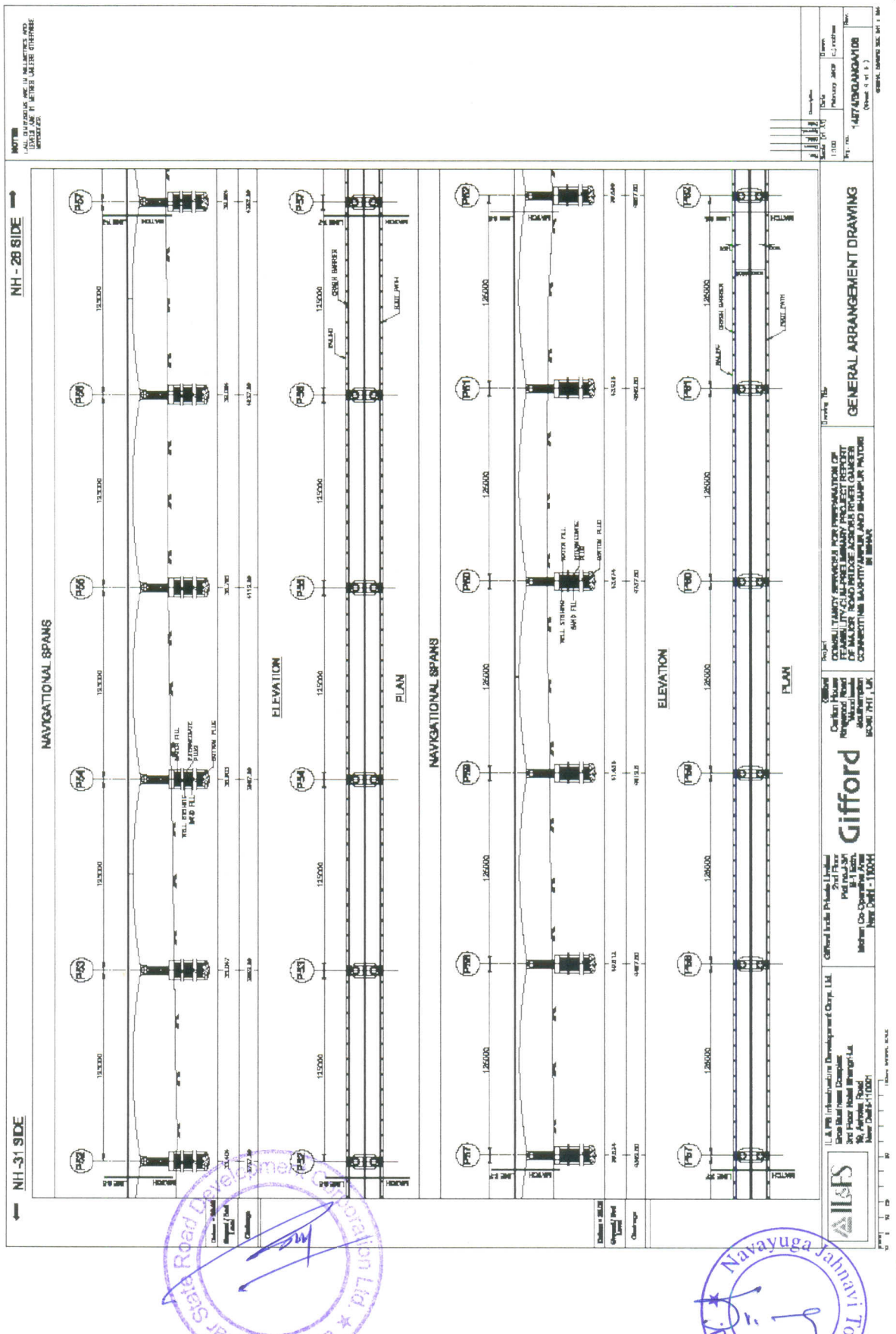
Navayuga Jahanvi Toll Bridge Pvt. Ltd.



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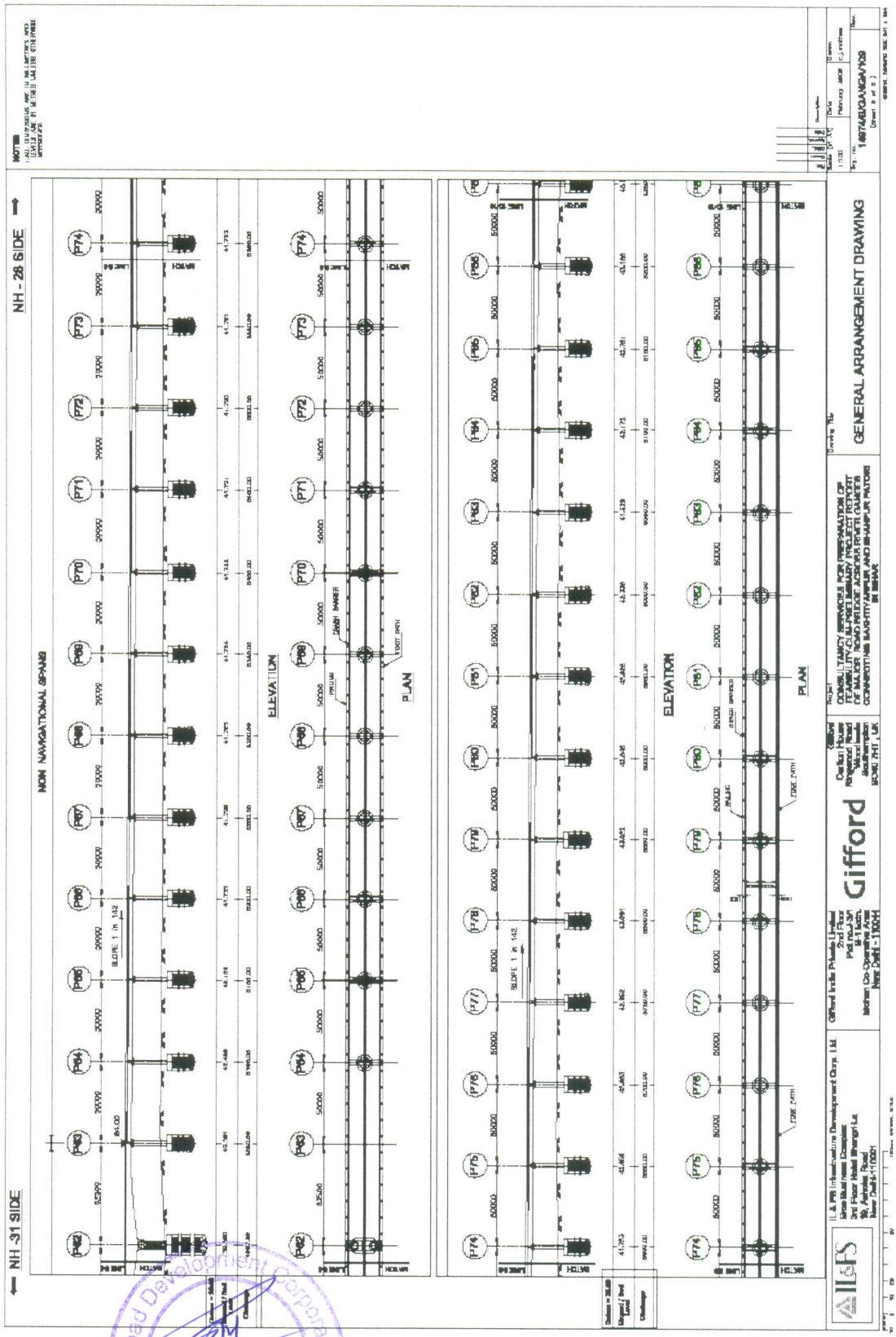

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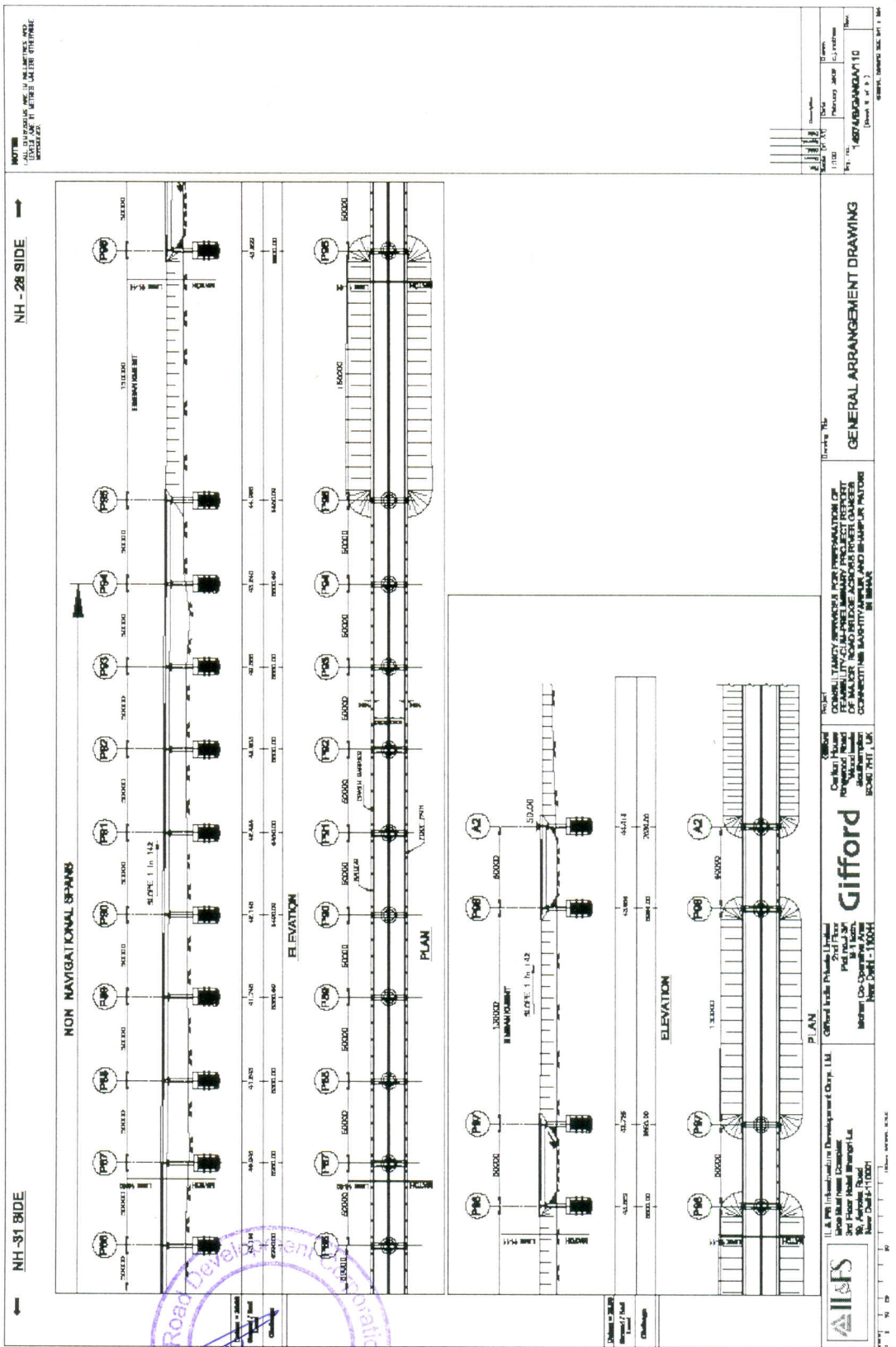
Navayuga Jahnavi Toll Bridge Pvt. Ltd.


NH - 28 SIDE
NH -31 SIDE
NON NAVIGATIONAL SPANS
ELEVATION
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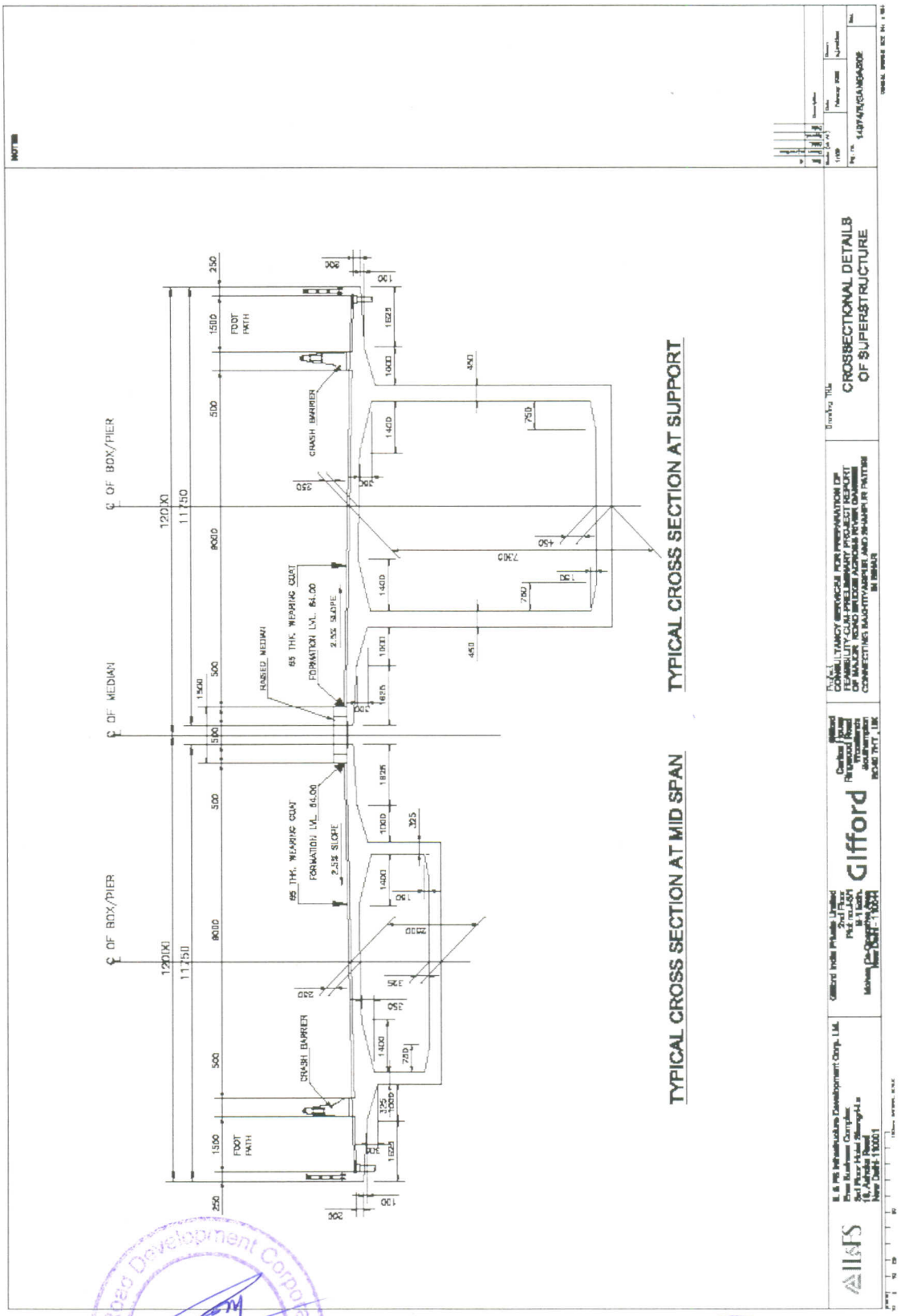
ELEVATION
PLAN
GENERAL ARRANGEMENT DRAWING
Gifford



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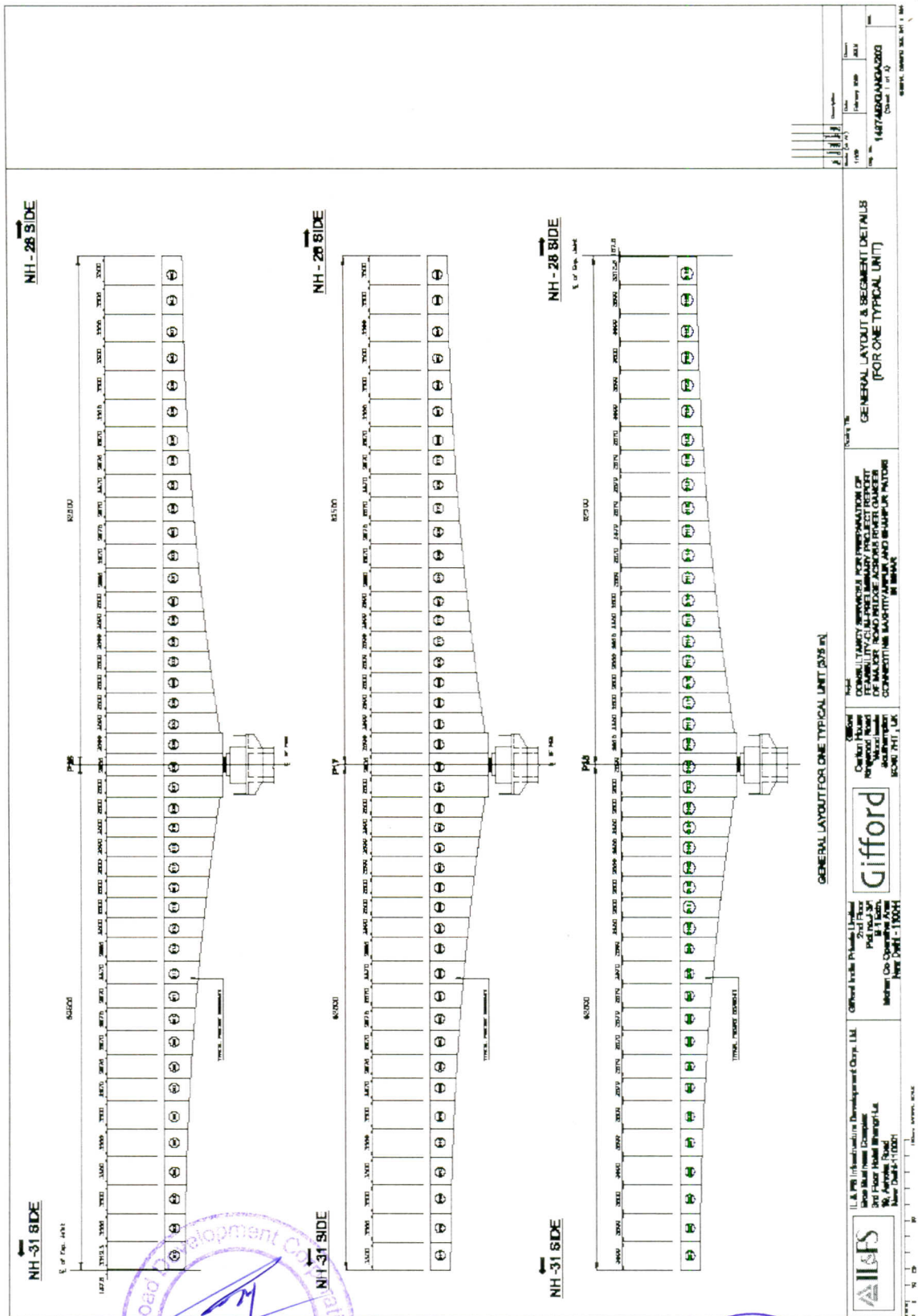
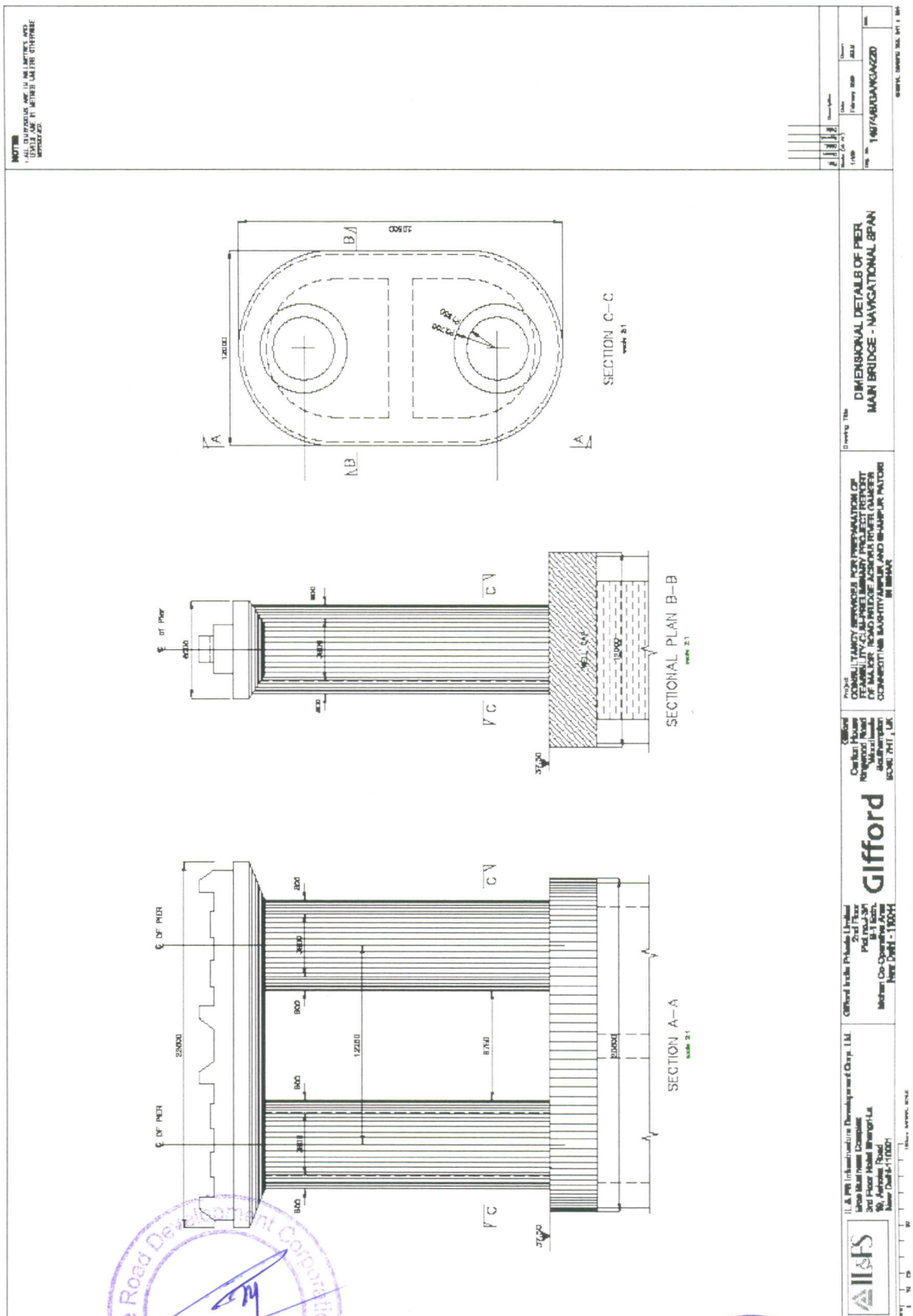
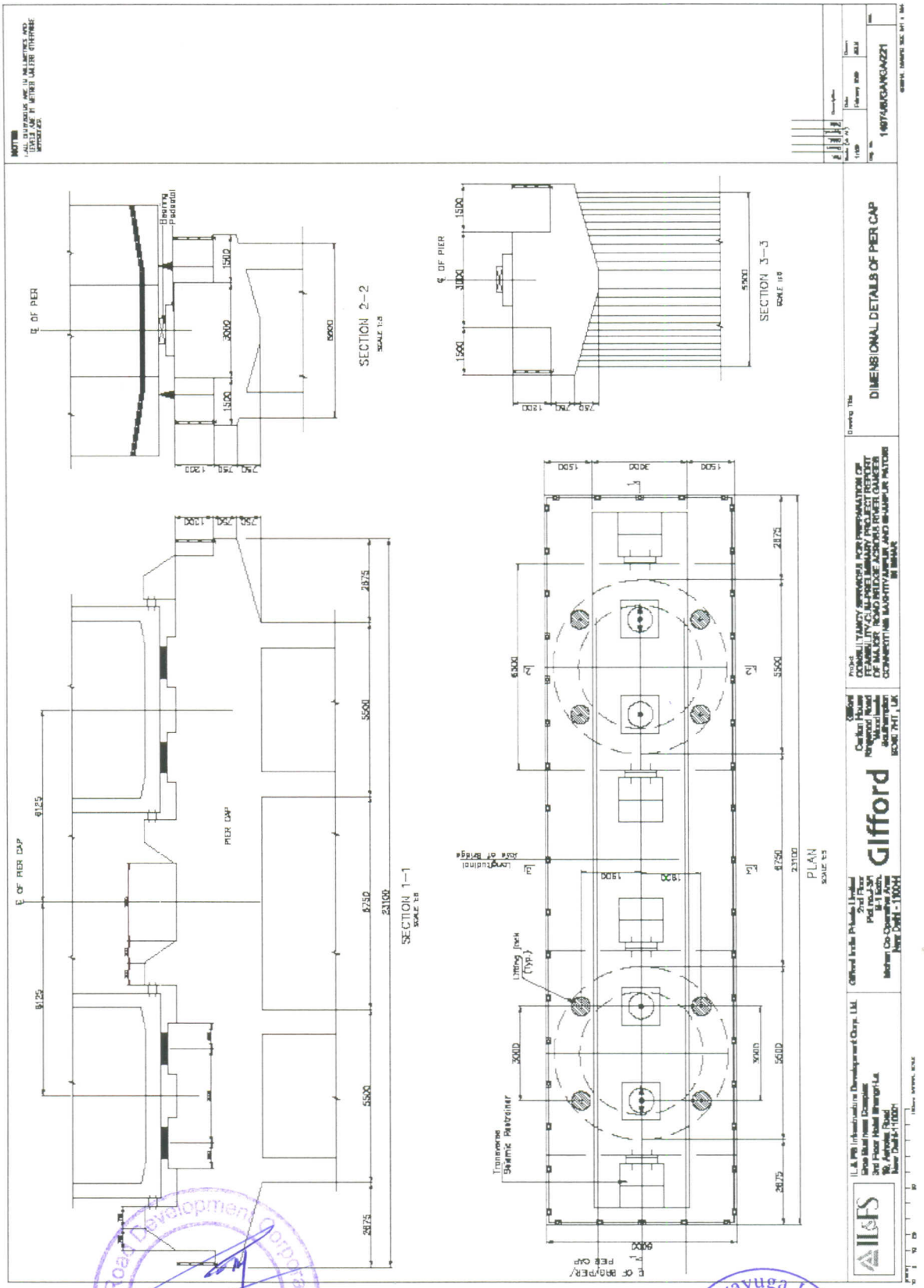

NH - 28 SIDE
NH -31 SIDE
P16
P17
P18
GENERAL LAYOUT FOR ONE TYPICAL UNIT (575 m)
GENERAL LAYOUT & SEGMENT DETAILS
(FOR ONE TYPICAL UNIT)
Gifford


SECTION C–C
SECTIONAL PLAN B–B
SECTION A–A
DIMENSIONAL DETAILS OF PIER
MAIN BRIDGE - NAVIGATIONAL SPAN
Gifford



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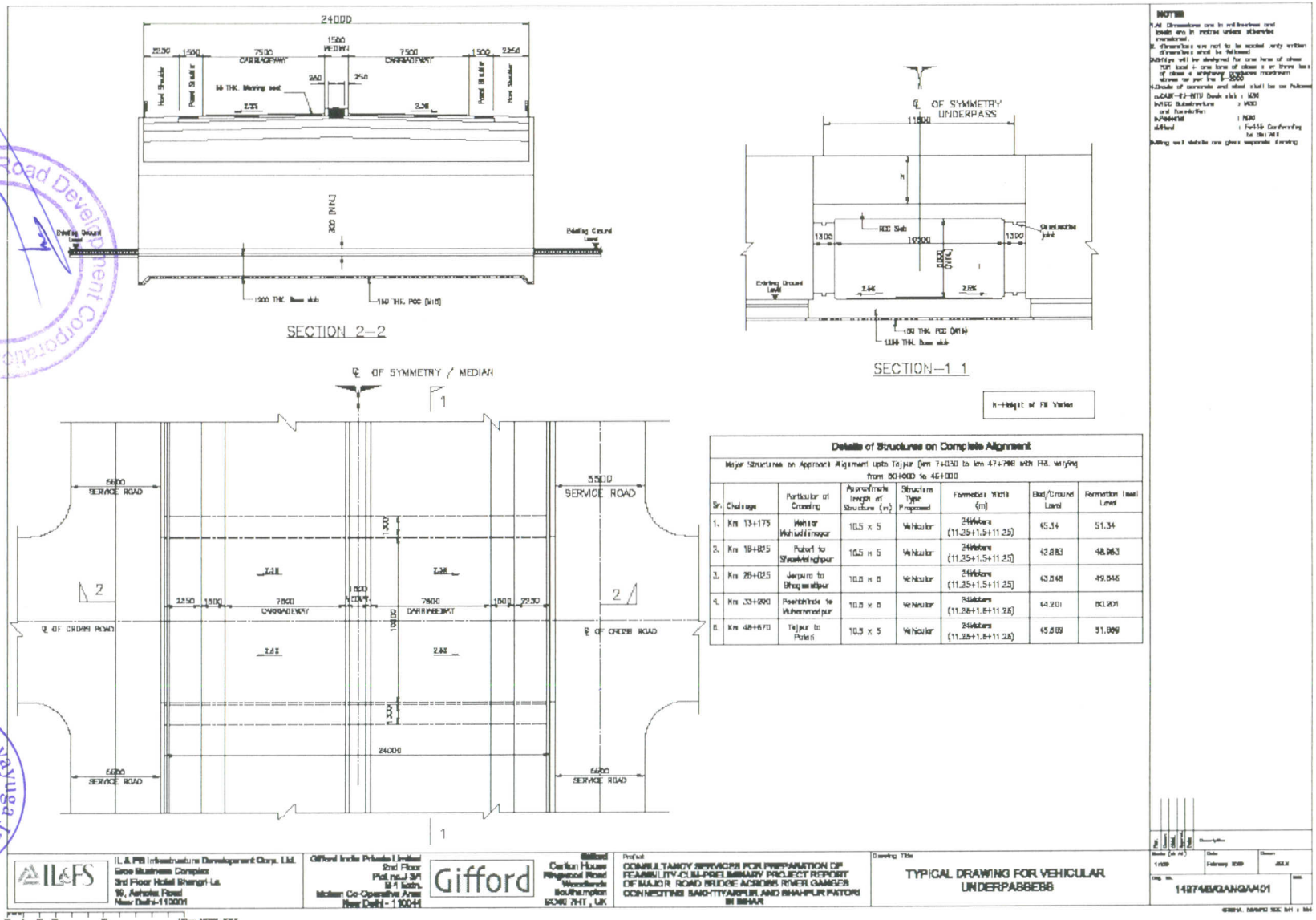
Navayuga Jahnavi Toll Bridge Pvt. Ltd.

SECTIONAL PLAN D-D
scale 1:10
SECTION B-B
scale 1:10
SECTION A-A
scale 1:10
SECTIONAL PLAN C-C
scale 1:10
DETAIL 'X'
scale 1:1
DETAIL 'Y'
scale 1:1
DETAIL-'A'
Scale 1:5
DETAIL-'B'
Scale 1:5
DIMENSIONAL DETAILS OF WELL & WELL CAP
Gifford
WELL CAP
WATER FILL
EXTERMINATE PLUG
WELL STEINING
SAND FILL
BOTTOM PLUG
WELL CURB
OUTER PLATE
STIFFENER PLATE
Navayuga Jahnavi Toll Bridge Pvt. Ltd.



NOTES

1. All dimensions are in millimetres and levels are in metres unless otherwise mentioned.
2. Dimensions are not to be scaled, only written dimensions shall be followed.
3. Earthfill will be developed for one layer of above 700 (and + one layer of above + or three layers of above + embankment) maximum thickness as per IRC 36-2000
4. Grade of concrete and steel shall be as follows:
   a. RCC : M30
   b. PCC : M20
   c. Steel reinforcement : Fe415 Conforming to IS 1786
5. Earthfill shall include one layer separate filtering

h = Height of Fill Varies

Details of Structures on Complete Alignment

Major Structures on Approach Alignment upto Tajpur (km 7+050 to km 47+788 with FRL varying from RD+000 to 48+000

Sr.	Chainage	Particular of Crossing	Approximate length of Structure (m)	Structure Type Proposed	Formation Width (m)	Bed/Ground Level	Formation Level
1.	Km 13+175	Water Mahuddinagar	10.5 x 5	Vehicular	24Meters (11.25+1.5+11.25)	45.34	51.34
2.	Km 18+825	Pulvert to Shwakhrighpur	10.5 x 5	Vehicular	24Meters (11.25+1.5+11.25)	42.863	48.863
3.	Km 28+025	Jaspuro to Bhagwanpur	10.8 x 8	Vehicular	24Meters (11.25+1.5+11.25)	43.548	49.548
4.	Km 33+990	Peshkhinde to Mohammadpur	10.8 x 8	Vehicular	24Meters (11.25+1.5+11.25)	44.201	50.201
5.	Km 48+670	Tajpur to Pulvrt	10.5 x 5	Vehicular	24Meters (11.25+1.5+11.25)	45.859	51.859

IL&FS — IL & FS Infrastructure Development Corp. Ltd.
Sree Business Complex
3rd Floor Hotel Bhangri La.
19, Ashoka Road
New Delhi-110001

Gifford India Private Limited
2nd Floor
Plot no.J-3/1
M-1 sector,
Mohan Co-Operative Area
New Delhi - 110044

Gifford
Carlton House
Ringwood Road
Woodlands
Southampton
SO40 7HT, UK

Project: CONSULTANCY SERVICES FOR PREPARATION OF FEASIBILITY-CUM-PRELIMINARY PROJECT REPORT OF MAJOR ROAD BRIDGE ACROSS RIVER GANGES ON NEPTUNE BAKHTIYARPUR AND SHAHPUR PATORI IN BIHAR

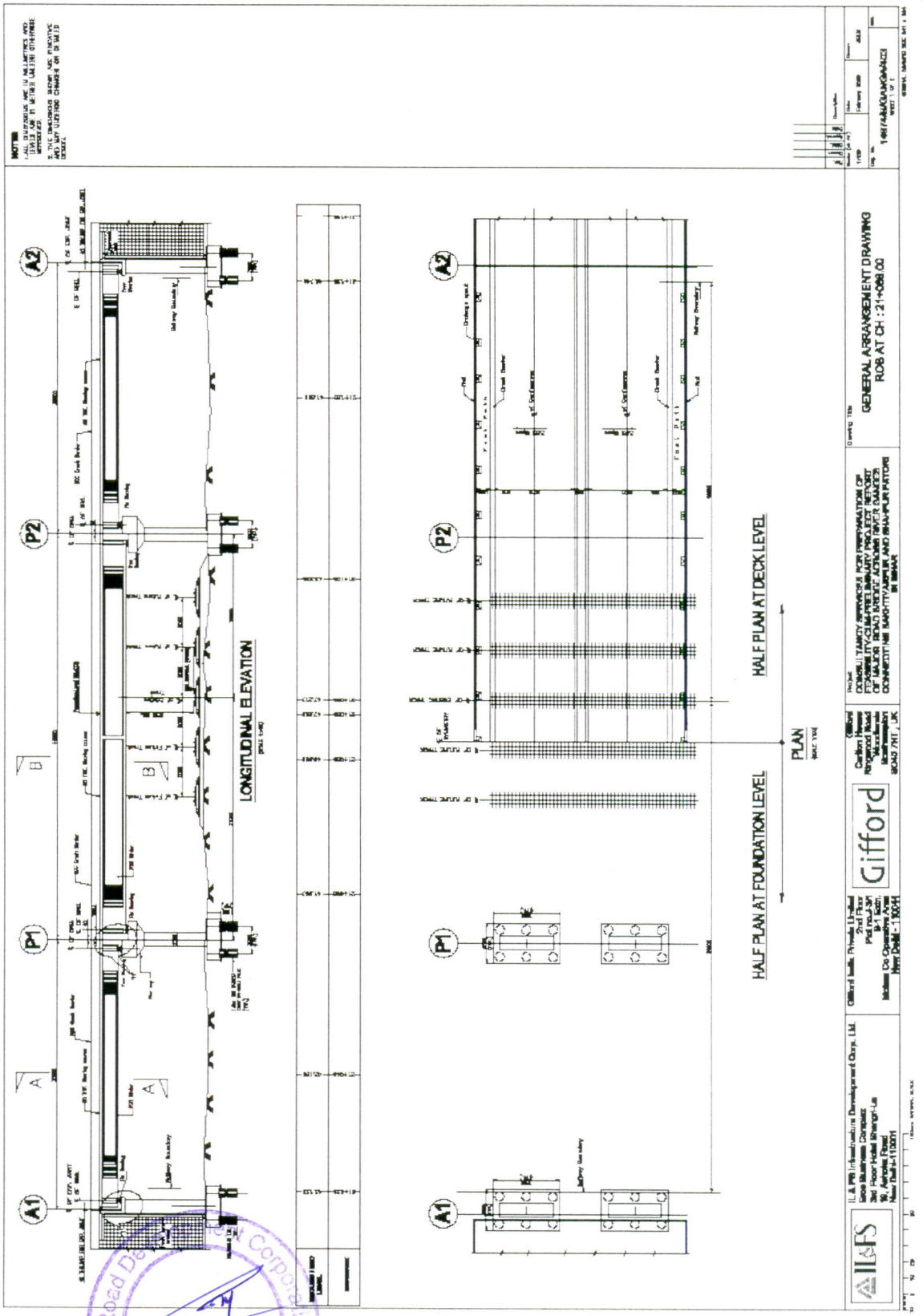
Drawing Title: TYPICAL DRAWING FOR VEHICULAR UNDERPASSES

Scale: 1:1000 | Date: February 2009 | Drawn: ASLN

Drg. No. 1497/4/BG/GAN/QA/401

Navayuga Jahanvi Toll Bridge Pvt. Ltd.

Bihar State Road Development Corporation Ltd.



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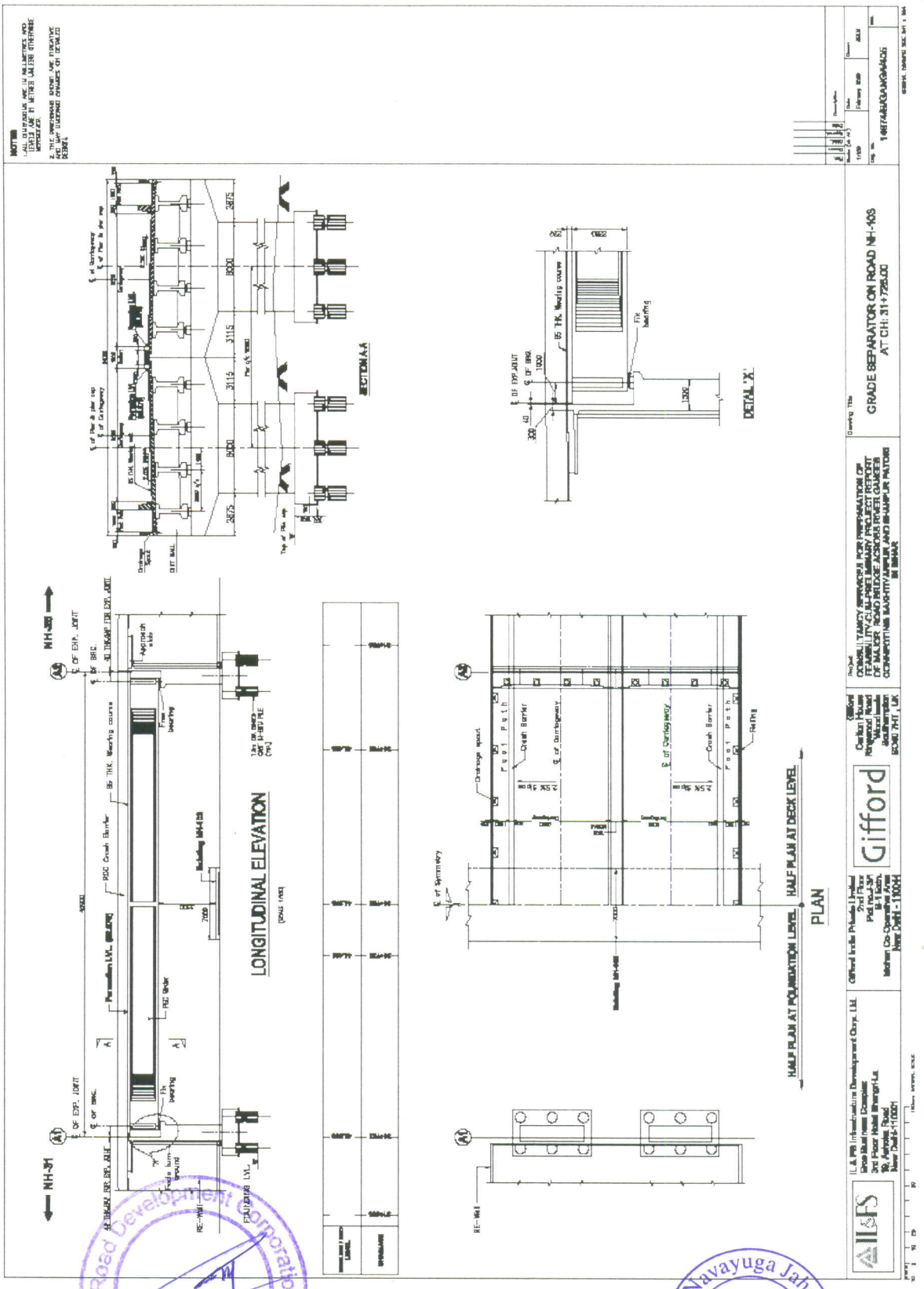

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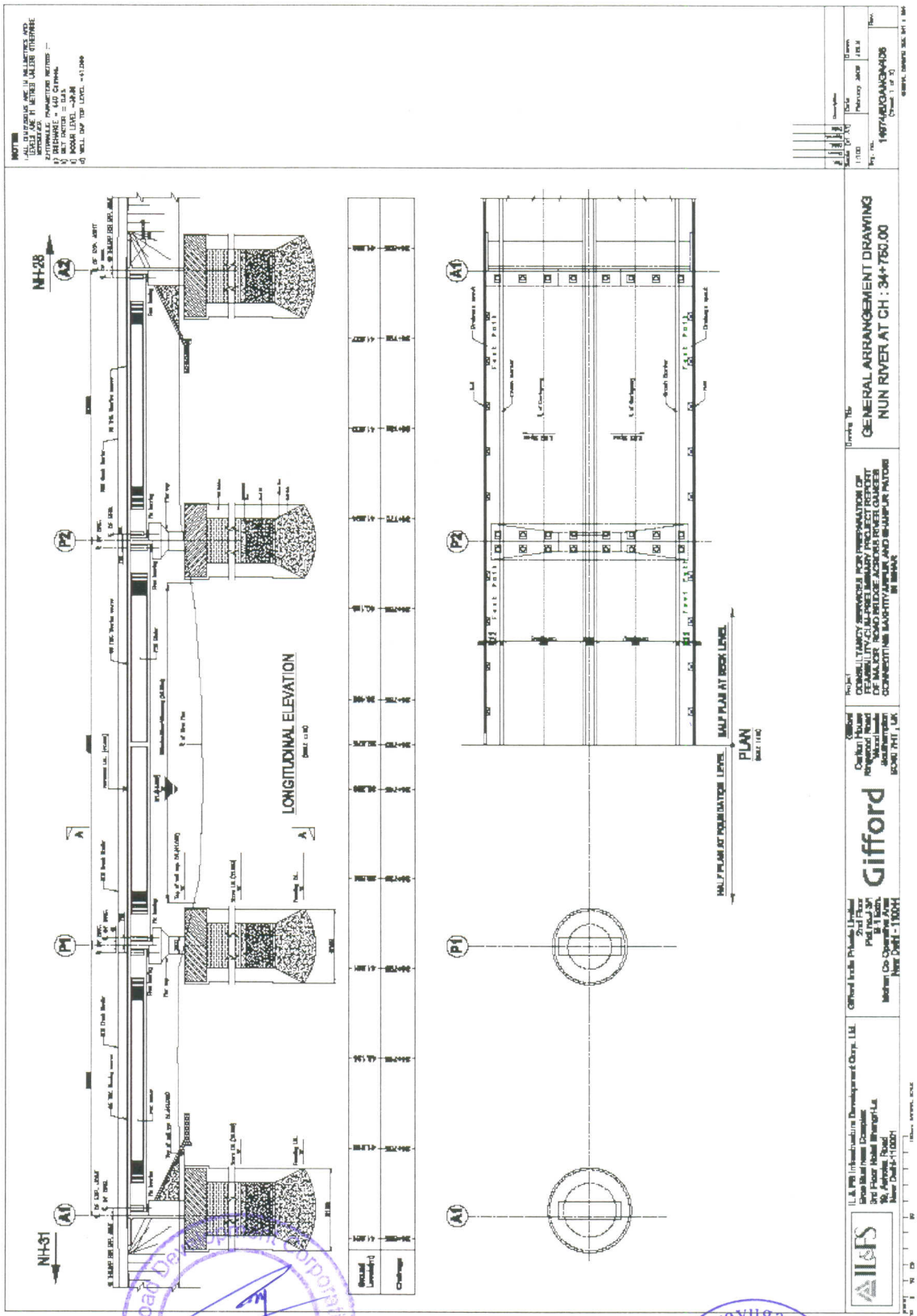
Navayuga Jahnavi Toll Bridge Pvt. Ltd.



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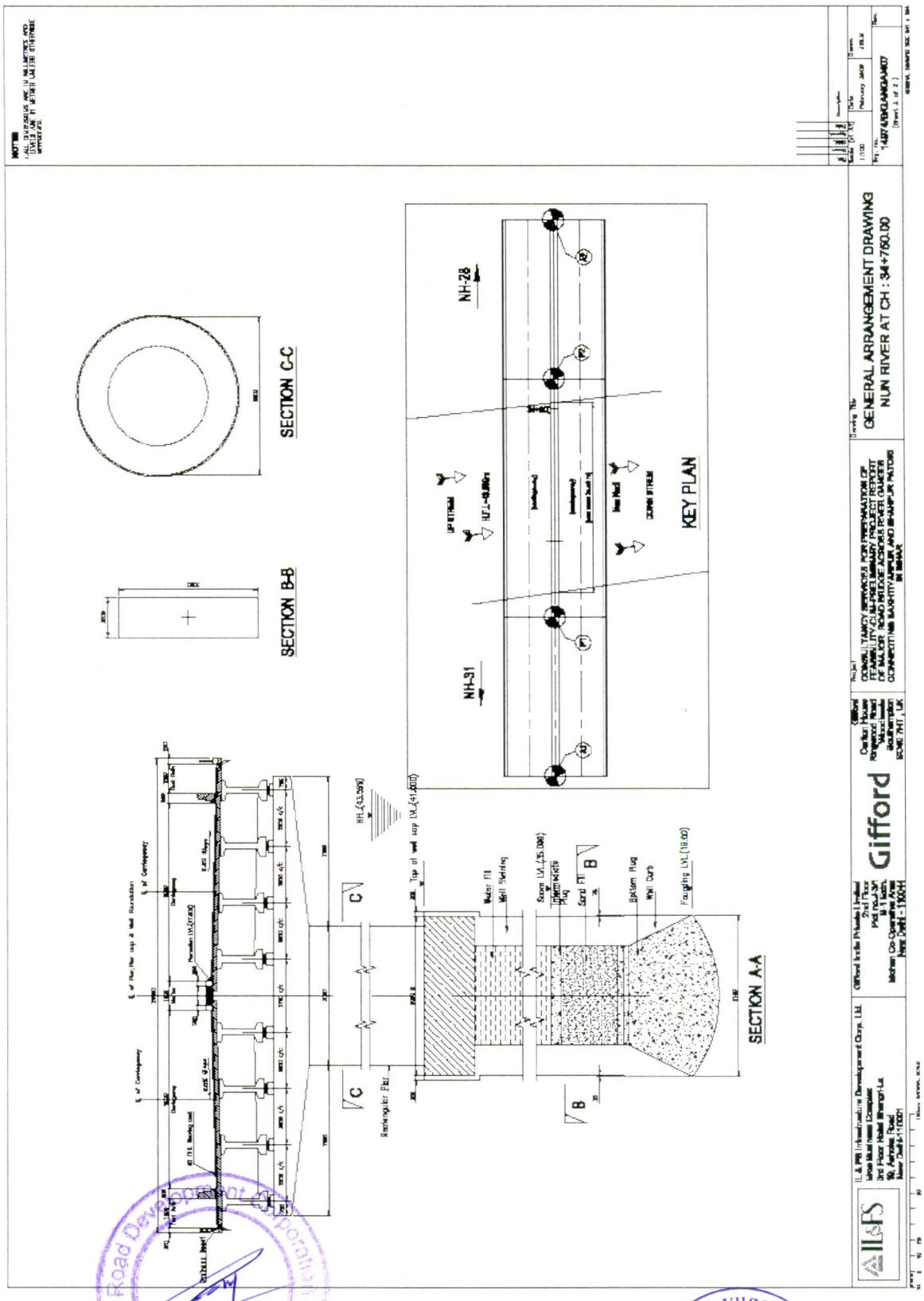
Navayuga Jahnavi Toll Bridge Pvt. Ltd.



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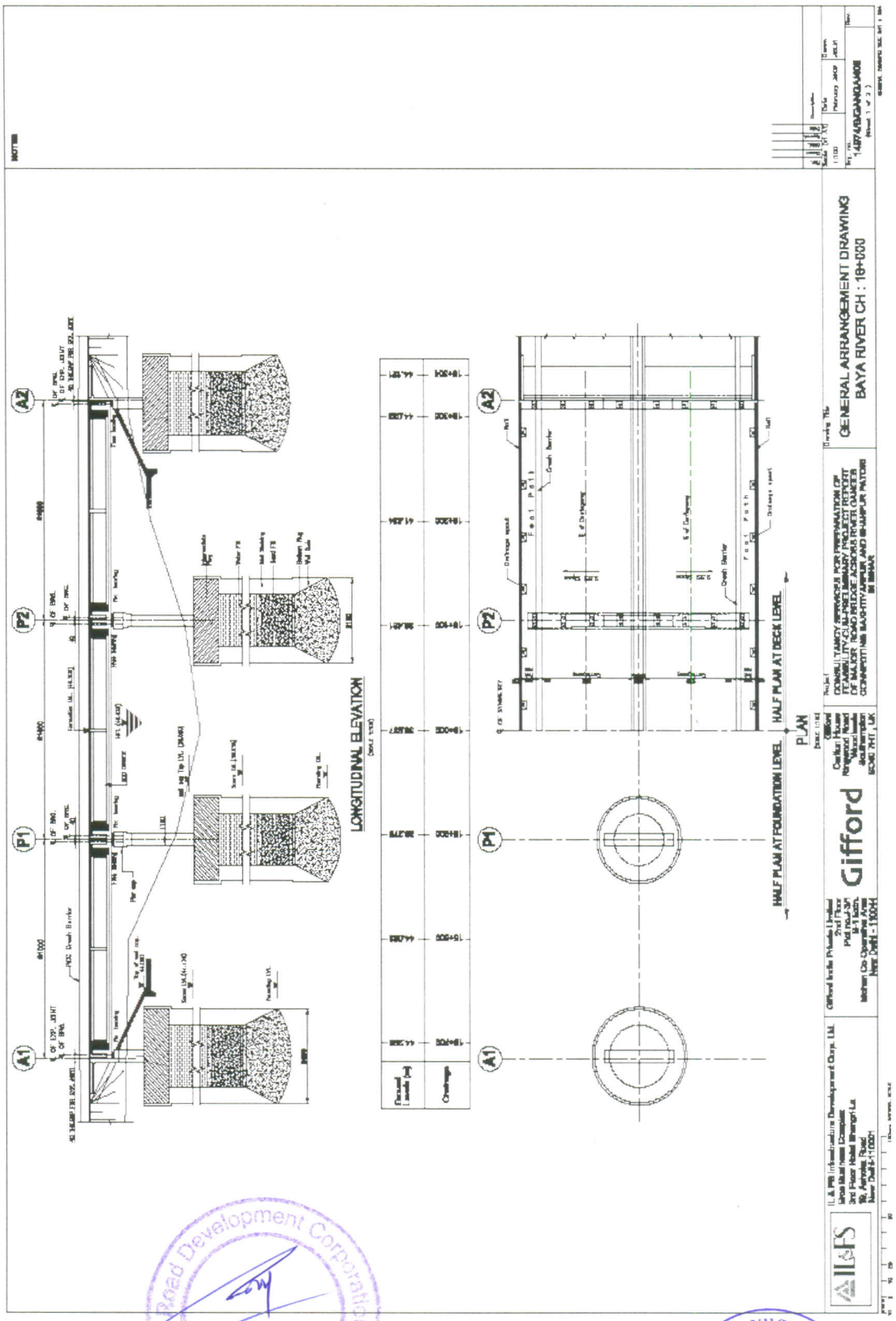

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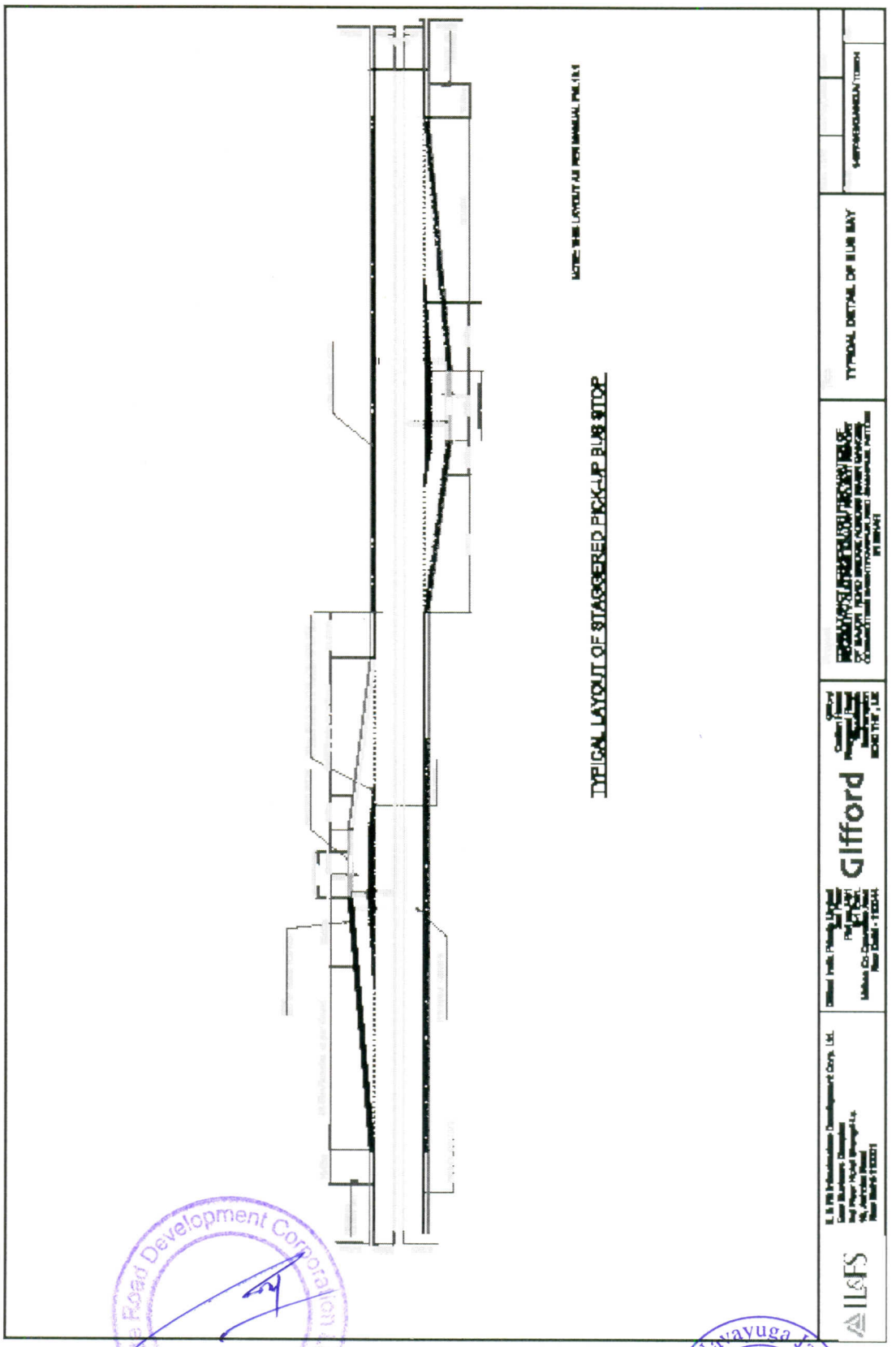
Navayuga Jahnavi Toll Bridge Pvt. Ltd.



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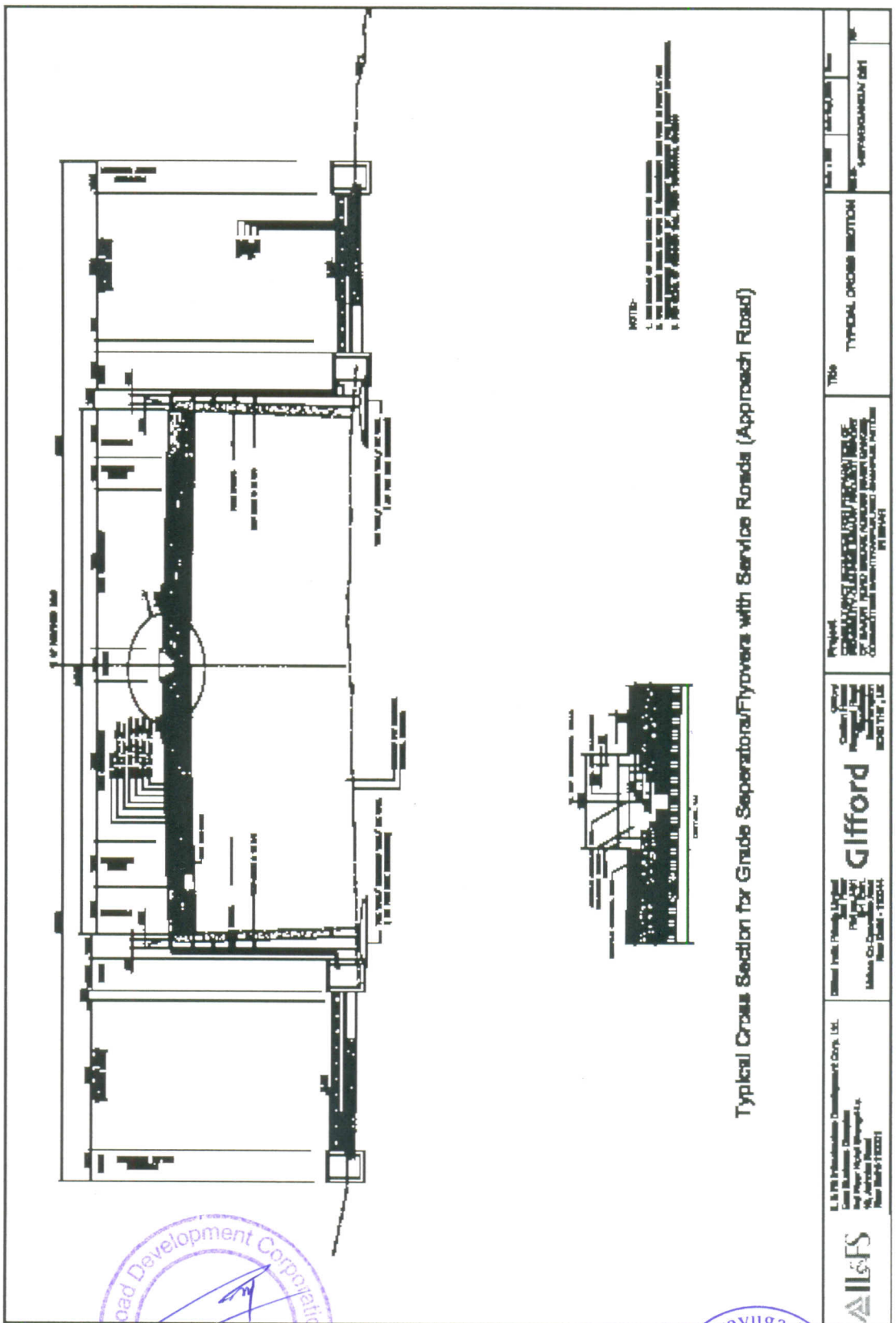
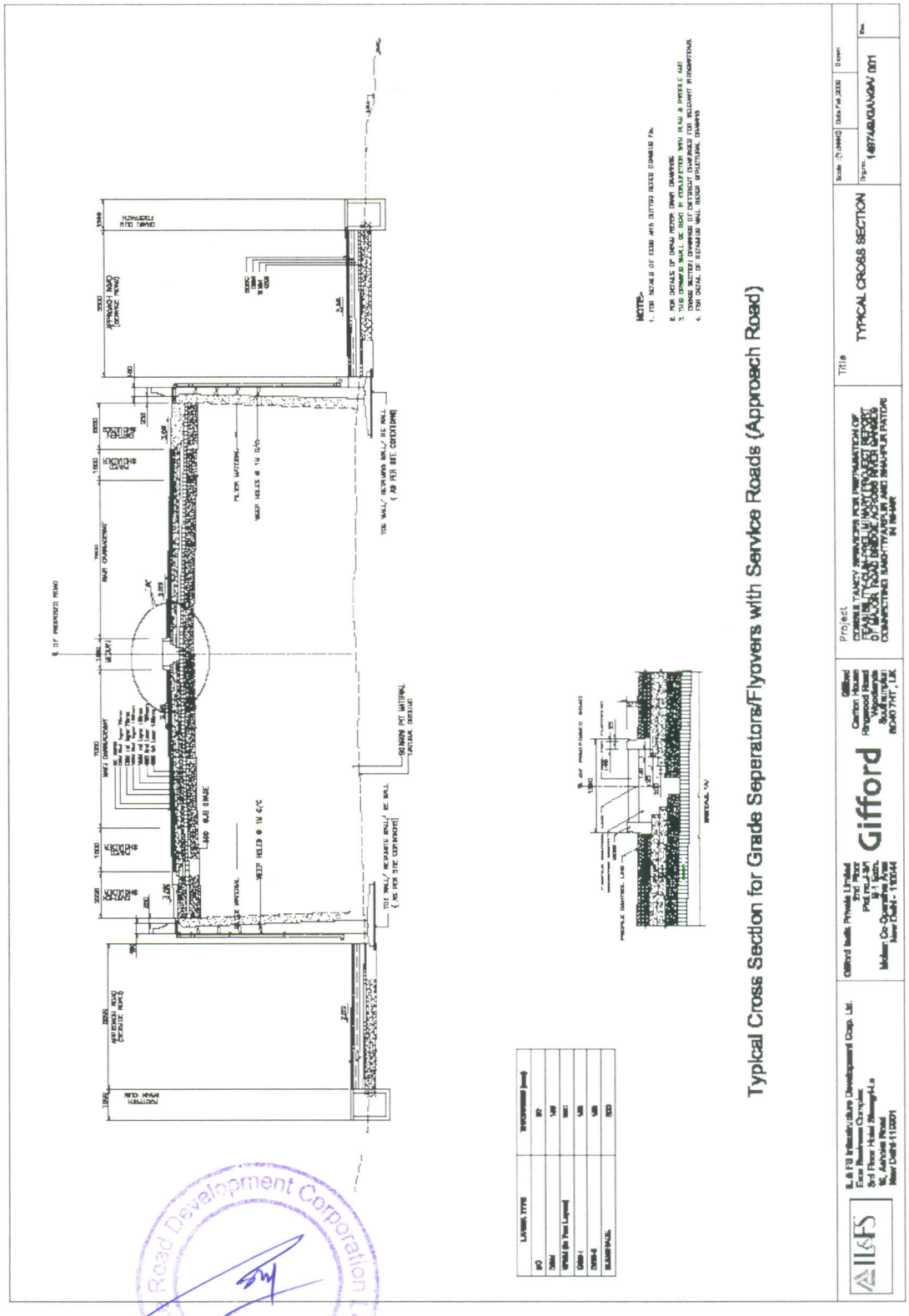
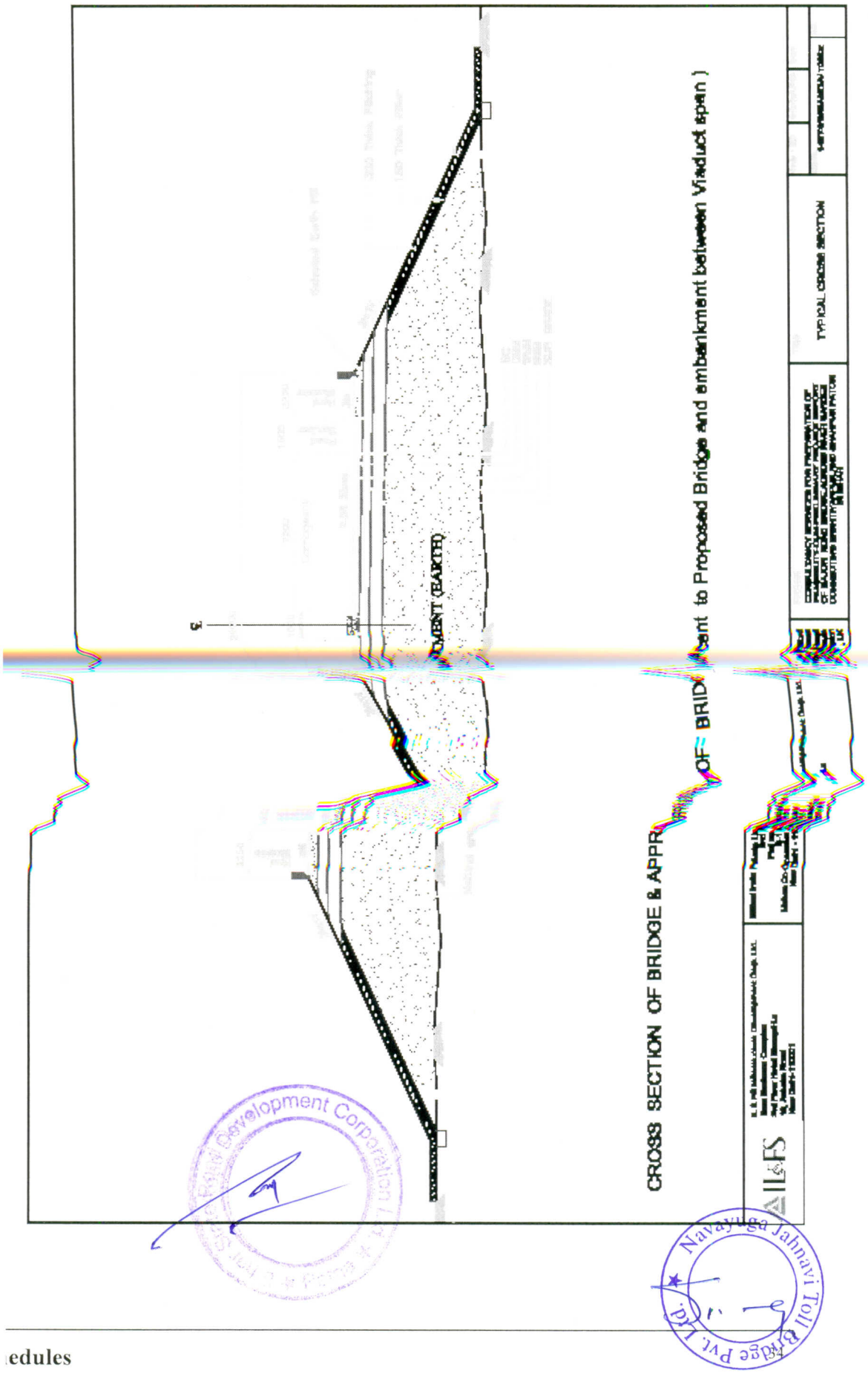
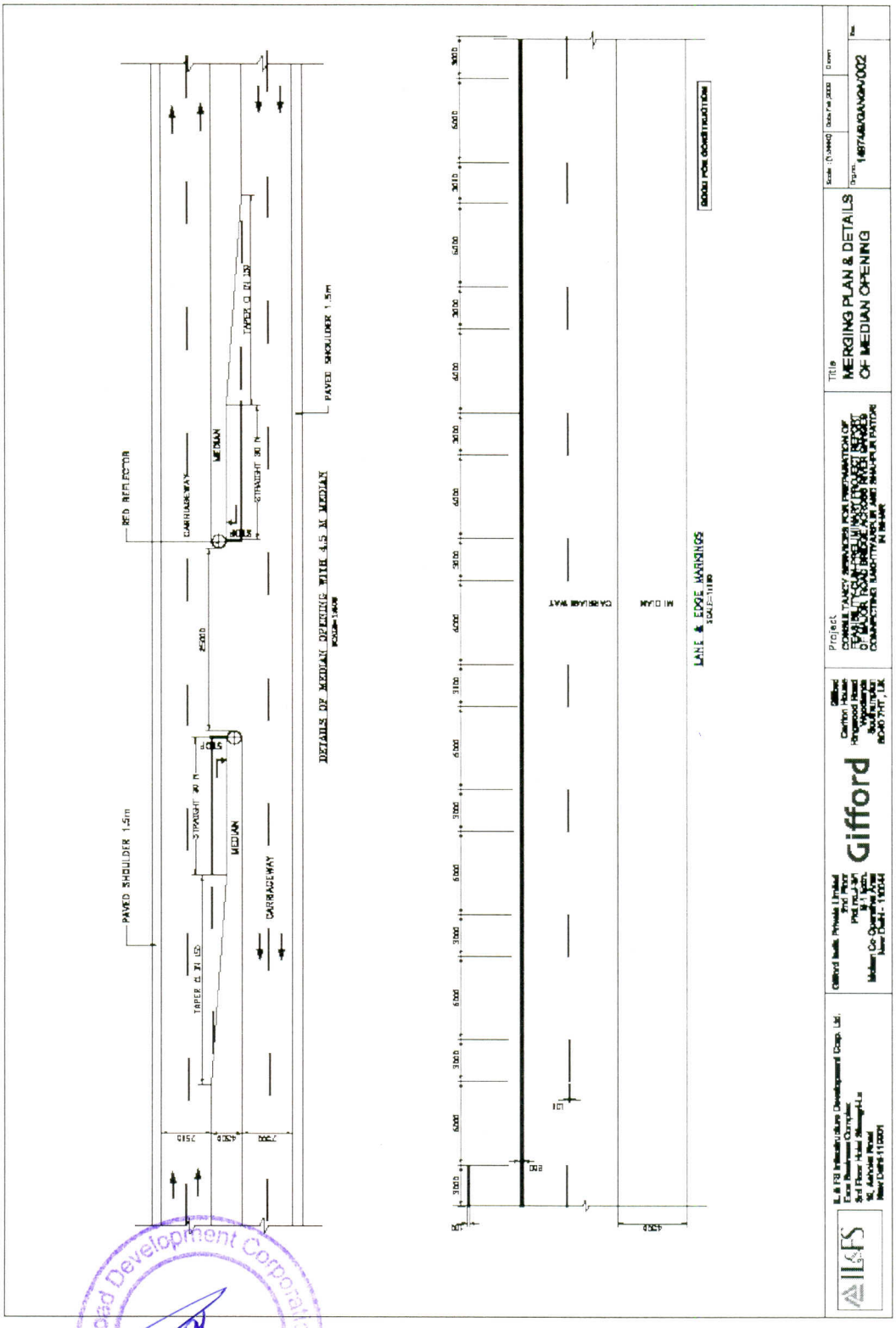
Navayuga Jahnavi Toll Bridge Pvt. Ltd.

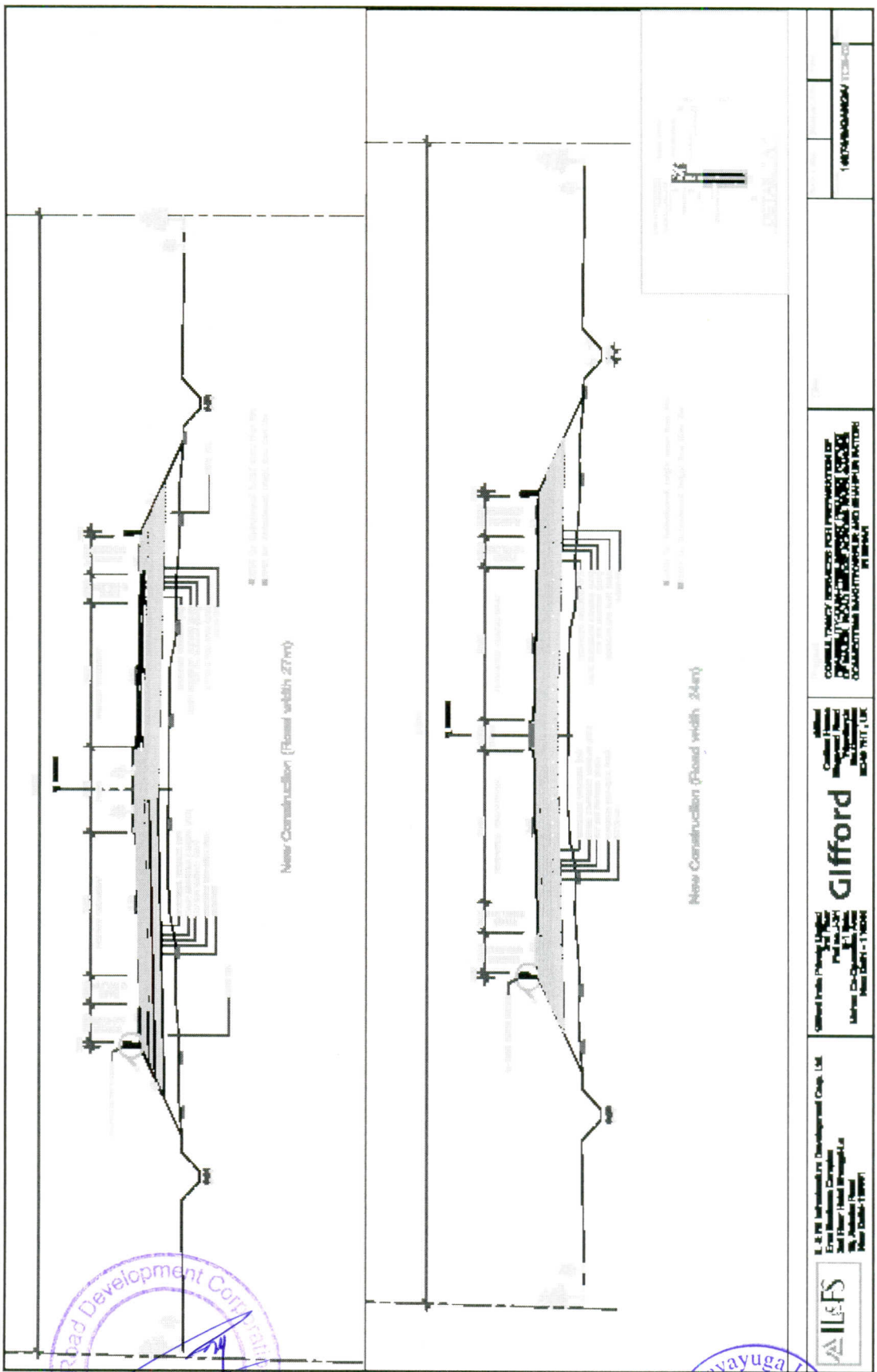


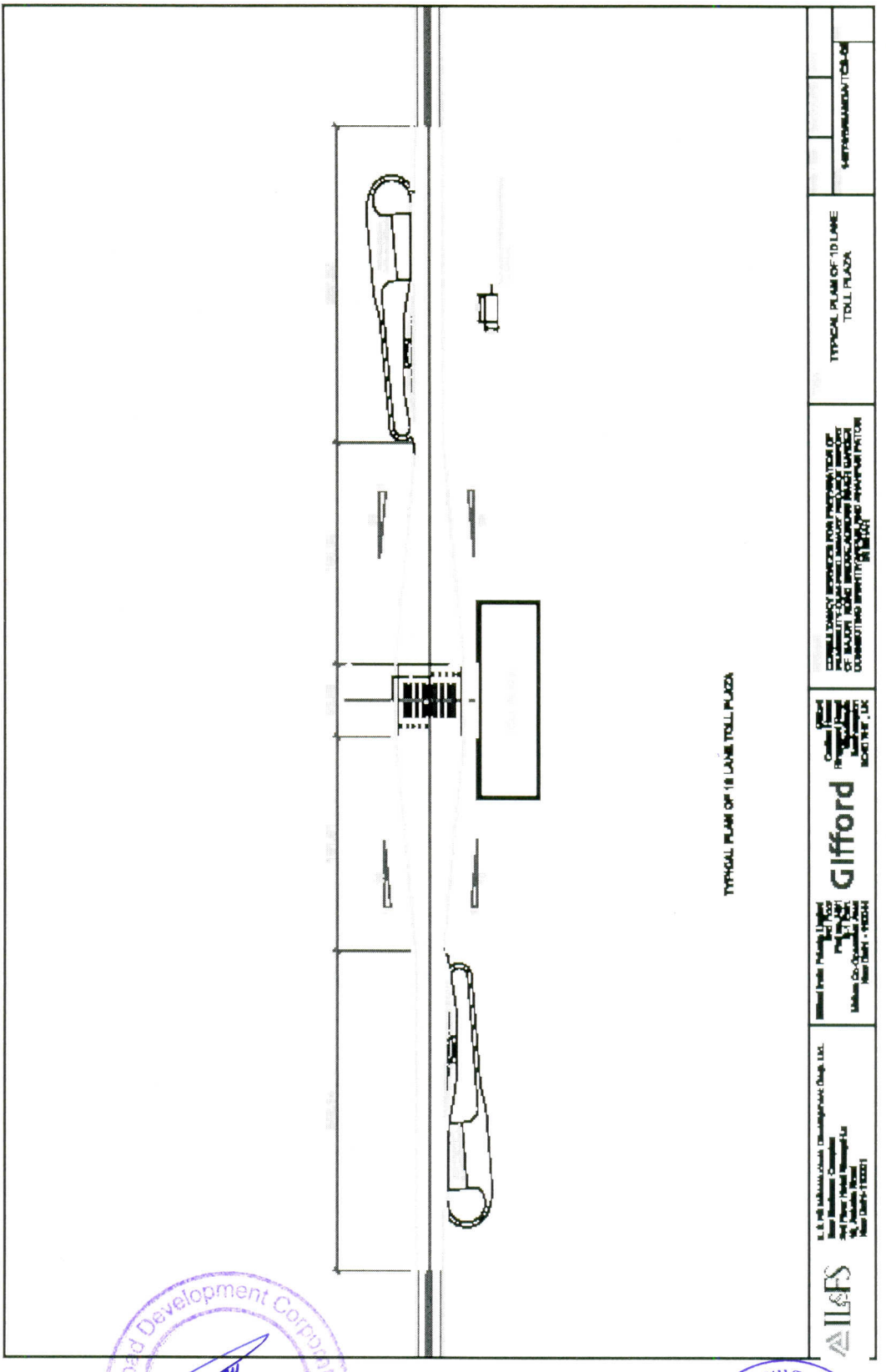
Bihar State Road Development Corporation Ltd. Patna
Navayuga Jahnavi Toll Bridge Pvt. Ltd.

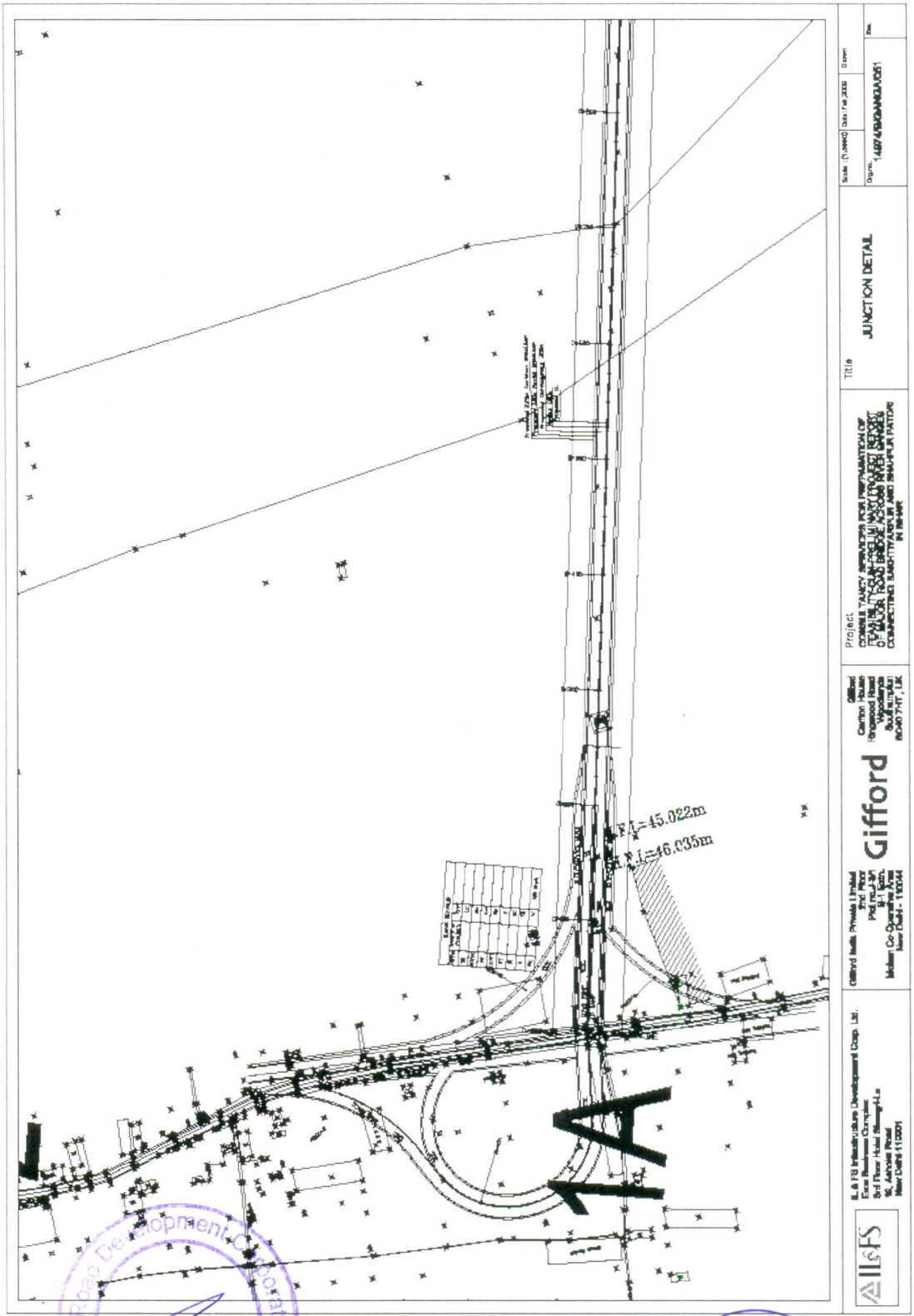

Typical Cross Section for Grade Separators/Flyovers with Service Roads (Approach Road)
TYPICAL CROSS SECTION
Gifford
Navayuga Jahnavi Toll Bridge Pvt. Ltd.


CROSS SECTION OF BRIDGE & APPR
OF BRID
nt to Proposed Bridge and embankment between Viaduct span)
EMENT (EARTH)
TYPICAL CROSS SECTION
IL&FS
Navayuga Jahnavi Toll Bridge Pvt. Ltd.


DETAILS OF MEDIAN OPENING WITH 4.5 M MEDIAN
RED REFLECTOR
PAVED SHOULDER 1.5m
CARRIAGEWAY
MEDIAN
STRAIGHT 30 M
TAPER CL 1/1 LSD
LANE & EDGE MARKINGS
MERGING PLAN & DETAILS OF MEDIAN OPENING
Gifford
Project
Title
Scale
Drawn
Date
Drg. No.
Rev.
Gifford India Private Limited
Carlton House
Hazlewood Road
Vigodarga
Southampton
SO40 7HT, UK
Gifford India Private Limited
2nd Floor
Plot no.J-1/1
Sri Ram Mohan Co-Operative Area
New Delhi - 110044
IL&FS
IL&FS Infrastructure Development Corp. Ltd.
Eros Business Complex
3rd Floor Hotel Shangri-La
16, Ashoka Road
New Delhi-110001
Navayuga Jahnavi Toll Bridge Pvt. Ltd.
Bihar State Road Development Corporation Ltd.


New Construction (Road width 27m)
New Construction (Road width 24m)
Gifford
ALFS


TYPICAL PLAN OF 10 LANE TOLL PLAZA
TYPICAL PLAN OF 10 LANE TOLL PLAZA
Gifford



Bihar State Road Development Corporation Ltd. ★ Patna ★
Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Annex - II
(Schedule-B)

Description of [Six-Laning]

Six-laning is beyond the purview of the present study.

SCHEDULE – C
(See Clause 2.1)

PROJECT FACILITIES

1 Project Facilities

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

(a) toll plaza[s];

(b) roadside furniture;

(c) street lighting;

(d) pedestrian facilities;

(e) landscaping and tree plantation;

(f) rest areas;

(g) truck lay-bys;

(h) bus-bays and bus shelters;

(i) cattle crossings;

[(j) development of site for wayside amenities;]

[(k) traffic aid posts;]

[(l) medical aid posts;]

[(m) vehicle rescue posts;]

[(n) telecom system; and]

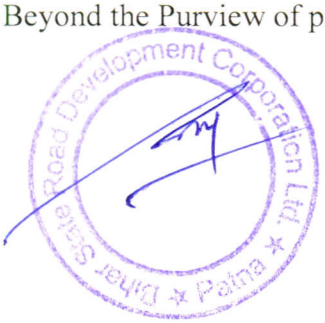
[(o) highway traffic management system.]

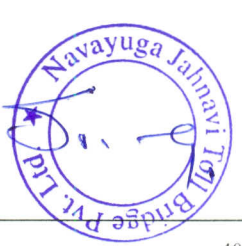
2 Project Facilities for [Four-Laning]

Project Facilities forming part of [Four-Laning] and to be completed on or before the Project Completion Date have been described in Annex-I of this Schedule-C.

3 Project Facilities for [Six-Laning]

Beyond the Purview of present concession.





Annex - I
(Schedule-C)

Project Facilities for [Four-Laning]

1 Project Facilities

The Concessionaire shall construct the Project Facilities described in this Annex-I to form part of the [Four-Lane] Project. The Project Facilities shall include:

(a) toll plaza[s];

(b) roadside furniture;

(c) pedestrian facilities;

(d) landscaping & tree plantation;

(e) truck lay-bys;

(f) bus-bays and bus shelters; and

[(g) others (to be specified)]

2 Description of Project Facilities

Each of the Project Facilities shall be constructed in accordance with the Manual of Specifications and Standards specified in Schedule-D.

a. Toll plazas

The location of Toll plazas are as under:

Sl.No.	Proposed Chainage
1	Km 10.625
2	Km 33.675

The toll plazas shall have minimum 4-Lanes in each direction and one separate service lane in each direction for non-tollable traffic and over-sized vehicles.

Specifications and other requirements of toll plazas shall be strictly as per schedule "D" of the concession agreement.

b. Road Side Furniture

(i) Traffic Signs and Pavement Markings

Traffic signs and pavement markings shall include roadside signs, overhead signs; curb signs and road marking along the Project Highway

Bihar State Road Development Corporation Ltd. Patna

Navayuga Jamnavi Toll Bridge Pvt. Ltd.

shall be as per the design standard indicated in **Schedule-D** and the location for various treatments shall be finalized in consultation with the Independent Engineer.

(ii) Concrete crash barrier, Metal beam crash barrier, Separators (MS ralings)

(iii) Traffic Safety devices wherever required

(iv) Boundary Stones

(v) Hectometer/Kilometer Stone

(vi) Traffic Blinker Signal (L. E. D) at intersection

c. Pedestrian Facilities

The additional pedestrians' facilities in the form of guard rails, footpath, lighting etc. shall be provided wherever required.

d. Landscaping & Tree plantation

Landscaping of the highway shall be done on, but not limited to, the following

- Grade Separated intersections
- At Grade islands of intersection locations
- Toll Plaza Area
- Truck Lay-byes

e. Truck Lay-byes

Truck lay-byes shall be provided at 1 location i.e, at km 24.500

f. Bus-Byes and Bus Shelters

Bus byes and bus shelter shall be provided at 6 locations

g. Others

The facilities shall be provided as per Concession Agreement and "Manual of Specifications and Standards for four laning of road projects published by the Authority/MORT&H"

Annex - II
(Schedule-C)

Project Facilities for [Six-Laning]

Six-laning is beyond the purview of present study.

SCHEDULE – D
(See Clause 2.1)

SPECIFICATIONS AND STANDARDS

1 Four-Lane Greenfield Bridge and approach roads

The Concessionaire shall comply with the Specifications and Standards set forth in Annex-I of this Schedule-D for construction of the Project.

2 [Six-Laning]

Six-laning is beyond the purview of present Concession.

Annex - I
(Schedule-D)

Specifications and Standards for the Project

1 Manual of Specifications and Standards to apply

Subject to the provisions of Paragraph 2 of this Annex-I, the construction activities related to the Project shall conform to the Manual of Specifications and Standards for 4-laning of National Highways through Public Private Partnership on DBFOT published by MORT&H. (An authenticated copy of the Manual has been provided to the Concessionaire as part of the bid documents.)

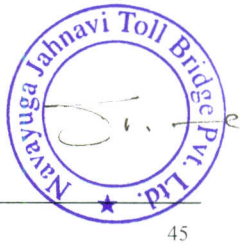
2 Deviations from the Manual

Notwithstanding anything to the contrary contained in the aforesaid Manual, the following Specifications and Standards shall apply to all the construction activities related to the Project, and for purposes of this Agreement, the aforesaid Manual shall be deemed to be amended to the extent set forth below:

The following standards are applicable for construction of bridge across river Ganga in view of the quality and speed in construction in variance to clauses in IRC:-

- Jack down method of sinking shall be resorted instead conventional Kent ledge method
- Pre cast segmental superstructure is a mandatory method of construction for bridge superstructure.
- The expansions shall be proposed at minimum 150m apart on the bridge deck for better riding quality.
- The latest guidelines issued by IWAI shall be followed for vertical & horizontal clearances





Annex - II
(Schedule-D)

Specifications and Standards for [Six-Laning]

Six-laning is beyond the purview of the present Concession.

SCHEDULE –E
(See Clause 4.1.3)

APPLICABLE PERMITS

1 Applicable Permits

1.1 The Concessionaire shall obtain, as required under the Applicable Laws, the following Applicable Permits on or before the Appointed Date, save and except to the extent of a waiver granted by the Authority in accordance with Clause 4.1.3 of the Agreement:

(a) Permission of the State Government for extraction of boulders from quarry;

(b) Permission of Village Panchayat 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 Asphalt Plant;

(h) Permission of Village Panchayat and State Government for borrow earth;

(i) Permission of State Government for cutting of trees; and

(j) Any other permits or clearances required under Applicable Laws.

1.2 Applicable Permits, as required, relating to environmental protection and conservation shall have been procured by the Authority as a Condition Precedent.

SCHEDULE –F
(See Clause 9.1)

PERFORMANCE SECURITY

The Managing Director,
Bihar State Road Development Corporation Limited
Patna

WHEREAS:

(A) **Navayuga Jahnavi Toll Bridge Pvt. Ltd.**(the "**Concessionaire**") and the Managing Director, Bihar State Road Development Corporation Limited, Patna (the "Authority") have entered into a Concession Agreement dated 08th October 2010 (the "Agreement") whereby the Authority has agreed to the Concessionaire undertaking development of a Greenfield alignment connecting NH-31 near Bakhtiyarpur & NH-28 at Tazpur with a bridge across river Ganga (approximately 42 km approach road and 5.55 km long bridge) on design, build, finance, operate and transfer ("D**BFOT**") basis, subject to and in accordance with the provisions of the Agreement.

(B) The Agreement requires the Concessionaire to furnish a Performance Security to the Authority in a sum of Rs. 75.137 crores (Rupees seventy five crore thirteen lacs and seven thousand) (i.e. 5% of Total Project Cost) (the "**Guarantee Amount**") as security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period (as defined in the Agreement).

(C) We, ... through our Branch at ..... (the "**Bank**") have agreed to furnish this Bank Guarantee by way of Performance Security.

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Concessionaire's obligations during the Construction Period, under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Concessionaire, such sum or sums upto an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an Officer not below the rank of Chief General Manager in the Bihar State Road Development Corporation Limited, Govt. of Bihar, that the Concessionaire has committed default in the due and faithful performance of all or any of its obligations under and in

accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Concessionaire is in default in due and faithful performance of its obligations during the Construction Period under the Agreement and its decision that the Concessionaire is in default shall be final, and binding on the Bank, notwithstanding any differences between the Authority and the Concessionaire, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Concessionaire for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Concessionaire and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Concessionaire before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreement or to extend the time or period for the compliance with, fulfilment and/ or performance of all or any of the obligations of the Concessionaire contained in the Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Concessionaire, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Concessionaire or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfilment, compliance and/or performance of all or any of the obligations of the Concessionaire under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force 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, no later than 6 (six) months from the date of expiry of this Guarantee, all rights of the Authority under this Guarantee

shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Performance Security shall cease to be in force and effect when the Concessionaire shall have expended on Project construction an aggregate sum not less than 20% (twenty per cent) of the Total Project Cost which is deemed to be Rs. 300 cr. (Rupees Three hundred crores only) for the purposes of this Guarantee, and provided the Concessionaire is not in breach of this Agreement. Upon request made by the Concessionaire for release of the Performance Security alongwith the particulars required hereunder, duly certified by a statutory auditor of the Concessionaire, the Authority shall release the Performance Security forthwith.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

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

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for a period of one year or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

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 –G
(See Clause 12.1)

PROJECT COMPLETION SCHEDULE

1 Project Completion Schedule

During Construction Period, the Concessionaire shall comply with the requirements set forth in this Schedule-G for each of the Project Milestones and the Scheduled Commissioning Date (the "**Project Completion Schedule**"). Within 15 (fifteen) days of the date of each Project Milestone, the Concessionaire shall notify the Authority of such compliance alongwith necessary particulars thereof.

2 Project Milestone-I

2.1 Project Milestone-I shall occur on the date falling on the 410th (four hundred and tenth) day from the Appointed Date (the "**Project Milestone-I**").

2.2 Prior to the occurrence of Project Milestone-I, the Concessionaire shall have commenced construction of the Project and expended not less than 10% (ten per cent) of the total capital cost set forth in the Financial Package.

3 Project Milestone-II

3.1 Project Milestone-II shall occur on the date falling on the 830th (eight hundred and thirtieth) day from the Appointed Date (the "**Project Milestone-II**").

3.2 Prior to the occurrence of Project Milestone-II, the Concessionaire shall have commenced construction of all other bridges and expended not less than 35% (thirty five per cent) of the total capital cost set forth in the Financial Package.

4 Project Milestone-III

4.1 Project Milestone-III shall occur on the date falling on the 1240th (twelve hundred and fortieth) day from the Appointed Date (the "**Project Milestone-III**").

4.2 Prior to the occurrence of Project Milestone-III, the Concessionaire shall have commenced construction of all Project Facilities and expended not less than 70% (Seventy per cent) of the total capital cost set forth in the Financial Package.

5 Scheduled Commissioning Date

5.1 The Scheduled Commissioning Date shall occur on the 1642nd (sixteen hundred and forty second) day from the Appointed Date.

5.2 On or before the Scheduled Commissioning Date, the Concessionaire shall

have completed all construction works pertaining to the Four-lane Greenfield Bridge and its approach roads in accordance with this Agreement.

6 Extension of period

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Commissioning 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 –H
(See Clause 12.3)

DRAWINGS

1 Drawings

In compliance of the obligations set forth in Clause 12.3 of this Agreement, the Concessionaire shall furnish to the Independent Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-H.

2 Additional drawings

If the Independent Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Annex-I, it may by notice require the Concessionaire to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Concessionaire shall promptly prepare and furnish such drawings to the Independent Engineer, as if such drawings formed part of Annex-I of this Schedule-H.

Annex - I
(Schedule-H)

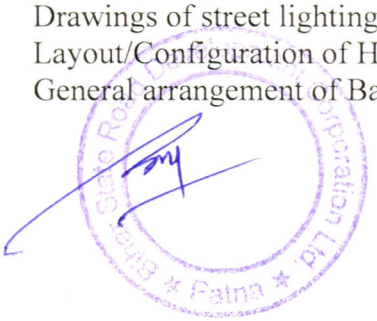
List of Drawings

1. The Project drawings, as defined in Clause 1.1, Definitions, Article 1, Definitions and Interpretation, Part-I: Preliminary, of the Concession Agreement shall consist:

   (a) Working Drawings of all the components/elements of the Project as determined by Independent Engineer/BSRDC, and
   (b) As-built drawings for the Project components / elements as determined by IE/BSRDC. As-built drawings shall be duly certified by Independent Engineer.

2. A broad list of the drawings of the various components / elements of the Project and project facilities required to be submitted by the Concessionaire is given below:

   (a) Drawings of horizontal alignment, vertical profile and cross sections
   (b) Structural Drawings for bridge across river Ganga which includes dimension and reinforcement drawings of foundations, substructure & superstructure
   (c) Drawings of temporary works
   (d) Drawings of cross drainage works
   (e) Drawings of interchanges, major intersections, grade separators, underpasses and ROB's
   (f) Drawings of toll plaza layout, toll collection systems and roadway near toll plaza
   (g) Drawings of Control Centre
   (h) Drawings of bus-bay and bus shelters with furniture and drainage system
   (i) Drawing of a truck parking lay bye with furniture and drainage system
   (j) Drawings of road furniture items including traffic signage, markings, safety barriers, etc.
   (k) Drawings of traffic diversion plans and traffic control measures
   (l) Drawings of road drainage measures
   (m) Drawings of typical details slope protection measures
   (n) Drawings of landscaping and horticulture
   (o) Drawings of pedestrian crossings
   (p) Drawings of street lighting
   (q) Layout/Configuration of HTMS
   (r) General arrangement of Base camp and Administrative Block





SCHEDULE –I
(See Clause 14.1.2)

TESTS

1 Schedule for Tests

1.1 The Concessionaire shall, no later than 30 (thirty) days prior to the likely completion of the Project, notify the Independent Engineer and the Authority of its intent to subject the Project to Tests, and no later than 7 (seven) days prior to the actual date of Tests, furnish to the Independent Engineer and the Authority detailed inventory and particulars of all works and equipment forming part of the Project.

1.2 The Concessionaire shall notify the Independent Engineer of its readiness to subject the Project to Tests at any time after 7 (seven) days from the date of such notice, and upon receipt of such notice, the Independent Engineer shall, in consultation with the Concessionaire, determine the date and time for each Test and notify the same to the Authority who may designate its representative to witness the Tests. The Independent Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 14 and this Schedule-I.

2 Tests

2.1 Visual and physical Test: The Independent Engineer shall conduct a visual and physical check of all the construction works related to the Project to determine that all works and equipment forming part thereof conform to the provisions of this Agreement.

2.2 Test drive: The Independent Engineer shall undertake a test drive of the Project by a Car and by a fully loaded Truck to determine that the quality of service conforms to the provisions of the Agreement.

2.3 Riding quality Test: Riding quality of each lane of the carriageway shall be checked with the help of a calibrated bump integrator and the maximum permissible roughness for purposes of this Test shall be [1,800 (one thousand and eight hundred)] mm for each kilometre.

2.4 Pavement Composition Test: The thickness and composition of the pavement structure shall be checked on a sample basis by digging pits to determine conformity of such pavement structure with Specifications and Standards. The sample shall consist of one pit in each direction of travel to be chosen at random in each stretch of 5 (five) kilometres of the Project. The first pit for the sample shall be selected by the Independent Engineer through an open draw of lots and every fifth kilometre from such first pit shall form part of the sample for this pavement quality Test.

2.5 Cross-section Test: The cross-sections of the Project shall be checked on a sample basis through physical measurement of their dimensions for

determining the conformity thereof with Specifications and Standards. For the road portion, the sample shall consist of one spot to be selected at random in each stretch of 1 (one) kilometre of the Project. The first spot for the sample shall be selected by the Independent Engineer through an open draw of lots and the spots located at every one kilometre from such first spot shall form part of the sample. For the bridge portion, one spot shall be selected at random by the Independent Engineer in each span of the bridge.

2.6 Structural Test for bridges: All major and minor bridges constructed by the Concessionaire shall be subjected to the Rebound Hammer and Ultrasonic Pulse Velocity tests, to be conducted in accordance with the procedure described in Special Report No. 17: 1996 of the IRC Highway Research Board on Nondestructive Testing Techniques, at two spots in every span, to be chosen at random by the Independent Engineer. Bridges with a span of 15 (fifteen) metres or more shall also be subjected to load testing.

2.7 Other Tests: The Independent Engineer may require the Concessionaire to carry out or cause to be carried additional Tests, in accordance with Good Industry Practice, for determining the compliance of the Project with Specifications and Standards.

2.8 Environmental audit: The Independent Engineer shall carry out a check to determine conformity of the Project with the environmental requirements set forth in Applicable Laws and Applicable Permits.

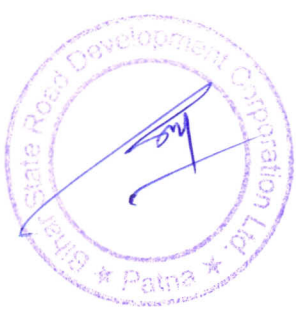
2.9 Safety review: Safety audit of the Project shall have been undertaken by the Safety Consultant as set forth in Schedule-L, and on the basis of such audit, the Independent Engineer shall determine conformity of the Project with the provisions of this Agreement.

3 Agency for conducting Tests

All Tests set forth in this Schedule-I shall be conducted by the Independent Engineer or such other agency or person as it may specify in consultation with the Authority.

4 Completion/Provisional Certificate

Upon successful completion of Tests, the Independent Engineer shall issue the Completion Certificate or the Provisional Certificate, as the case may be, in accordance with the provisions of Article 14.





SCHEDULE –J

(See Clauses 14.2 & 14.3)

COMPLETION CERTIFICATE

1 I, ... (Name of the Independent Engineer), acting as Independent Engineer, under and in accordance with the Concession Agreement dated ..... (the "**Agreement**"), for New four lane Ganga Bridge and its approaches connecting NH-31 near Bakhtiyarpur & NH-28 at Tazpur (the "**Project**") on design, build, finance, operate and transfer (DBFOT) basis, through ..... (Name of Concessionaire), hereby certify that the Tests specified in Article 14 and Schedule-I of the Agreement have been successfully undertaken to determine compliance of the Project with the provisions of the Agreement, and I am satisfied that the Project can be safely and reliably placed in commercial service of the Users thereof.

2 It is certified that, in terms of the aforesaid Agreement, all works forming part of the Project have been completed, and the Project is hereby declared fit for entry into commercial operation on this the ..... day of ..... 20.....

SIGNED, SEALED AND DELIVERED
For and on behalf of
the INDEPENDENT ENGINEER by:

(Signature)
(Name)
(Designation)
(Address)

Bihar State Road Development Corporation Ltd. ★ Patna ★

Narayuga Jahnavi Toll Bridge Pvt. Ltd. ★

PROVISIONAL CERTIFICATE

1 I, ... (Name of the Independent Engineer), acting as Independent Engineer, under and in accordance with the Concession Agreement dated ..... (the **"Agreement"**), for construction New four lane Ganga Bridge and its approaches connecting NH-31 near Bakhtiyarpur & NH-28 at Tazpur (the **"Project"**) on design, build, finance, operate and transfer (DBFOT) basis through ..... (Name of Concessionaire), hereby certify that the Tests specified in Article 14 and Schedule-I of the Agreement have been undertaken to determine compliance of the Project with the provisions of the Agreement.

2 Construction Works that were found to be incomplete and/or deficient have been specified in the Punch List appended hereto, and the Concessionaire has agreed and accepted that it shall complete and/or rectify all such works in the time and manner set forth in the Agreement. (Some of the incomplete works have been delayed as a result of reasons attributable to the Authority or due to Force Majeure and the Provisional Certificate cannot be withheld on this account. Though the remaining incomplete works have been delayed as a result of reasons attributable to the Concessionaire,)[@] I am satisfied that having regard to the nature and extent of such incomplete works, it would not be prudent to withhold commercial operation of the Project, pending completion thereof.

3 In view of the foregoing, I am satisfied that the Project can be safely and reliably placed in commercial service of the Users thereof, and in terms of the Agreement, the Project is hereby provisionally declared fit for entry into commercial operation on this the ..... day of ..... 20.....

ACCEPTED, SIGNED, SEALED AND DELIVERED For and on behalf of CONCESSIONAIRE by: by:	SIGNED, SEALED AND DELIVERED For and on behalf of INDEPENDENT ENGINEER
(Signature) (Name and Designation) (Address)	(Signature) (Name and Designation) (Address)

@ Strike out if not applicable.

SCHEDULE –K
(See Clause 17.2)

MAINTENANCE REQUIREMENTS

1 Maintenance Requirements

1.1 The Concessionaire shall, at all times, operate and maintain the Project in accordance with the provisions of the Agreement, Applicable Laws and Applicable Permits. In particular, the Concessionaire shall, at all times during the Operation Period, conform to the maintenance requirements set forth in this Schedule-K (the "**Maintenance Requirements**").

1.2 The Concessionaire shall repair or rectify any defect or deficiency set forth in Paragraph 2 of this Schedule-K within the time limit specified therein and any failure in this behalf shall constitute a breach of the Agreement. Upon occurrence of any breach hereunder, the Authority shall be entitled to recover Damages as set forth in Clause 17.8 of the Agreement, without prejudice to the rights of the Authority under the Agreement, including Termination thereof.

2 Repair/rectification of defects and deficiencies

The obligations of the Concessionaire in respect of Maintenance Requirements shall include repair and rectification of the defects and deficiencies specified in Annex - I of this Schedule - K within the time limit set forth therein.

3 Other defects and deficiencies

3.1 In respect of any defect or deficiency not specified in Annex - I of this Schedule-K, the Concessionaire shall undertake repair or rectification in accordance with Good Industry Practice.

3.2 In respect of any defect or deficiency not specified in Annex - I of this Schedule-K, the Independent Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Concessionaire within the time limit specified by the Independent Engineer.

4 Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule-K, if the nature and extent of any defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Concessionaire shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Independent Engineer and conveyed to the Concessionaire and the Authority with reasons thereof.

5 Emergency repairs/restoration

Notwithstanding anything to the contrary contained in this Schedule-K, if any defect, deficiency or deterioration in the Project poses a hazard to safety or risk of damage to property, the Concessionaire shall promptly take all reasonable measures for eliminating or minimizing such danger.

6 Daily Inspection by the Concessionaire

The Concessionaire shall, through its engineer, undertake a daily visual inspection of the Project and maintain a record thereof in a register to be kept in such form and manner as the Independent Engineer may specify. Such record shall be kept in safe custody of the Concessionaire and shall be open to inspection by the Authority and the Independent Engineer at any time during office hours.

7 Divestment Requirements

All defects and deficiencies specified in this Schedule-K shall be repaired and rectified by the Concessionaire so that the Project conforms to the Maintenance Requirements on the Transfer Date.

8 Display of Schedule - K

The Concessionaire shall display a copy of this Schedule - K at the Toll Plaza[s] along with the Complaint Register stipulated in Article 46.





Annex - I
(Schedule-K)

Repair/Rectification of Defects and Deficiencies

The Concessionaire shall repair and rectify the defects and deficiencies specified in this Annex-I of Schedule-K within the time limit set forth herein.[1]

Nature of defect or deficiency		Time limit for repair/ rectification
ROADS		
(a) Carriageway and paved shoulders		
(i) Breach or blockade	-	Temporary / restoration of traffic within 24 hours; permanent restoration within 15 days
(ii) Roughness value exceeding 2,500 mm in a stretch of 1 km (as measured by a standardised roughometer/bump integrator)	-	180 days
(iii) Pot holes	-	48 hours
(iv) Cracking in more than 5% of road surface in a stretch of 1 km	-	30 days
(v) Rutting exceeding 10 mm in more than 2% of road surface in a stretch of 1 km (measured with 3 m straight edge)	-	30 days
(vi) Bleeding/skidding	-	7 days
(vii) Ravelling/Stripping of bitumen surface exceeding 10 sq m	-	15 days
(viii) Damage to pavement edges exceeding 10 cm	-	15 days
(ix) Removal of debris	-	6 hours

[1]MoSRTH may, in consultation with IRC, by order modify the values and periods specified herein, but such modification shall take effect only if it is included in the respective bidding documents.

(b)	**Hard/earth shoulders, side slopes, drains and culverts**		
(i)	Variation by more than 2% in the prescribed slope of camber/cross fall	-	30 days
(ii)	Edge drop at shoulders exceeding 40 mm	-	7 days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	-	30 days
(iv)	Rain cuts/gullies in slope	-	7 days
(v)	Damage to or silting of culverts and side drains during and immediately preceding the rainy season	-	7 days
(vi)	Desilting of drains in urban/semi-urban areas	-	48 hours
(c)	**Road side furniture including road signs and pavement marking**		
(i)	Damage to shape or position; poor visibility or loss of retro-reflectivity	-	48 hours
(d)	**Street lighting and telecom (ATMS)**		
(i)	Any major failure of the system	-	24 hours
(ii)	Faults and minor failures	-	8 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 hours
(ii)	Deterioration in health of trees and bushes	-	Timely watering and treatment
(iii)	Replacement of trees and bushes	-	90 days
(iv)	Removal of vegetation affecting sight line and road structures	-	15 days
(f)	**Rest areas**		
(i)	Cleaning of toilets	-	Every 4 hours

(ii)	Defects in electrical, water and sanitary installations	-	24 hours
(g)	**Toll plaza[s]**		
(i)	Failure of toll collection equipment or lighting	-	8 hours
(ii)	Damage to toll plaza	-	7 days
(h)	**Other Project Facilities and Approach roads**		
(i)	Damage or deterioration in Approach Roads, [pedestrian facilities, truck lay-bys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts and other works]	-	15 days

BRIDGES

(a)	**Superstructure of bridges**		
(i)	Cracks		
	Temporary measures	-	within 48 hours
	Permanent measures	-	within 45 days
(ii)	Spalling/scaling	-	15 days
(b)	**Foundations of bridges**		
(i)	Scouring and/or cavitation	-	15 days
(c)	**Piers, abutments, return walls and wing walls of bridges**		
(i)	Cracks and damages including settlement and tilting	-	30 days
(d)	**Bearings (metallic) of bridges**		
(i)	Deformation	-	15 days
(e)	**Joints in bridges**		
(i)	Loosening and malfunctioning of joints	-	15 days
(f)	**Other items relating to bridges**		
(i)	Deforming of pads in elastomeric bearings	-	7 days

(ii)	Gathering of dirt in bearings and joints; or clogging of spouts, weep holes and vent-holes	-	3 days
(iii)	Damage or deterioration in parapets and handrails	-	3 days
(iv)	Rain-cuts or erosion of banks of the side slopes of approaches	-	15 days
(v)	Damage to wearing coat	-	15 days
(vi)	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	-	30 days
(vii)	Growth of vegetation affecting the structure or obstructing the waterway	-	15 days

Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Toll Bridge Pvt. Ltd. ★

SCHEDULE –L
(See Clause 18.1.1)

SAFETY REQUIREMENTS

1 Guiding principles

1.1 Safety Requirements aim at reduction in injuries, loss of life and damage to property resulting from accidents on the Project, irrespective of the person(s) at fault.

1.2 Users of the Project include motorised and non-motorised vehicles as well as pedestrians and animals involved in, or associated with accidents. Vulnerable Road Users (VRU) include pedestrians as well as riders of motorised two-wheelers, bicycles and other vehicles which do not provide adequate occupant protection.

1.3 Safety Requirements apply to all phases of construction, operation and maintenance with emphasis on identification of factors associated with accidents, consideration of the same, and implementation of appropriate remedial measures.

1.4 Safety Requirements include measures associated with traffic management and regulation such as road signs, pavement marking, traffic control devices, roadside furniture, highway design elements, enforcement and emergency response.

2 Obligations of the Concessionaire

The Concessionaire shall abide by the following insofar as they relate to safety of the Users:

(a) Applicable Laws and Applicable Permits;

(b) Manual for Safety in Road Design, issued by MOSRTH;

(c) relevant Standards/Guidelines of IRC relating to safety, road geometrics, bridges, culverts, road signs, pavement marking and roadside furniture;

(d) provisions of this Agreement; and

(e) Good Industry Practice.

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3 Appointment of Safety Consultant

For carrying out safety audit of the Project under and in accordance with this Schedule-L, the Authority shall appoint from time to time, one or more qualified firms or organisations as its consultants (the "**Safety Consultant**"). The Safety Consultant shall employ a team comprising, without limitation, one road safety expert and one traffic planner to undertake safety audit of the Project.

4 Safety measures during Development Period

4.1 No later than 90 (ninety) days from the date of this Agreement, the Authority shall appoint a Safety Consultant for carrying out safety audit at the design stage of the Project. The Safety Consultant shall collect data on all fatal crashes and other road accidents which occurred on the Project in the preceding two years by obtaining copies of the relevant First Information Reports (FIRs) from the police stations having jurisdiction. The information contained in such FIRs shall be summarised in the form prescribed by IRC/MOSRTH for this purpose and the data shall be analysed for the type of victims killed or injured, impacting vehicles, location of accidents and other relevant factors.

4.2 The Concessionaire shall provide to the Safety Consultant, in four copies, the relevant drawings containing the design details that have a bearing on safety of Users (the "**Safety Drawings**"). Such design details shall include horizontal and vertical alignments; sightlines; layouts of intersections; interchanges; road cross-section; bridges and culverts; side drains; provision for parked vehicles, slow moving vehicles (tractors, bullock carts, bicycles) and pedestrians; bus bays; truck lay-bys; and other incidental or consequential information. The Safety Consultant shall review the design details and forward three copies of the Safety Drawings with its recommendations, if any, to the Independent Engineer who shall record its comments, if any, and forward one copy each to the Authority and the Concessionaire.

4.3 The accident data and the design details shall be compiled, analysed and used by the Safety Consultant for evolving a package of recommendations consisting of safety related measures for the Project. The safety audit shall be completed in a period of three months and a report thereof (the "**Safety Report**") shall be submitted to the Authority, in five copies. One copy each of the Safety Report shall be forwarded by the Authority to the Concessionaire and the Independent Engineer forthwith.

4.4 The Concessionaire shall endeavour to incorporate the recommendations of the Safety Report in the design of the Project, as may reasonably be required in accordance with Applicable Laws, Applicable Permits, Manuals and Guidelines of MOSRTH and IRC, Specifications and Standards, and Good Industry Practice. If the Concessionaire does not agree with any or all of

such recommendations, it shall state the reasons thereof and convey them to the Authority forthwith. In the event that any or all of the works and services recommended in the Safety Report fall beyond the scope of Schedule-B, Schedule-C or Schedule-D, the Concessionaire shall make a report thereon and seek the instructions of the Authority for funding such works in accordance with the provisions of Article 18.

4.5 Without prejudice to the provisions of Paragraph 4.4, the Concessionaire and the Independent Engineer shall, within 15 (fifteen) days of receiving the Safety Report, send their respective comments thereon to the Authority, and no later than 15 (fifteen) days of receiving such comments, the Authority shall review the same alongwith the Safety Report and by notice direct the Concessionaire to carry out any or all of the recommendations contained therein with such modifications as the Authority may specify; provided that any works or services required to be undertaken hereunder shall be governed by the provisions of Article 18.

5 Safety measures during Construction Period

5.1 A Safety Consultant shall be appointed by the Authority, no later than 4 (four) months prior to the expected Project Completion Date, for carrying out a safety audit of the completed Construction Works.

5.2 The Safety Consultant shall collect and analyse the accident data for the preceding two years in the manner specified in Paragraph 4.1 of this Schedule-L. It shall study the Safety Report for the Development Period and inspect the Project to assess the adequacy of safety measures. The Safety Consultant shall complete the safety audit within a period of 4 (four) months and submit a Safety Report recommending a package of additional road safety measures, if any, that are considered essential for reducing accident hazards on the Project. Such recommendations shall be processed, *mutatis mutandis*, and acted upon in the manner set forth in Paragraphs 4.3, 4.4 and 4.5 of this Schedule-L.

5.3 The Concessionaire shall make adequate arrangements during the Construction Period for the safety of workers and road Users in accordance with the guidelines of IRC for safety in construction zones, and notify the Authority and the Independent Engineer about such arrangements.

6 Safety measures during Operation Period

6.1 The Concessionaire shall develop, implement and administer a surveillance and safety programme for Users, including correction of safety violations and deficiencies and all other actions necessary to provide a safe environment in accordance with this Agreement.

6.2 The Concessionaire shall establish a Highway Safety Management Unit (the "**HSMU**") to be functional on and after COD, and designate one of its

officers to be in-charge of the HSMU. Such officer shall have specialist knowledge and training in road safety and traffic engineering by having attended a course conducted by a reputed organisation on the subject.

6.3 The Concessionaire shall keep a copy of every FIR recorded by the Police with respect to any accident occurring on the Project. In addition, the Concessionaire shall also collect data for all cases of accidents not recorded by the Police but where a vehicle rolled over or had to be towed away. The information so collected shall be summarised in the form prescribed by IRC/ MOSRTH for this purpose. The Concessionaire shall also record the exact location of each accident on a road map. The aforesaid data shall be submitted to the Authority at the conclusion of every quarter and to the Safety Consultant as and when appointed.

6.4 The Concessionaire shall submit to the Authority before the 31st (thirty first) May of each year, an annual report (in ten copies) containing, without limitation, a detailed listing and analysis of all accidents of the preceding Accounting Year and the measures taken by the Concessionaire pursuant to the provisions of Paragraph 6.1 of this Schedule-L for averting or minimising such accidents in future.

6.5 Once in every Accounting Year, a safety audit shall be carried out by the Safety Consultant to be appointed by the Authority. It shall review and analyse the annual report and accident data of the preceding year, and undertake an inspection of the Project. The Safety Consultant shall complete the safety audit within a period of 1 (one) month and submit a Safety Report recommending specific improvements, if any, required to be made to the road, bridges, culverts, markings, signs, road furniture and Project Facilities, including cattle crossings and pedestrian crossings. Such recommendations shall be processed, *mutatis mutandis*, and acted upon in the manner set forth in Paragraphs 4.3, 4.4 and 4.5 of this Schedule-L.

7 Costs and expenses

Costs and expenses incurred in connection with the Safety Requirements set forth herein, including the provisions of Paragraph 2 of this Schedule, shall be met in accordance with Article 18, and in particular, the remuneration of the Safety Consultant, safety audit, and costs incidental thereto, shall be met out of the Safety Fund.

Bihar State Road Development Corporation Ltd. Patna

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

SCHEDULE –M
(See clause19.5)

MONTHLY FEE STATEMENT

Project: **Month:**

Type of Vehicle	For Corresponding Month of Previous Year		For Preceding Month		For the Month Reported upon		
	No. of Vehicles	Fee Collected (in lakh Rs.)	No. of Vehicles	Fee Collected (in lakh Rs.)	Fee per Vehicle (in Rs.)	No. of Vehicles	Fee Collected (in lakh Rs.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A Car							
B LCV							
C Bus							
D Truck							
E Multi-axle Truck							
F Oversized vehicle							
G **Total**							

Note 1: The above statement does not include Local Users and vehicles travelling on Passes

Note 2: Monthly Fee Statements for Passes have been prepared separately in the above format and are enclosed.

Remarks, if any:

Bihar State Road Development Corporation Ltd. Patna

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SCHEDULE –N
(See Clause22.1)

WEEKLY TRAFFIC CENSUS

Project: **Week ending:**

Type of Vehicle	No. of vehicles using the Project during		
	Corresponding week/last year	Preceding week	Week of report
(1)	(2)	(3)	(4)
A Fee paying Traffic A1 Car			
A2 LCV			
A3 Bus			
A4 Truck			
A5 Multi-axle Truck			
A6 Oversized vehicle			
Total (A)			
B Local Users B1 Car			
Total (B)			
C Exempted Vehicles C1 Motor Cycle			
C2 Car			
C3 LCV			
C4 Bus			
C5 Truck			
C6 Tractor			
Total (C)			
D Total Traffic (A+B-C) D1 Motor Cycle			
D2 Car			
D3 LCV			
D4 Bus			
D5 Truck			
D6 Multi-axle Truck			
D7 Oversized vehicle			
D8 Tractor			
Grand Total (E)			

Remarks, if any

Bihar State Road Development Corporation Ltd. ★ Patna ★

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WEEKLY REPORT FOR WEIGH STATIONS

Project: **Week ending:**

Type of Vehicle	Permitted Gross Vehicle Weight (Tonnes)	No. of Vehicles weighed (Sample size)	No. of Vehicles carrying load:			
			Within permissible limits	Up to 10% in excess	Over 10% and up to 20% in excess	Over 20% in excess
(1)	(2)	(3)	(4)	(5)	(6)	(7)
A LCV						
B Truck						
C Multi-axle Truck						
D **Total**						

Note: Sample size shall not be less than 200 trucks per week and 20 trucks per day, and should include a proportionate number of Multi-axle Trucks.

Remarks, if any:

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SCHEDULE –O
(See Clause 22.3.1)

TRAFFIC SAMPLING

1 Traffic sampling

The Authority may, in its discretion and at its own cost, undertake traffic sampling, pursuant to Clause 22.3, in order to determine the actual traffic on the Project. Such traffic sampling shall be undertaken through the Independent Engineer in the manner set forth below.

2 Manual traffic count

The Independent Engineer shall employ the required number of enumerators who shall count, classify and record all the vehicles as they pass by, and divide the survey into fixed time periods. The count stations shall be located near the Toll Plaza[s] on a straight section of the road with good visibility. The survey shall be conducted continuously for a minimum of 24 (twenty four) hours and maximum of 7 (seven) days at a time. The count period shall be 15 (fifteen) minutes with results summarised hourly.

3 Automatic traffic count

For automatic traffic count to be conducted on intermittent (non-continuous) basis, the Independent Engineer shall use suitable and standardised equipment to classify and record the range of vehicles passing through the Toll Plaza[s]. For this purpose, the counter shall be checked with at least 100 (one hundred) vehicles, including all major vehicle types, over a range of speeds to ensure that all vehicles are being counted and classified correctly.

4 Variation between manual and automatic count

Average Daily Traffic (ADT) for each type of vehicle shall be determined separately by the aforesaid two methods and in the event that the number of vehicles in any category, as counted by the manual method, varies by more than 1% (one per cent) of the number of such vehicles as counted by the automatic method, the manual and automatic count of such category of vehicles shall be repeated, and in the event of any discrepancy between the two counts in the second enumeration, the average thereof shall be deemed to be the actual traffic. For the avoidance of doubt, it is expressly agreed that the Authority may, in consultation with the Concessionaire, adopt modified or alternative processes of traffic sampling for improving the reliability of such sampling.

SCHEDULE –P
(See Clause 23.1)

SELECTION OF INDEPENDENT ENGINEER

1 Selection of Independent Engineer

1.1 The provisions of Part II of the Standard Bidding Documents for Consultancy Assignments: Time Based (Volume V) issued by the Ministry of Finance, GOI in July, 1997 or any substitute thereof shall apply, *mutatis mutandis*, for invitation of bids and evaluation thereof save as otherwise provided herein.

1.2 The Authority shall invite expressions of interest from consulting engineering firms or bodies corporate to undertake and perform the duties and functions set forth in Schedule-Q and thereupon shortlist 10 (ten) qualified firms in accordance with pre-determined criteria. The Authority shall convey the aforesaid list of firms to the Concessionaire for scrutiny and comments, if any. The Concessionaire shall be entitled to scrutinise the relevant records of the Authority to ascertain whether the selection of firms has been undertaken in accordance with the prescribed procedure and it shall send its comments, if any, to the Authority within 15 (fifteen) days of receiving the aforesaid list of firms. Upon receipt of such comments, if any, the Authority shall, after considering all relevant factors, finalise and constitute a panel of 10 (ten) firms (the "**Panel of Firms**") and convey its decision to the Concessionaire.

1.3 The Authority shall invite the aforesaid firms in the Panel of Firms to submit their respective technical and financial offers, each in a separate sealed cover. All the technical bids so received shall be opened and pursuant to the evaluation thereof, the Authority shall shortlist 3 (three) eligible firms on the basis of their technical scores. The financial bids in respect of such 3 (three) firms shall be opened and the order of priority as among these firms shall be determined on the basis of a weighted evaluation where technical and financial scores shall be assigned respective weights of 80:20.

2 Fee and expenses

2.1 In determining the nature and quantum of duties and services to be performed by the Independent Engineer during the Development Period and Construction Period, the Authority shall endeavour that payments to the Independent Engineer on account of fee and expenses do not exceed 2% (two per cent) of the Total Project Cost. Payments not exceeding such 2% (two per cent) shall be borne equally by the Authority and the Concessionaire in accordance with the provisions of this Agreement and any payments in excess thereof shall be borne entirely by the Authority.

2.2 The nature and quantum of duties and services to be performed by the Independent Engineer during the Operation Period shall be determined by

the Authority in conformity with the provisions of this Agreement and with due regard for economy in expenditure. All payments made to the Independent Engineer on account of fee and expenses during the Operation Period, shall be borne equally by the Authority and the Concessionaire.

3 Constitution of fresh panel

No later than three years from the date of this Agreement, and every three years thereafter, the Authority shall prepare a fresh panel of firms in accordance with the criteria set forth in this Schedule-P; provided that the Authority may, at any time, prepare a fresh panel with prior written consent of the Concessionaire.

4 Appointment of government entity as Independent Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Independent Engineer; provided that such entity shall be a body corporate having as one of its primary function the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government-owned entity which is owned or controlled by the Authority and/or MoSRTH shall not be eligible for appointment as Independent Engineer.

Bihar State Road Development Corporation Ltd. ★ Patna ★

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SCHEDULE –Q
(See Clause 23.2.1)

TERMS OF REFERENCE FOR INDEPENDENT ENGINEER

1 Scope

1.1 These Terms of Reference for the Independent Engineer (the "**TOR**") are being specified pursuant to the Concession Agreement dated ..... (the "**Agreement**"), which has been entered into between the Authority and ..... (the "**Concessionaire**") for New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches in the State of Bihar on design, build, finance, operate and transfer (DBFOT) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

1.2 This TOR shall apply to construction, operation and maintenance of the Project.

2 Definitions and interpretation

2.1 The words and expressions beginning with or in capital letters used in this TOR and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.

2.2 References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.

2.3 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Agreement shall apply, *mutatis mutandis*, to this TOR.

3 Role and functions of the Independent Engineer

3.1 The role and functions of the Independent Engineer shall include the following:

(i) review of the Drawings and Documents as set forth in Paragraph 4;

(ii) review, inspection and monitoring of Construction Works as set forth in Paragraph 5;

(iii) conducting Tests on completion of construction and issuing Completion/ Provisional Certificate as set forth in Paragraph 5;

(iv) review, inspection and monitoring of O&M as set forth in Paragraph 6;

(v) review, inspection and monitoring of Divestment Requirements as set forth in Paragraph 7;

(vi) determining, as required under the Agreement, the costs of any works or services and/or their reasonableness;

(vii) determining, as required under the Agreement, the period or any extension thereof, for performing any duty or obligation;

(viii) assisting the Parties in resolution of disputes as set forth in Paragraph 9; and

(ix) undertaking all other duties and functions in accordance with the Agreement.

3.2 The Independent Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.

4 Development Period

4.1 During the Development Period, the Independent Engineer shall undertake a detailed review of the Drawings to be furnished by the Concessionaire along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys and traffic surveys. The Independent Engineer shall complete such review and send its comments/observations to the Authority and the Concessionaire within 15 (fifteen) days of receipt of such Drawings. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.

4.2 The Independent Engineer shall review any modified Drawings or supporting Documents sent to it by the Concessionaire and furnish its comments within 7 (seven) days of receiving such Drawings or Documents.

4.3 The Independent Engineer shall review the Drawings sent to it by the Safety Consultant in accordance with Schedule-L and furnish its comments thereon to the Authority and the Concessionaire within 7 (seven) days of receiving such Drawings. The Independent Engineer shall also review the Safety Report and furnish its comments thereon to the Authority within 15 (fifteen) days of receiving such report.

4.4 The Independent Engineer shall review the detailed design, construction methodology, quality assurance procedures and the procurement, engineering and construction time schedule sent to it by the Concessionaire and furnish its comments within 15 (fifteen) days of receipt thereof.

4.5 Upon reference by the Authority, the Independent Engineer shall review and comment on the EPC Contract or any other contract for construction, operation and maintenance of the Project, and furnish its comments within 7

(seven) days from receipt of such reference from the Authority.

5 Construction Period

5.1 In respect of the Drawings, Documents and Safety Report received by the Independent Engineer for its review and comments during the Construction Period, the provisions of Paragraph 4 shall apply, *mutatis mutandis*.

5.2 The Independent Engineer shall review the monthly progress report furnished by the Concessionaire and send its comments thereon to the Authority and the Concessionaire within 7 (seven) days of receipt of such report.

5.3 The Independent Engineer shall inspect the Construction Works and the Project once every month, preferably after receipt of the monthly progress report from the Concessionaire, but before the 20th (twentieth) day of each month in any case, and make out a report of such inspection (the "**Inspection Report**") setting forth an overview of the status, progress, quality and safety of construction, including the work methodology adopted, the materials used and their sources, and conformity of Construction Works with the Scope of the Project and the Specifications and Standards. In a separate section of the Inspection Report, the Independent Engineer shall describe in reasonable detail the lapses, defects or deficiencies observed by it in the construction of the Project. The Inspection Report shall also contain a review of the maintenance of the existing lanes in conformity with the provisions of the Agreement. The Independent Engineer shall send a copy of its Inspection Report to the Authority and the Concessionaire within 7 (seven) days of the inspection.

5.4 The Independent Engineer may inspect the Project more than once in a month if any lapses, defects or deficiencies require such inspections.

5.5 For determining that the Construction Works conform to Specifications and Standards, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests on a sample basis, to be specified by the Independent Engineer in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 5.5, the tests specified in the IRC Special Publication-11 (Handbook of Quality Control for Construction of Roads and Runways) and the Specifications for Road and Bridge Works issued by MOSRTH (the "**Quality Control Manuals**") or any modification/substitution thereof shall be deemed to be tests conforming to Good Industry Practice for quality assurance. The Independent Engineer shall issue necessary directions to the Concessionaire for ensuring that the tests are conducted in a fair and efficient manner, and shall monitor and review the results thereof.

5.6 The sample size of the tests, to be specified by the Independent Engineer under Paragraph 5.5, shall comprise 10% (ten per cent) of the quantity or number of tests prescribed for each category or type of tests in the Quality Control Manuals; provided that the Independent Engineer may, for reasons

to be recorded in writing, increase the aforesaid sample size by up to 10% (ten per cent) for certain categories or types of tests.

5.7 The timing of tests referred to in Paragraph 5.5, and the criteria for acceptance/ rejection of their results shall be determined by the Independent Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Concessionaire for its own quality assurance in accordance with Good Industry Practice.

5.8 In the event that the Concessionaire carries out any remedial works for removal or rectification of any defects or deficiencies, the Independent Engineer shall require the Concessionaire to carry out, or cause to be carried out, tests to determine that such remedial works have brought the Construction Works into conformity with the Specifications and Standards, and the provisions of this Paragraph 5 shall apply to such tests.

5.9 In the event that the Concessionaire fails to achieve any of the Project Milestones, the Independent Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Independent Engineer shall determine that completion of the Project is not feasible within the time specified in the Agreement, it shall require the Concessionaire to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Concessionaire, the Independent Engineer shall review the same and send its comments to the Authority and the Concessionaire forthwith.

5.10 If at any time during the Construction Period, the Independent Engineer determines that the Concessionaire has not made adequate arrangements for the safety of workers and Users in the zone of construction or that any work is being carried out in a manner that threatens the safety of the workers and the Users, it shall make a recommendation to the Authority forthwith, identifying the whole or part of the Construction Works that should be suspended for ensuring safety in respect thereof.

5.11 In the event that the Concessionaire carries out any remedial measures to secure the safety of suspended works and Users, it may, by notice in writing, require the Independent Engineer to inspect such works, and within 3 (three) days of receiving such notice, the Independent Engineer shall inspect the suspended works and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.

5.12 If suspension of Construction Works is for reasons not attributable to the Concessionaire, the Independent Engineer shall determine the extension of dates set forth in the Project Completion Schedule, to which the Concessionaire is reasonably entitled, and shall notify the Authority and the Concessionaire of the same.

5.13 The Independent Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-I and issue a Completion Certificate or Provisional Certificate, as the case may be. For carrying out its functions under this Paragraph 5.13 and all matters incidental thereto, the Independent Engineer shall act under and in accordance with the provisions of Article 14 and Schedule-I.

5.14 Upon reference from the Authority, the Independent Engineer shall make a fair and reasonable assessment of the costs of providing information, works and services as set forth in Article 16 and certify the reasonableness of such costs for payment by the Authority to the Concessionaire.

5.15 The Independent Engineer shall aid and advise the Concessionaire in preparing the Maintenance Manual.

6 Operation Period

6.1 In respect of the Drawings, Documents and Safety Report received by the Independent Engineer for its review and comments during the Operation Period, the provisions of Paragraph 4 shall apply, *mutatis mutandis*.

6.2 The Independent Engineer shall review the annual Maintenance Programme furnished by the Concessionaire and send its comments thereon to the Authority and the Concessionaire within 15 (fifteen) days of receipt of the Maintenance Programme.

6.3 The Independent Engineer shall review the monthly status report furnished by the Concessionaire and send its comments thereon to the Authority and the Concessionaire within 7 (seven) days of receipt of such report.

6.4 The Independent Engineer shall inspect the Project once every month, preferably after receipt of the monthly status report from the Concessionaire, but before the 20th (twentieth) day of each month in any case, and make out an O&M Inspection Report setting forth an overview of the status, quality and safety of O&M including its conformity with the Maintenance Requirements and Safety Requirements. In a separate section of the O&M Inspection Report, the Independent Engineer shall describe in reasonable detail the lapses, defects or deficiencies observed by it in O&M of the Project. The Independent Engineer shall send a copy of its O&M Inspection Report to the Authority and the Concessionaire within 7 (seven) days of the inspection.

6.5 The Independent Engineer may inspect the Project more than once in a month, if any lapses, defects or deficiencies require such inspections.

6.6 The Independent Engineer shall in its O&M Inspection Report specify the tests, if any, that the Concessionaire shall carry out, or cause to be carried out, for the purpose of determining that the Project is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Concessionaire in this behalf.

6.7 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule-K, the Independent Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.

6.8 The Independent Engineer shall determine if any delay has occurred in completion of repair or remedial works in accordance with the Agreement, and shall also determine the Damages, if any, payable by the Concessionaire to the Authority for such delay.

6.9 The Independent Engineer shall examine the request of the Concessionaire for closure of any lane(s) of the carriageway for undertaking maintenance/repair thereof, keeping in view the need to minimise disruption in traffic and the time required for completing such maintenance/repair in accordance with Good Industry Practice. It shall grant permission with such modifications, as it may deem necessary, within 3 (three) days of receiving a request from the Concessionaire. Upon expiry of the permitted period of closure, the Independent Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Concessionaire to the Authority under Clause 17.7.

6.10 The Independent Engineer shall monitor and review the curing of defects and deficiencies by the Concessionaire as set forth in Clause 19.4.

6.11 In the event that the Concessionaire notifies the Independent Engineer of any modifications that it proposes to make to the Project, the Independent Engineer shall review the same and send its comments to the Authority and the Concessionaire within 15 (fifteen) days of receiving the proposal.

6.12 The Independent Engineer shall undertake traffic sampling, as and when required by the Authority, under and in accordance with Article 22 and Schedule-O.

7 Termination

7.1 At any time, not earlier than 90 (ninety) days prior to Termination but not later than 15 (fifteen) days prior to such Termination, the Independent Engineer shall, in the presence of a representative of the Concessionaire, inspect the Project for determining compliance by the Concessionaire with the Divestment Requirements set forth in Clause 38.1 and, if required, cause tests to be carried out at the Concessionaire's cost for determining such compliance. If the Independent Engineer determines that the status of the Project is such that its repair and rectification would require a larger amount than the sum set forth in Clause 39.2, it shall recommend retention of the required amount in the Escrow Account and the period of retention thereof.

7.2 The Independent Engineer shall inspect the Project once in every 15(fifteen) days during a period of 90 (ninety) days after Termination for determining

the liability of the Concessionaire under Article 39, in respect of the defects or deficiencies specified therein. If any such defect or deficiency is found by the Independent Engineer, it shall make a report in reasonable detail and send it forthwith to the Authority and the Concessionaire.

8 Determination of costs and time

8.1 The Independent Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under the Agreement.

8.2 The Independent Engineer shall determine the period, or any extension thereof, that is required to be determined by it under the Agreement.

9 Assistance in Dispute resolution

9.1 When called upon by either Party in the event of any Dispute, the Independent Engineer shall mediate and assist the Parties in arriving at an amicable settlement.

9.2 In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the Independent Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

10 Other duties and functions

The Independent Engineer shall perform all other duties and functions specified in the Agreement.

11 Miscellaneous

11.1 The Independent Engineer shall notify its programme of inspection to the Authority and to the Concessionaire, who may, in their discretion, depute their respective representatives to be present during the inspection.

11.2 A copy of all communications, comments, instructions, Drawings or Documents sent by the Independent Engineer to the Concessionaire pursuant to this TOR, and a copy of all the test results with comments of the Independent Engineer thereon shall be furnished by the Independent Engineer to the Authority forthwith.

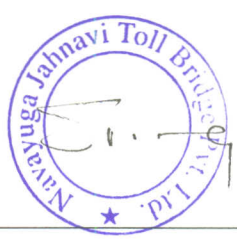
11.3 The Independent Engineer shall obtain, and the Concessionaire shall furnish in two copies thereof, all communications and reports required to be submitted, under this Agreement, by the Concessionaire to the Independent Engineer, whereupon the Independent Engineer shall send one of the copies to the Authority along with its comments thereon.

11.4 The Independent Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them

in its safe custody.

11.5 Upon completion of its assignment hereunder, the Independent Engineer shall duly classify and list all Drawings, Documents, results of tests and other relevant records, and hand them over to the Authority or such other person as the Authority may specify, and obtain written receipt thereof. Two copies of the said documents shall also be furnished in micro film form or in such other medium as may be acceptable to the Authority.





in its safe custody.

11.5 Upon completion of its assignment hereunder, the Independent Engineer shall duly classify and list all Drawings, Documents, results of tests and other relevant records, and hand them over to the Authority or such other person as the Authority may specify, and obtain written receipt thereof. Two copies of the said documents shall also be furnished in micro film form or in such other medium as may be acceptable to the Authority.





SCHEDULE –R

(See Clause 27.1.1)

FEE NOTIFICATION

MINISTRY OF SHIPPING, ROAD TRANSPORT AND HIGHWAYS

(Department of Road Transport and Highways)

NOTIFICATION

New Delhi, the ..... 20...

S.O. ..... Whereas, by the notification of the Government of India in the Ministry of Shipping, Road Transport & Highways (MoSRT&H), number ..... dated ..... issued under Section 11 of the National Highways Authority of India Act, 1988 (68 of 1988), The Bihar State Road Development Corporation Limited has a mandate to develop **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the States of Bihar (herein after referred to as the "Authority");

And, WHEREAS, pursuant to the provisions of section 14 of the said Act, the Authority has entered into an agreement with ....., having its Registered Office at ..... (hereinafter referred to as "Concessionaire") for the development of **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the State of Bihar on Design, Build, Finance, Operate and Transfer (DBFOT) basis;

AND, WHEREAS, the Central Government has entered into an agreement with the Authority for the development of the **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the State of Bihar and to issue a Fee Notification to levy and collect the Fees from the said new Greenfield alignment to be connected to two National Highways (NH-31 & NH-28) in terms of the aforesaid agreement entered into between the Authority and the said Concessionaire;

NOW, THEREFORE, in exercise of powers conferred by section 9 of the National Highways Act, 1956 (48 of 1956), and in suppression of the National Highways (Temporaray Bridges) Rules, 1964, the National Highways (Collection of Fees by any person for the use of section of National

Highways/permanent bridge/temporary bridge on National Highway) Rules, 1997, the National Highways (Fees for the Use of National Highways Section and Permanent Bridge-Public Funded Project) Rules, 1997, except as respects things done or omitted to be done before such suppression the Central Government has made the following rules for collection of fee for use of sections of National Highways, permanent bridges, bypasses and tunnels, namely.

The Central Government, having regard to the expenditure involved in building, maintenance, management and operation of the said section of the said Greenfield Road, interest on the capital invested, reasonable return, the volume of traffic and the period of such agreement entered into between the Authority and the Concessionaire, hereby notifies that there shall be levied and collected Fees on motorized vehicles for the use of the said section i.e **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the State of Bihar at the rate specified in the Schedule below, and authorizes the said Concessionaire to collect and retain the said Fees on and from the date of commercial operation and till the termination date as mentioned in the Agreement.

1. **Short Title and Commencement** – (1) These rules may be called the National Highways Fee (Determination of Rates and Collection) Rules, 2008 in the State of Bihar.

2. **Definitions**

(1) In the notification, unless the context otherwise requires, -

(i) "**Act**" means the national Highways Act, 1956;

(ii) "**base year**" means the period from 1st April 2007 to 31st March 2008;

(iii) "**bypass**" means a section of the national highway bypassing a town or city;

(iv) "**concessionaire**" means a person with whom an agreement has been entered into under section 8A of the Act;

(v) "**elevated highway**" means any section of national highway raised above ground level through support of piers or columns ;

(vi) "**executing authority**" means an officer or authority notified by the Central Government under section 5 of the Act;

(vii) "**expressway**" means a national highway having a divided carriageway suitable for high speed traffic with control of access;

(viii) "**financial year**" means the year commencing on the 1st day of April of a year and ending on 31st day of March of the succeeding year;

(ix) "**gross vehicle weight**" in respect of any vehicle means the total weight of the vehicle and the load certified and registered by the registering authority as permissible for that vehicle under the Motor Vehicles Act, 1988 (59 of 1988);

(x) "**lane**" means a lane forming part of the main carriageway and having a minimum width of three meters and fifty centimeters;

(xi) "**mechanical vehicle**" means any vehicle driven under its own power including a motor vehicle as defined under the Motor Vehicles Act,1988;

(xii) "**notification**" means a notification published in the Official Gazette;

(xiii) "**private investment project**" means a project relating to section of national highway, permanent bridge, bypass or tunnel, as the case may be, for which an agreement is entered into with a concessionaire;

(xiv) "**public funded project**" means a project which is not a private investment project as defined in clause (m) above and includes a private investment project in respect of which the agreement has expired;

(xv) "**toll plaza**" means any building, structure or both made for collection of fee.

(2) Words and Expression used herein and not defined but defined in the National Highways Authority of India Act, 1988 shall have the meanings respectively assigned to them in that Act.

3. Levy of Fee.-

(1) the Central government may by notification, levy fee for use of any section of national highway, permanent bridge, bypass or tunnel forming part of the national highways, as the case may be, in accordance with the provisions of these rules:

Provided that the Central government may, by notification, exempt any section of national highway, permanent bridge, bypass or tunnel constructed through public funded project from levy of fee or part thereof, and subject to such conditions as may be specified in that notification.

Bihar State Road Development Corporation Ltd. ★ Patna ★
Nawayuga Jahanabad Toll Bridge Pvt. Ltd.

(2) The collection of fee levied under sub-rule (1) of rule 3, shall commence within forty-five days from the date of completion of the section of national highway, permanent bridge, bypass or tunnel, as the case may be, constructed through public funded project.

(3) In case of private investment project, the collection of fee levied under sub-rule (1) shall be made in accordance with the terms of the agreement entered into by the concessionaire.

(4) No fee shall be levied for the levy fee for use of section of national highway, permanent bridge, bypass or tunnel, as the case may be, by two wheelers, three wheelers, tractors and animal drawn vehicles.

Provided that the two wheelers, three wheelers, tractors and animal drawn vehicles shall not be allowed to use the section of national highway, permanent bridge, bypass or tunnel, as the case may be, where a service road or alternative road is available in lieu of the said national highway, permanent bridge, bypass or tunnel:

Provided further that where service road or alternative road is available and the driver, owner or the person in charge of a two wheeler is making use of section of national highway, permanent bridge, bypass or tunnel, as the case may be, shall be charged fifty per cent of the levied fees on a car.

Explanation1- For the purpose of this rule,- (a) "alternative road" means such other road, the carriageway of which is more than the ten meters wide and the length of which does not exceed the corresponding length of such section of national highway by twenty per cent thereof;

(b)" service road" means a road running parallel to a section national highway which provides access to land adjoin to such section of the national highway.

(5) The fee notified by the Central government under these rules shall be rounded off and levied in the nearest multiple of the nearest Rupee five.

4. Base Rate of fee

(1) The rate of fee for use of the section of national highway, permanent bridge, bypass or tunnel constructed through public funded project or private investment project shall be identical.

(2) The rate of fee for use of section of national highway of four or more lanes shall, for the base year 2007-08, be the product of the length of such section multiplied by the following rates:

S. No.	Category of Vehicle	Capping Rate of base Fees per vehicle per one way trip at April 2007 (in rupees per km.)
(1)	(2)	(3)
1.	Car, Jeep, Van or Light Motor Vehicle	0.65
2.	Light Commercial Vehicle , Light Goods Vehicle or Mini Bus	1.05
3.	Bus, Truck	2.20
4.	Heavy Construction Machinery (HCM) or Moving Equipment(EME) or Multi Axle Vehicle (MAV) (three to six axle)	3.45
5	Oversized (seven or more axles)	4.20

Explanation:- for the purpose of this rule;

(a) **"car"** or **"jeep"** or **"van"** or **"light motor vehicle"** means any mechanical vehicle the gross vehicle weight of which does not exceed seven thousand five hundred kilograms or the registered passenger carrying capability as specified in the certificate of registration issued under Motor Vehicles Act,1988 does not exceed twelve excluding the driver;

(b) **"light commercial vehicle"** or **light goods vehicle"** or **"mini bus"** means any mechanical vehicle the gross vehicle weight exceeding seven thousand five hundred kilograms but less than twelve thousand kilograms or the registered passenger carrying capability as specified in the certificate of registration issued under Motor Vehicles Act, 1988 exceeds twelve but does not exceeds thirty two excluding the driver;

(c) **"truck"** or **"bus"** means any mechanical vehicle the gross vehicle weight exceeding twelve thousand kilograms but less than twenty thousand kilograms or the registered passenger carrying capability as specified in the certificate of registration issued under Motor Vehicles Act,1988 exceeds thirty two excluding the driver;

(d) **"heavy construction machinery"** or **"earth moving equipment"** or **"multi axle vehicle"** means heavy construction machinery or earth moving equipment or mechanical vehicle including a multi axle vehicle with three to six axles or vehicle with a gross vehicle weight exceeding twenty thousand kilograms but less than sixty thousand kilograms; and

(e) "oversized vehicle" means any mechanical vehicle having seven or more axles or vehicle with a gross vehicle weight exceeding sixty thousand kilograms.

(3) The rate of fee for use of the section of permanent bridge, bypass or tunnel constructed with cost exceeding Rupees ten crore, shall, for the base year 2007-08, be as follows:-

Base Rate of fee (Rupees per vehicle per trip)					
Cost of permanent bridge, bypass or tunnel (Rupees in crore)	Car, Jeep, Van or Light Motor Vehicle	Light Commercial Vehicle, Light Goods Vehicle or Mini Bus	Truck or Bus	HCM, EME or MAV	Oversized
10 to 15	5	7.5	15	22	30
For every additional Rupees five crore or part thereof exceeding Rupees fifteen crore and up to Rupees one hundred crore.	1	1.5	3	4.5	6
For every additional Rupees five crore or part thereof exceeding Rupees one hundred crore and up to Rupees two hundred crore.	0.75	1.15	2.25	3.4	4.5
For every additional Rupees five crore or part thereof exceeding Rupees two hundred crore	0.5	0.75	1.5	2.25	3

Provided that while computing fee for the section of national highway on which a permanent bridge, bypass or tunnel costing Rupees fifty crore or more is situated, the length of such permanent bridge, bypass or tunnel shall be excluded from the length of such section of national highway and fee shall be levied at the rates specified for such permanent bridge, bypass and tunnel.

Provided further that the cost of such permanent bridge, bypass or tunnel is less than Rupees fifty crore, and the said permanent bridge, bypass or tunnel, form part of the section of national highway, then instead of above rate of fee,

the rate of fee specified under sub rule (2) of rule 4 shall be applicable for such permanent bridge, bypass and tunnel.

Explanation.- For the purpose of this sub-rule,-

(a) The cost for private investment project, shall be the cost as assessed by the executing authority prior to invitation of bids from the concessionaire.

(b) The cost public funded project, shall be the cost as assessed by the executing authority six months prior to completion thereof.

5. Annual Revision of rate of fee.- (1)The rates specified under rule 4 shall be increased without compounding, by three percent, each year with effect from the 1st day of April, 2008 and such increased rate shall be deemed to be the base rate for the subsequent years.

(2)The applicable base rates shall be revised annually with effect from April 1 each year to reflect the increase in wholesale price index between the week ending on January 6, 2007 (i.e. 208.7) and the week ending on or immediately after January 1 of the year in which such revision is undertaken but such revision shall be restricted to forty per cent of the increase in wholesale price index.

(3) The formula for determining the applicable rate of fee shall be as follows;-

Applicable rate of fee= base rate + base rate X {(WPI A- WPI B)/WPI B} X 0.4

Where

- Applicable rate of fee shall be the rate payable by the user;
- Base rate shall be the rate specified in rule 4 read with sub- rule 1 of rule 5;
- WPI-A= is the Wholesale Price Index of the week ending on or subsequent to 1st January immediately preceding the Fee Revision date under these rules; and
- WPI-B = is the Wholesale Price Index of the week ending on 6th January, 2007 i.e. 208.7

WPI means Wholesale Price Index as released by the Office of the Economic Advisor, Ministry of Commerce and Industry, Government of India or any other index replacing the same.

(4) The annual revision of rate of fee under this rule shall be effective from first of April every year.

6. **Collection of fee.-** (1) Fee levied under these rules shall be collected by the executing authority or the concessionaire, as the case may be, at the toll plaza.

(2) Every driver, owner or the person in charge of the mechanical vehicle shall for making use of section of national highway, permanent bridge, bypass or tunnel, before crossing the toll plaza, pay the fees specified under these rules.

(3) The fee collected under these rules shall be paid either in cash or through smart card or on board unit (transponder) or any other like device:

Provided that no additional charges shall be released for making the payment of fee by use of a smart card on board unit (transponder) or any other like device.

(4) Any driver, owner or the person in charge of the mechanical vehicle who opts for the installation of on board unit (transponder) or any other like device for payment of fee, shall deposit a refundable security equivalent to the cost of the equipment with the executing authority or the concessionaire, as the case may be, for such installation and no interest shall accrue on such deposit.

(5) The person receiving such fee under sub-rule (2) of rule 6, shall issue to the driver, owner or the person in charge of the mechanical vehicle a receipt, specifying therein the date and time of such receipt of fee, total amount received, and the class of vehicle for which the fee has been received.

Provided that where the fee is paid through smart card or on board unit (transponder) or any other like device, a receipt shall be issued only on demand

(6) The fee shall be collected in perpetuity by the executing authority or the concessionaire, as the case may be, for a specified period in accordance with the terms of the agreement entered into by the concessionaire.

(7) In respect of public funded projects the fee levied under these rules shall be collected by the executing authority through its own officials or through contractor.

7. **Remittance and appropriation of fee,-** (1) In case of public funded projects, the fee collected under the provisions of these rules executing authority shall be remitted to the Central Government.

Provided that the Central Government may by notification allow any or all executing authorities to appropriate the whole or any part of the fee for such

purposes and subject to such conditions as may be specified in the said notification.

Provided further that in the private investment projects, the fee collected under the provisions of these rules shall be appropriated by the concessionaire in accordance with the provisions of and for the performance of its obligations under the agreement entered by such concessionaire.

(2) Every executing authority shall remit to the Central Government, the amount of fee collected over and above the amount permitted to be appropriated by the executing authority under sub-rule (1) of rule 7, within ninety days from the date of the closing of the financial year along with an annual return showing the amount collected and the expenditure incurred on collection of fee, including the administrative and management expenses.

(3) The Central Government shall by notification determine the administrative and management expenses which may be allowed to be deducted and retained executing authority.

8. **Location of Toll Plaza.-** (1) The executing authority or the concessionaire, as the case may be, shall establish a toll plaza beyond a distance of ten kilometers from a municipal or local town area limits.

Provided that the executing authority may, for reasons to be recorded in writing, locate or allow the concessionaire to locate a toll plaza within a distance of ten kilometers of such municipal or local town area limits, but in no case within five kilometers of such municipal or local town area limits.

Provided further that where section of national highway, permanent bridge, bypass or tunnel, as the case may be, is constructed within the municipal or local town area limits or within a distance of five kilometers from such limits, primarily for use of the residents of such municipal or town area, the toll plaza may be established within the municipal or local town area limits or within a distance of five kilometers from such limits.

(2) Any other toll plaza on the same section of national highway and in the same direction shall not be established within a distance of sixty kilometers:

Provided that where the executing authority deems necessary, it may for reasons to be recorded in writing, establish or allow the concessionaire to establish another toll plaza within a distance of sixty kilometers.

Provided further that a toll plaza may be established within a distance of sixty kilometers from another toll plaza if such toll plaza is for collection of fee for a permanent bridge, bypass or tunnel.

9. Discounts.- (1) The executing authority or the concessionaire, as the case may be, shall upon request provide a pass for multiple journeys to cross a toll plaza within the specified period at the rates specified in sub-rule (2) of rule 9.

(2) A driver, owner or the person in charge of the mechanical vehicle who makes the use of section of national highway, permanent bridge, bypass or tunnel, may opt for such a pass and he or she shall have 2 pay the fee in accordance with the following rates:-

Amount Payable	Maximum number of one way journeys allowed	Period of Validity
One and half times of the fee for one way journey	Two	Twenty Four hours from the time of payment
Two-Third of amount of the fee payable for fifty single journeys	Fifty	One month from date of payment

(3) A person who owns mechanical vehicle registered for non- fee commercial purpose and uses it as such for continuing on a section of national highway, permanent bridge, bypass or tunnel, may obtain a pass, on a payment of at the base rate for the year 2007-08 of Rupees one hundred and fifty per calendar month and revised annually with rule 5, authorizing

It to cross the toll plaza specified in such pass:

Provided that such pass shall be issued only if such driver owner or person in charge of such mechanical vehicle resides within a twenty kilometers from the toll plaza specified by such person and the use of such national highway, permanent bridge, bypass or tunnel, as the case may be, does not extend beyond the toll plaza next to the specified toll plaza.

Provided further that no such pass shall be issued if service road or alternative road is available for use by such driver, owner or person in charge of a mechanical vehicle.

(4) No pass shall be issued or fee collected from a driver, owner or person in charge of a mechanical vehicle that uses part of the section of nation highway and does not cross a toll plaza.

10. Rate of fee for overloading: (1) Without prejudice to the liability of the driver, owner or a person in charge of a mechanical vehicle under any law for the time being in force, a mechanical vehicle which is loaded in excess of the permissible load specified for its category of mechanical vehicles:

Provided that the payment of such fee for overloading shall not entitle a driver or owner or a person in charge or a mechanical vehicle to make use of such national highway and his or her vehicle shall be prevented from using the national highway or crossing the toll plaza until the excess load has been removed from such mechanical vehicle.

(2) The weight of a mechanical vehicle, as recorded at a weighbridge installed at the toll plaza, shall be the basis for levying the fee for overloading under this rule

Provided that where no weighbridge has been installed at the toll plaza, no fee for overloading shall be levied and collected under this rule and the driver, owner or person in charge of the mechanical vehicle shall be liable to pay fee applicable for such vehicle only.

11. Exemption from payment of fee.-(1) No fee shall be levied and collected from a mechanical vehicle

(a) transporting and accompanying –

I. The President of India;
II. The Vice President of India;
III. The Prime Minister of India;
IV. The Chief Justice of India;
V. The Governor;
VI. The Lieutenant Governor;
VII. The Union Minister;
VIII. The Chief Minister;
IX. The Judge of Supreme Court;
X. The Chairman of the Council of State;
XI. The Speaker of the House of People;
XII. The Chairman of the Legislative Council of the State;
XIII. The Speaker of the Legislative Council of the State;
XIV. The Chief Justice of High Court;
XV. The Judge of High Court;
XVI. Ministers of States;
XVII. Foreign dignitaries on State visit;

(b) used for official purposes by-

I. the Ministry of Defense including those which are eligible for exemption in accordance with the provisions of the Indian Toll (Army and Air force) Act 1901 and rules made thereunder, as extended to Navy also;

II. the Central and State armed forces in uniform including para military forces and police;

III. an executive Magistrate;

IV. a fire-fighting department or organization;

V. the National Highway Authority or any other organization or person using such vehicle for inspection, survey, construction, or operation and maintenance thereof; and

(c) used as ambulance.

12. Display of Information.- (1) The executing authority or the concessionaire, as the case may be, shall publish a notice specifying the amount of fee to be charged from the mechanical vehicle, in at least one news paper, each in English and vernacular language, having a wide circulation in such area.

(2) The executing authority shall prominently display in Hindi and English one thousand meters ahead of the toll plaza and in English and local language five hundred meters ahead of the toll plaza-

the amount of fee payable for each class of vehicles and the discounts available under rule 9;

The categories of vehicles exempted from payment of fee; and

The name, address and telephone or contact number of the executing authority or the concessionaire, as the case may be;

(3) The height of the display boards, their quality and size of lettering shall be visible and legible to the users.

13. Unauthorised collection.-(1) an officer authorized by the executing authoritymay assess the excess fee collected, if any, by the executing authority or the concessionaire, along with an additional sum equal to twenty five percent of the excess fee collected;

Provided that no recovery of such excess fee shall be made unless an opportunity of hearing lhas been given to the executing authority or concessionaire, as the case may be.

(2) Any driver, owner or person in-charge of a mechanical vehicle aggrieved by unauthorized collection of fee, may lodge a complaint with the officer authorised by the executing authorityin this behalf, who shall after hearing the parties pass an order on such complaint for refund of excess payment and damages for the inconvenience suffered by such user within thirty days

14. Failure to pay fee.-(1) If any driver, owner or person in charge of a mechanical vehicle does not pay or refuses to pay the fee for use of national highway, permanent bridge, bypass or tunnel, his or her vehicle shall not be allowed to use such section of national highways, permanent bridge, bypass or tunnel and in case such vehicle obstructs the normal flow of traffic, the executing authority or the concessionaire, as the case may be, may get such obstructing vehicle removed from the national highway, permanent bridge, bypass or tunnel, as the case may be.

(2) Where the driver or person in charge of a mechanical vehicle refuses or fails to pay the fee levied under these rules, the same shall be recovered from the registered owner of the mechanical vehicle

(3) Where the executing authority or the concessionaire, as the case may be, has reason to believe that a mechanical vehicle is plying on a section of the national highway, permanent bridge, bypass or tunnel without payment of fee due, it may stop such vehicle for the purpose of verifying the payment thereof and collect the fee due from such vehicle

15. Power of Central Government to verify records.- An officer duly authorized by the executing authority shall have the power to verify the collection of fee and inspect any document, records, other information, receipts or reports of the executing authority or the concessionaire, as the case may be.

16. Collection of fee in respect of Private Investment Project.- (1) The fee levied under the provisions of sub-rule (3) of rule 3 shall be collected by the concessionaire till its agreement is in force

(2) On and from the date of expiry of the agreement specified under sub rule (3) of rule 3, the fee levied shall be collected by the executing authority

17. Bar for installation of additional barrier.- No barrier be installed at any place, other than at the toll plaza, except with the prior permission in writing of the executing authority who after being satisfied that there is evasion of fee, may allow on such terms and conditions as it may impose, the installation of such additional barrier by the executing authority or the concessionaire, as the case may be, within ten kilometers from toll plaza, to check the evasion of fee:

Provided that the executing authority at any time, for reasons to be recorded in writing, withdraw such permission

Provided further that where the executing authority do not allow installation of an additional barrier by the concessionaire, the reasons for such refusal shall be communicated to such concessionaire within a reasonable period.

The fee levied and collected hereunder shall be due and payable at the following Toll Plazas for the distance specified for each such Toll Plaza:

F.No. RW/NH-.....

(Name)

Deputy Secretary

Government of Bihar

SCHEDULE –S

(See Clause 31.1.2)

ESCROW AGREEMENT

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

AMONGST

1 ..... LIMITED, a company incorporated under the provisions of the Companies Act, 1956 and having its registered office at ..... (hereinafter referred to as the "**Concessionaire**" which expression shall, unless repugnant to the context or meaning thereof, include its successors, permitted assigns and substitutes);

2 .....name and particulars of Lenders' Representative and having its registered office at .....acting for and on behalf of the Senior Lenders as their duly authorised agent with regard to matters arising out of or in relation to this Agreement (hereinafter referred to as the "**Lenders' Representative**" which expression shall, unless repugnant to the context or meaning thereof, include its successors and substitutes);

3 .....name and particulars of the Escrow Bank and having its registered office at .....(hereinafter referred to as the "**Escrow Bank**" which expression shall, unless repugnant to the context or meaning thereof, include its successors and substitutes); and

4 Bihar State Road Development Corporation Limited, represented by its Chief General Manager and having its principal offices at Central Mechanical Workshop Campus, Near Airport, Sheikpura, Patna 800014 (hereinafter referred to as the "**Authority**" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns).

WHEREAS:

(A) The Authority has entered into a Concession Agreement dated ..... with the Concessionaire (the "**Concession Agreement**") for **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the State of Bihar on design, build, finance, operate and transfer (DBFOT) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this Agreement.

(B) Senior Lenders have agreed to finance the Project in accordance with the terms and conditions set forth in the Financing Agreements.

(C) The Concession Agreement requires the Concessionaire to establish an Escrow Account, inter alia, on the terms and conditions stated herein.

NOW IT IS HEREBY AGREED as follows:

1 DEFINITIONS AND INTERPRETATION

1.1 Definitions

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

"**Agreement**" means this Escrow Agreement and any amendment thereto made in accordance with the provisions contained herein;

"**Concession Agreement**" means the Concession Agreement referred to in Recital (A) above and annexed hereto as Annex-A, and shall include all of its Recitals and Schedules and any amendments made thereto in accordance with the provisions contained in this behalf therein;

"**Cure Period**" means the period specified in this Agreement for curing any breach or default of any provision of this Agreement by the Concessionaire, and shall commence from the date on which a notice is delivered by the Authority or the Lenders' Representative, as the case may be, to the Concessionaire asking the latter to cure the breach or default specified in such notice;

"**Escrow Account**" means an escrow account established in terms of and under this Agreement, and shall include the Sub-Accounts;

"**Escrow Default**" shall have the meaning ascribed thereto in Clause 6.1;

"**Lenders' Representative**" means the person referred to as the Lenders' Representative in the foregoing Recitals;

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

"**Payment Date**" means, in relation to any payment specified in Clause 4.1, the date(s) specified for such payment; and

"**Sub-Accounts**" means the respective Sub-Accounts of the Escrow Account, into which the monies specified in Clause 4.1 would be credited every month and paid out if due, and if not due in a month then appropriated proportionately in such month and retained in the respective Sub Accounts and paid out therefrom on the Payment Date(s).

1.2 Interpretation

1.2.1 References to Lenders' Representative shall, unless repugnant to the context or meaning thereof, mean references to the Lenders' Representative, acting for and on behalf of Senior Lenders.

1.2.2 The words and expressions beginning with capital letters and defined in this Agreement shall have the meaning ascribed thereto herein, and the words

and expressions used in this Agreement and not defined herein but defined in the Concession Agreement shall, unless repugnant to the context, have the meaning ascribed thereto in the Concession Agreement.

1.2.3 References to Clauses are, unless stated otherwise, references to Clauses of this Agreement.

1.2.4 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Concession Agreement shall apply, *mutatis mutandis*, to this Agreement.

2 ESCROW ACCOUNT

2.1 Escrow Bank to act as trustee

2.1.1 The Concessionaire hereby appoints the Escrow Bank to act as trustee for the Authority, the Lenders' Representative and the Concessionaire in connection herewith and authorises the Escrow Bank to exercise such rights, powers, authorities and discretion as are specifically delegated to the Escrow Bank by the terms hereof together with all such rights, powers, authorities and discretion as are reasonably incidental hereto, and the Escrow Bank accepts such appointment pursuant to the terms hereof.

2.1.2 The Concessionaire hereby declares that all rights, title and interest in and to the Escrow Account shall be vested in the Escrow Bank and held in trust for the Authority, the Lenders' Representative and the Concessionaire, and applied in accordance with the terms of this Agreement. No person other than the Authority, the Lenders' Representative and the Concessionaire shall have any rights hereunder as the beneficiaries of, or as third party beneficiaries under this Agreement.

2.2 Acceptance of Escrow Bank

The Escrow Bank hereby agrees to act as such and to accept all payments and other amounts to be delivered to and held by the Escrow Bank pursuant to the provisions of this Agreement. The Escrow Bank shall hold and safeguard the Escrow Account during the term of this Agreement and shall treat the amount in the Escrow Account as monies deposited by the Concessionaire, Senior Lenders or the Authority with the Escrow Bank. In performing its functions and duties under this Agreement, the Escrow Bank shall act in trust for the benefit of, and as agent for, the Authority, the Lenders' Representative and the Concessionaire or their nominees, successors or assigns, in accordance with the provisions of this Agreement.

2.3 Establishment and operation of Escrow Account

2.3.1 Within 30 (thirty) days from the date of this Agreement, and in any case prior to the Appointed Date, the Concessionaire shall open and establish the Escrow Account with the ..... (name of Branch) Branch of the Escrow Bank. The Escrow Account shall be denominated in Rupees.

2.3.2 The Escrow Bank shall maintain the Escrow Account in accordance with the

terms of this Agreement and its usual practices and applicable regulations, and pay the maximum rate of interest payable to similar customers on the balance in the said account from time to time.

2.3.3 The Escrow Bank and the Concessionaire shall, after consultation with the Lenders' Representative, agree on the detailed mandates, terms and conditions, and operating procedures for the Escrow Account, but in the event of any conflict or inconsistency between this Agreement and such mandates, terms and conditions, or procedures, this Agreement shall prevail.

2.4 Escrow Bank's fee

The Escrow Bank shall be entitled to receive its fee and expenses in an amount, and at such times, as may be agreed between the Escrow Bank and the Concessionaire. For the avoidance of doubt, such fee and expenses shall form part of the O&M Expenses and shall be appropriated from the Escrow Account in accordance with Clause 4.1.

2.5 Rights of the parties

The rights of the Authority, the Lenders' Representative and the Concessionaire in the monies held in the Escrow Account are set forth in their entirety in this Agreement and the Authority, the Lenders' Representative and the Concessionaire shall have no other rights against or to the monies in the Escrow Account.

2.6 Substitution of the Concessionaire

The Parties hereto acknowledge and agree that upon substitution of the Concessionaire with the Nominated Company, pursuant to the Substitution Agreement, it shall be deemed for the purposes of this Agreement that the Nominated Company is a Party hereto and the Nominated Company shall accordingly be deemed to have succeeded to the rights and obligations of the Concessionaire under this Agreement on and with effect from the date of substitution of the Concessionaire with the Nominated Company.

3 DEPOSITS INTO ESCROW ACCOUNT

3.1 Deposits by the Concessionaire

3.1.1 The Concessionaire agrees and undertakes that it shall deposit into and/or credit the Escrow Account with:

(a) all monies received in relation to the Project from any source, including the Senior Lenders, lenders of Subordinated Debt and the Authority;

(b) all funds received by the Concessionaire from its share-holders, in any manner or form;

(c) all Fee levied and collected by the Concessionaire;

(d) any other revenues, deposits or capital receipts, as the case may be, from or in respect of the Project; and

(e) all proceeds received pursuant to any insurance claims.

3.1.2 The Concessionaire may at any time make deposits of its other funds into the Escrow Account, provided that the provisions of this Agreement shall apply to such deposits.

3.2 Deposits by the Authority

The Authority agrees and undertakes that, as and when due and payable, it shall deposit into and/or credit the Escrow Account with:

(a) Grant and any other monies disbursed by the Authority to the Concessionaire;

(b) Revenue Shortfall Loan;

(c) all Fee collected by the Authority in exercise of its rights under the Concession Agreement; and

(d) Termination Payments:

Provided that the Authority shall be entitled to appropriate from the aforesaid amounts, any Concession Fee due and payable to it by the Concessionaire, and the balance remaining shall be deposited into the Escrow Account.

3.3 Deposits by Senior Lenders

The Lenders' Representative agrees, confirms and undertakes that the Senior Lenders shall deposit into and/or credit the Escrow Account with all disbursements made by them in relation to or in respect of the Project; provided that notwithstanding anything to the contrary contained in this Agreement, the Senior Lenders shall be entitled to make direct payments to the EPC Contractor under and in accordance with the express provisions contained in this behalf in the Financing Agreements.

3.4 Interest on deposits

The Escrow Bank agrees and undertakes that all interest accruing on the balances of the Escrow Account shall be credited to the Escrow Account; provided that the Escrow Bank shall be entitled to appropriate therefrom the fee and expenses due to it from the Concessionaire in relation to the Escrow Account and credit the balance remaining to the Escrow Account.

4 WITHDRAWALS FROM ESCROW ACCOUNT

4.1 Withdrawals during Concession Period

4.1.1 At the beginning of every month, or at such shorter intervals as the Lenders'

Representative and the Concessionaire may by written instructions determine, the Escrow Bank shall withdraw amounts from the Escrow Account and appropriate them in the following order by depositing such amounts in the relevant Sub-Accounts for making due payments, and if such payments are not due in any month, then retain such monies in such Sub-Accounts and pay out therefrom on the Payment Date(s):

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

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

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

(d) O&M Expenses incurred by the Authority, provided it certifies to the Escrow Bank that it had incurred such expenses in accordance with the provisions of the Concession Agreement and that the amounts claimed are due to it from the Concessionaire;

(e) Concession Fee due and payable to the Authority;

(f) monthly proportionate provision of Debt Service due in an Accounting Year;

{(g) Premium due and payable to the Authority;}

(h) all payments and Damages certified by the Authority as due and payable to it by the Concessionaire pursuant to the Concession Agreement, including repayment of Revenue Shortfall Loan;

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

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

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

4.1.2 No later than 60 (sixty) days prior to the commencement of each Accounting Year, the Concessionaire shall provide to the Escrow Bank, with prior written approval of the Lenders' Representative, details of the amounts likely to be required for each of the payment obligations set forth in this Clause 4.1; provided that such amounts may be subsequently modified, with prior written approval of the Lenders' Representative, if fresh information received during the course of the year makes such modification necessary.

4.2 Withdrawals upon Termination

Upon Termination of the Concession Agreement, all amounts standing to the credit of the Escrow Account shall, notwithstanding anything in this Agreement, be appropriated and dealt with in the following order:

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

(b) 90% (ninety per cent) of Debt Due excluding Subordinated Debt;

(c) outstanding Concession Fee;

(d) all payments and Damages certified by the Authority as due and payable to it by the Concessionaire pursuant to the Concession Agreement, including {Premium,} repayment of Revenue Shortfall Loan and any claims in connection with or arising out of Termination;

(e) retention and payments arising out of, or in relation to, liability for defects and deficiencies set forth in Article 39 of the Concession Agreement;

(f) outstanding Debt Service including the balance of Debt Due;

(g) outstanding Subordinated Debt;

(h) incurred or accrued O&M Expenses;

(i) any other payments required to be made under the Concession Agreement; and

(j) balance, if any, in accordance with the instructions of the Concessionaire:

Provided that the disbursements specified in Sub-clause (j) of this Clause 4.2 shall be undertaken only after the Vesting Certificate has been issued by the Authority.

4.3 Application of insufficient funds

Funds in the Escrow Account shall be applied in the serial order of priority set forth in Clauses 4.1 and 4.2, as the case may be. If the funds available are not sufficient to meet all the requirements, the Escrow Bank shall apply such funds in the serial order of priority until exhaustion thereof.

4.4 Application of insurance proceeds

Notwithstanding anything in this Agreement, the proceeds from all insurance claims, except life and injury, shall be deposited into and/or credited to the Escrow Account and utilised for any necessary repair, reconstruction, reinstatement, replacement, improvement, delivery or installation of the Project, and the balance remaining, if any, shall be applied in accordance

with the provisions contained in this behalf in the Financing Agreements.

4.5 Withdrawals during Suspension

Notwithstanding anything to the contrary contained in this Agreement, the Authority may exercise all or any of the rights of the Concessionaire during the period of Suspension under Article 36 of the Concession Agreement. Any instructions given by the Authority to the Escrow Bank during such period shall be complied with as if such instructions were given by the Concessionaire under this Agreement and all actions of the Authority hereunder shall be deemed to have been taken for and on behalf of the Concessionaire.

5 OBLIGATIONS OF THE ESCROW BANK

5.1 Segregation of funds

Monies and other property received by the Escrow Bank under this Agreement shall, until used or applied in accordance with this Agreement, be held by the Escrow Bank in trust for the purposes for which they were received, and shall be segregated from other funds and property of the Escrow Bank.

5.2 Notification of balances

7 (seven) business days prior to each Payment Date (and for this purpose the Escrow Bank shall be entitled to rely on an affirmation by the Concessionaire and/or the Lenders' Representative as to the relevant Payment Dates), the Escrow Bank shall notify the Lenders' Representative of the balances in the Escrow Account and Sub-Accounts as at the close of business on the immediately preceding business day.

5.3 Communications and notices

In discharge of its duties and obligations hereunder, the Escrow Bank:

(a) may, in the absence of bad faith or gross negligence on its part, rely as to any matters of fact which might reasonably be expected to be within the knowledge of the Concessionaire upon a certificate signed by or on behalf of the Concessionaire;

(b) may, in the absence of bad faith or gross negligence on its part, rely upon the authenticity of any communication or document believed by it to be authentic;

(c) shall, within 5 (five) business days after receipt, deliver a copy to the Lenders' Representative of any notice or document received by it in its capacity as the Escrow Bank from the Concessionaire or any other person hereunder or in connection herewith; and

(d) shall, within 5 (five) business days after receipt, deliver a copy to the

Concessionaire of any notice or document received by it from the Lenders' Representative in connection herewith.

5.4 No set off

The Escrow Bank agrees not to claim or exercise any right of set off, banker's lien or other right or remedy with respect to amounts standing to the credit of the Escrow Account. For the avoidance of doubt, it is hereby acknowledged and agreed by the Escrow Bank that the monies and properties held by the Escrow Bank in the Escrow Account shall not be considered as part of the assets of the Escrow Bank and being trust property, shall in the case of bankruptcy or liquidation of the Escrow Bank, be wholly excluded from the assets of the Escrow Bank in such bankruptcy or liquidation.

5.5 Regulatory approvals

The Escrow Bank shall use its best efforts to procure, and thereafter maintain and comply with, all regulatory approvals required for it to establish and operate the Escrow Account. The Escrow Bank represents and warrants that it is not aware of any reason why such regulatory approvals will not ordinarily be granted to the Escrow Bank.

6 ESCROW DEFAULT

6.1 Escrow Default

6.1.1 Following events shall constitute an event of default by the Concessionaire (an"Escrow Default") unless such event of default has occurred as a result of Force Majeure or any act or omission of the Authority or the Lenders' Representative:

(a) the Concessionaire commits breach of this Agreement by failing to deposit any receipts into the Escrow Account as provided herein and fails to cure such breach by depositing the same into the Escrow Account within a Cure Period of 5 (five) business days;

(b) the Concessionaire causes the Escrow Bank to transfer funds to any account of the Concessionaire in breach of the terms of this Agreement and fails to cure such breach by depositing the relevant funds into the Escrow Account or any Sub-Account in which such transfer should have been made, within a Cure Period of 5 (five) business days; or

(c) the Concessionaire commits or causes any other breach of the provisions of this Agreement and fails to cure the same within a Cure Period of 5 (five) business days.

6.1.2 Upon occurrence of an Escrow Default, the consequences thereof shall be dealt with under and in accordance with the provisions of the Concession Agreement.

7 TERMINATION OF ESCROW AGREEMENT

7.1 Duration of the Escrow Agreement

This Agreement shall remain in full force and effect so long as any sum remains to be advanced or is outstanding from the Concessionaire in respect of the debt, guarantee or financial assistance received by it from the Senior Lenders, or any of its obligations to the Authority remain to be discharged, unless terminated earlier by consent of all the Parties or otherwise in accordance with the provisions of this Agreement.

7.2 Substitution of Escrow Bank

The Concessionaire may, by not less than 45 (forty five) days prior notice to the Escrow Bank, the Authority and the Lenders' Representative, terminate this Agreement and appoint a new Escrow Bank, provided that the new Escrow Bank is acceptable to the Lenders' Representative and arrangements are made satisfactory to the Lenders' Representative for transfer of amounts deposited in the Escrow Account to a new Escrow Account established with the successor Escrow Bank. The termination of this Agreement shall take effect only upon coming into force of an Escrow Agreement with the substitute Escrow Bank.

7.3 Closure of Escrow Account

The Escrow Bank shall, at the request of the Concessionaire and the Lenders' Representative made on or after the payment by the Concessionaire of all outstanding amounts under the Concession Agreement and the Financing Agreements including the payments specified in Clause 4.2, and upon confirmation of receipt of such payments, close the Escrow Account and Sub-Accounts and pay any amount standing to the credit thereof to the Concessionaire. Upon closure of the Escrow Account hereunder, the Escrow Agreement shall be deemed to be terminated.

8 SUPPLEMENTARY ESCROW AGREEMENT

8.1 Supplementary escrow agreement

The Lenders' Representative and the Concessionaire shall be entitled to enter into a supplementary escrow agreement with the Escrow Bank providing, inter alia, for detailed procedures and documentation for withdrawals from Sub-Accounts pursuant to Clause 4.1.1 and for matters not covered under this Agreement such as the rights and obligations of Senior Lenders and lenders of Subordinated Debt, investment of surplus funds, restrictions on withdrawals by the Concessionaire in the event of breach of this Agreement or upon occurrence of an Escrow Default, procedures relating to operation of the Escrow Account and withdrawal therefrom, reporting requirements and any matters incidental thereto; provided that such supplementary escrow agreement shall not contain any provision which is inconsistent with this Agreement and in the event of any conflict or inconsistency between provisions of this Agreement and such supplementary escrow agreement, the

provisions of this Agreement shall prevail.

9 INDEMNITY

9.1 General indemnity

9.1.1 The Concessionaire will indemnify, defend and hold the Authority, Escrow Bank and the Senior Lenders, acting through the Lenders' Representative, harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of any breach by the Concessionaire of any of its obligations under this Agreement or on account of failure of the Concessionaire to comply with Applicable Laws and Applicable Permits.

9.1.2 The Authority will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Authority to fulfil any of its obligations under this Agreement materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement or this Agreement other than any loss, damage, cost and expense arising out of acts done in discharge of their lawful functions by the Authority, its officers, servants and agents.

9.1.3 The Escrow Bank will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Escrow Bank to fulfil its obligations under this Agreement materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Escrow Bank, its officers, servants and agents.

9.2 Notice and contest of claims

In the event that any Party hereto receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under Clause 9.1 or in respect of which it is entitled to reimbursement (the "**Indemnified Party**"), it shall notify the other Party responsible for indemnifying such claim hereunder (the "**Indemnifying Party**") within 15 (fifteen) days of receipt of the claim and shall not settle or pay the claim without the prior approval of the Indemnifying Party, which approval shall not be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim, it may conduct the proceedings in the name of the Indemnified Party and shall bear all costs involved in contesting the same. The Indemnified Party shall provide all cooperation and assistance in contesting any claim and shall sign all such writings and documents as the Indemnifying Party may reasonably require.

10 DISPUTE RESOLUTION

10.1 Dispute resolution

10.1.1 Any dispute, difference or claim arising out of or in connection with this Agreement, which is not resolved amicably, shall be decided finally by reference to arbitration to a Board of Arbitrators comprising one nominee of each Party to the dispute, and where the number of such nominees is an even number, the nominees shall elect another person to such Board. Such arbitration shall be held in accordance with the Rules of Arbitration of the International Centre for Alternative Dispute Resolution, New Delhi (the "Rules") or such other rules as may be mutually agreed by the Parties, and shall be subject to the provisions of the Arbitration and Conciliation Act, 1996.

10.1.2 The Arbitrators shall issue a reasoned award and such award shall be final and binding on the Parties. The venue of arbitration shall be Patna and the language of arbitration shall be Hindi or English.

11 MISCELLANEOUS PROVISIONS

11.1 Governing law and jurisdiction

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

11.2 Waiver of sovereign immunity

The Authority unconditionally and irrevocably:

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

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

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

(d) consents generally in respect of the enforcement of any 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).

11.3 Priority of agreements

In the event of any conflict between the Concession Agreement and this Agreement, the provisions contained in the Concession Agreement shall prevail over this Agreement.

11.4 Alteration of terms

All additions, amendments, modifications and variations to this Agreement shall be effectual and binding only if in writing and signed by the duly authorised representatives of the Parties.

11.5 Waiver

11.5.1 Waiver by any Party of a default by another Party in the observance and performance of any provision of or obligations under this Agreement:

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

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

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

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

11.6 No third party beneficiaries

This Agreement is solely for the benefit of the Parties and no other person or entity shall have any rights hereunder.

11.7 Survival

11.7.1 Termination of this Agreement:

(a) shall not relieve the Parties of any obligations hereunder which expressly or by implication survive termination hereof; and

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

11.7.2 All obligations surviving the cancellation, expiration or termination of this Agreement shall only survive for a period of 3 (three) years following the date of such termination or expiry of this Agreement.

11.8 Severability

If for any reason whatever any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to dispute resolution under Clause 10.1 of this Agreement or otherwise.

11.9 Successors and assigns

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

11.10 Notices

All notices or other communications to be given or made under this Agreement shall be in writing and shall either be delivered personally or sent by courier or registered post with an additional copy to be sent by facsimile or e-mail. The address for service of each Party, its facsimile number or e-mail are set out under its name on the signing pages hereto. A notice shall be effective upon actual receipt thereof, save that where it is received after 5.30 (five thirty) p.m. on a business day, or on a day that is not a business day, the notice shall be deemed to be received on the first business day following the date of actual receipt. Without prejudice to the foregoing, a Party giving or making a notice or communication by facsimile or e-mail shall promptly deliver a copy thereof personally, or send it by courier or registered post to the addressee of such notice or communication. It is hereby agreed and acknowledged that any Party may by notice change the address to which such notices and communications to it are to be delivered or mailed. Such change shall be effective when all the Parties have notice of it.

11.11 Language

All notices, certificates, correspondence and proceedings under or in connection with this Agreement shall be in English.

11.12 Authorised representatives

Each of the Parties shall, by notice in writing, designate their respective authorised representatives through whom only all communications shall be made. A Party hereto shall be entitled to remove and/or substitute or make fresh appointment of such authorised representative by similar notice.

11.13 Original Document

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

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

SIGNED, SEALED AND
DELIVERED
For and on behalf of
CONCESSIONAIRE by:

(Signature)

(Name)
(Designation)
(Address)
(Fax No.)
(Email address)

SIGNED, SEALED AND
DELIVERED
For and on behalf of
SENIOR LENDERS by the
Lenders' Representative:

(Signature)

(Name)
(Designation)
(Address)
(Fax No.)
(Email address)

SIGNED, SEALED AND
DELIVERED
For and on behalf of
ESCROW BANK by:

(Signature)

(Name)
(Designation)
(Address)
(Fax No.)
(Email address)

SIGNED, SEALED AND
DELIVERED
For and on behalf of
Bihar State Road Development
Corporation Limited by:

(Signature)

(Name)
(Designation)
(Address)
(Fax No.)
(Email address)

In the presence of:

1.

2.

SCHEDULE –T
(See Clause 33.2.1)

PANEL OF CHARTERED ACCOUNTANTS

1 Panel of Chartered Accountants

Pursuant to the provisions of Clause 33.2.1 of the Agreement, the Authority and the Concessionaire shall prepare a mutually agreed panel of 10 (ten) reputable firms of Chartered Accountants having their registered offices in India (the "**Panel of Chartered Accountants**"). The criteria for preparing such Panel and the procedure to be adopted in this behalf shall be as set forth in this Schedule-T.

2 Invitation for empanelment

2.1 The Authority shall invite offers from all reputable firms of Chartered Accountants who fulfil the following eligibility criteria, namely:

(a) the firm should have conducted statutory audit of the annual accounts of at least one hundred companies registered under the Companies Act, 1956, of which at least ten should have been public sector undertakings;

(b) the firm should have at least 5 (five) practising Chartered Accountants on its rolls, each with a minimum experience of ten years in the profession;

(c) the firm or any of its partners should not have been disqualified or black-listed by the Comptroller and Auditor General of India or the Authority; and

(d) the firm should have an office in the State or in an adjacent State with at least 2 (two) practising Chartered Accountants on its rolls in such State.

2.2 Interested firms meeting the eligibility criteria shall be required to submit a statement of their capability including the bio-data of all the practising Chartered Accountants on its rolls. In particular, each firm shall be required to furnish year- wise information relating to the names of all the companies with an annual turnover exceeding Rs. 100,00,00,000 (Rs. one hundred crore) whose annual accounts were audited by such firm in any of the preceding 5 (five) Accounting Years.

3 Evaluation and selection

3.1 The information furnished by each firm shall be scrutinised and evaluated by the Authority and 1 (one) point shall be awarded for each annual audit of the companies specified in Paragraph 2.2 above. (For the avoidance of doubt, a firm which has conducted audit of the annual accounts of any such company

for five years shall be awarded five points).

3.2 The Authority shall prepare a list of all the eligible firms along with the points scored by each such firm and 10 (ten) firms scoring the highest points shall be identified and included in the draft Panel of Chartered Accountants.

4 Consultation with the Concessionaire

The Authority shall convey the aforesaid panel of firms to the Concessionaire for scrutiny and comments, if any. The Concessionaire shall be entitled to scrutinise the relevant records of the Authority to ascertain whether the selection of firms has been undertaken in accordance with the prescribed procedure and it shall send its comments, if any, to the Authority within 15 (fifteen) days of receiving the aforesaid panel.

5 Mutually agreed panel

5.1 The Authority shall, after considering all relevant factors including the comments, if any, of the Concessionaire, finalise and constitute a panel of 10 (ten) firms which shall be deemed to be the mutually agreed Panel of Chartered Accountants.

5.2 After completion of every five years from the date of preparing the mutually agreed Panel of Chartered Accountants, or such earlier period as may be agreed between the Authority and the Concessionaire, a new panel shall be prepared in accordance with the provisions of this Schedule - T.





SCHEDULE –U
(See Clause3843)

VESTING CERTIFICATE

1 The Managing Director, Bihar State Road Development Corporation Limited (the **"Authority"**) refers to the Concession Agreement dated ..... (the **"Agreement"**) entered into between the Authority and ..... (the **"Concessionaire"**) for **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the State of Bihar on design, build, finance, operate and transfer (**"DBFOT"**) basis.

2 The Authority hereby acknowledges compliance and fulfilment by the Concessionaire of the Divestment Requirements set forth in Clause 38.1 of the Agreement on the basis that upon issue of this Vesting Certificate, the Authority shall be deemed to have acquired, and all title and interest of the Concessionaire in or about the Project shall be deemed to have vested unto the Authority, free from any encumbrances, charges and liens whatsoever.

3 Notwithstanding anything to the contrary contained hereinabove, it shall be a condition of this Vesting Certificate that nothing contained herein shall be construed or interpreted as waiving the obligation of the Concessionaire to rectify and remedy any defect or deficiency in any of the Divestment Requirements and/or relieving the Concessionaire in any manner of the same.

Signed this ..... day of ....., 20..... at Delhi.

AGREED, ACCEPTED AND SIGNED	SIGNED, SEALED AND DELIVERED
For and on behalf of CONCESSIONAIRE by:	For and on behalf of Bihar State Road Development Corporation Limited by:
(Signature)	(Signature)
(Name)	(Name)
(Designation)	(Designation)
(Address)	(Address)

In the presence of:

1. Bihar State Road Development Corporation Ltd. Patna

2. Narayuga Jahnavi Toll Bridge Pvt. Ltd.

SCHEDULE –V

(See Clause 40.3.1)

SUBSTITUTION AGREEMENT

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

AMONGST

1 The Bihar State Road Development Corporation Limited, represented by its Managing Director and having its principal offices at Central Mechanical Workshop Campus, Near Airport, Sheikpura, Patna 800014 (hereinafter referred to as the "Authority" which expression shall unless repugnant to the context or meaning thereof include its administrators, successors and assigns);

2 ..... LIMITED, a company incorporated under the provisions of the Companies Act, 1956 and having its registered office at ....., (hereinafter referred to as the "**Concessionaire**" which expression shall unless repugnant to the context or meaning thereof include its successors and permitted assigns and substitutes);

3 .....name and particulars of Lenders' Representative and having its registered office at ....., acting for and on behalf of the Senior Lenders as their duly authorised agent with regard to matters arising out of or in relation to this Agreement (hereinafter referred to as the "**Lenders' Representative**", which expression shall unless repugnant to the context or meaning thereof include its successors and substitutes);

WHEREAS:

(A) The Authority has entered into a Concession Agreement dated ..... with the Concessionaire (the "**Concession Agreement**") for **New Four-Lane bridge across river Ganga connecting NH-31 near Bakhtiyarpur & Tazpur on NH-28 and its approaches** in the State of Bihar on design, build, finance, operate and transfer basis (DBFOT), and a copy of which is annexed hereto and marked as Annex-A to form part of this Agreement.

(B) Senior Lenders have agreed to finance the Project in accordance with the terms and conditions set forth in the Financing Agreements.

(C) Senior Lenders have requested the Authority to enter into this Substitution Agreement for securing their interests through assignment, transfer and

substitution of the Concession to a Nominated Company in accordance with the provisions of this Agreement and the Concession Agreement.

(D) In order to enable implementation of the Project including its financing, construction, operation and maintenance, the Authority has agreed and undertaken to transfer and assign the Concession to a Nominated Company in accordance with the terms and conditions set forth in this Agreement and the Concession Agreement.

NOW IT IS HEREBY AGREED as follows:

1 DEFINITIONS AND INTERPRETATION

1.1 Definitions

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

"**Agreement**" means this Substitution Agreement and any amendment thereto made in accordance with the provisions contained in this Agreement;

"**Financial Default**" means occurrence of a material breach of the terms and conditions of the Financing Agreements or a continuous default in Debt Service by the Concessionaire for a minimum period of 3 (three) months;

"**Lenders' Representative**" means the person referred to as the Lenders' Representative in the foregoing Recitals;

"**Nominated Company**" means a company, incorporated under the provisions of the Companies Act, 1956, selected by the Lenders' Representative, on behalf of Senior Lenders, and proposed to the Authority for assignment/transfer of the Concession as provided in this Agreement;

"**Notice of Financial Default**" shall have the meaning ascribed thereto in Clause 3.2.1; and

"**Parties**" means the parties to this Agreement collectively and "Party" shall mean any of the Parties to this Agreement individually.

1.2 Interpretation

1.2.1 References to Lenders' Representative shall, unless repugnant to the context or meaning thereof, mean references to the Lenders' Representative, acting for and on behalf of Senior Lenders.

1.2.2 References to Clauses are, unless stated otherwise, references to Clauses of this Agreement.

1.2.3 The words and expressions beginning with capital letters and defined in this Agreement shall have the meaning ascribed thereto herein, and the words and expressions used in this Agreement and not defined herein but defined in the Concession Agreement shall, unless repugnant to the context, have the meaning ascribed thereto in the Concession Agreement.

1.2.4 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Concession Agreement shall apply, *mutatis mutandis*, to this Agreement.

2 ASSIGNMENT

2.1 Assignment of rights and title

The Concessionaire hereby assigns the rights, title and interest in the Concession to, and in favour of, the Lenders' Representative pursuant to and in accordance with the provisions of this Agreement and the Concession Agreement by way of security in respect of financing by the Senior Lenders under the Financing Agreements.

3 SUBSTITUTION OF THE CONCESSIONAIRE

3.1 Rights of substitution

3.1.1 Pursuant to the rights, title and interest assigned under Clause 2.1, the Lenders' Representative shall be entitled to substitute the Concessionaire by a Nominated Company under and in accordance with the provisions of this Agreement and the Concession Agreement.

3.1.2 The Authority hereby agrees to substitute the Concessionaire by endorsement on the Concession Agreement in favour of the Nominated Company selected by the Lenders' Representative in accordance with this Agreement. (For the avoidance of doubt, the Senior Lenders or the Lenders' Representative shall not be entitled to operate and maintain the Project as Concessionaire either individually or collectively).

3.2 Substitution upon occurrence of Financial Default

3.2.1 Upon occurrence of a Financial Default, the Lenders' Representative may issue a notice to the Concessionaire (the "**Notice of Financial Default**") along with particulars thereof, and send a copy to the Authority for its information and record. A Notice of Financial Default under this Clause 3 shall be conclusive evidence of such Financial Default and it shall be final

and binding upon the Concessionaire for the purposes of this Agreement.

3.2.2 Upon issue of a Notice of Financial Default hereunder, the Lenders' Representative may, without prejudice to any of its rights or remedies under this Agreement or the Financing Agreements, substitute the Concessionaire by a Nominated Company in accordance with the provisions of this Agreement.

3.2.3 At any time after the Lenders' Representative has issued a Notice of Financial Default, it may by notice require the Authority to suspend all the rights of the Concessionaire and undertake the operation and maintenance of the Project in accordance with the provisions of Article 36 of the Concession Agreement, and upon receipt of such notice, the Authority shall undertake Suspension under and in accordance with the provisions of the Concession Agreement. The aforesaid Suspension shall be revoked upon substitution of the Concessionaire by a Nominated Company, and in the event such substitution is not completed within 180 (one hundred and eighty) days from the date of such Suspension, the Authority may terminate the Concession Agreement forthwith by issuing a Termination Notice in accordance with the provisions of the Concession Agreement; provided that upon written request from the Lenders' Representative and the Concessionaire, the Authority may extend the aforesaid period of 180 (one hundred and eighty) days by a period not exceeding 90 (ninety) days.

3.3 Substitution upon occurrence of Concessionaire Default

3.3.1 Upon occurrence of a Concessionaire Default, the Authority shall by a notice inform the Lenders' Representative of its intention to issue a Termination Notice and grant 15 (fifteen) days time to the Lenders' Representative to make a representation, stating the intention to substitute the Concessionaire by a Nominated Company.

3.3.2 In the event that the Lenders' Representative makes a representation to the Authority within the period of 15 (fifteen) days specified in Clause 3.3.1, stating that it intends to substitute the Concessionaire by a Nominated Company, the Lenders' Representative shall be entitled to undertake and complete the substitution of the Concessionaire by a Nominated Company in accordance with the provisions of this Agreement within a period of 180 (one hundred and eighty) days from the date of such representation, and the Authority shall either withhold Termination or undertake Suspension for the aforesaid period of 180 (one hundred and eighty) days; provided that upon written request from the Lenders' Representative and the Concessionaire, the Authority shall extend the aforesaid period of 180 (one hundred and eighty)

days by a period not exceeding 90 (ninety) days.

3.4 Procedure for substitution

3.4.1 The Authority and the Concessionaire hereby agree that on or after the date of Notice of Financial Default or the date of representation to the Authority under Clause 3.3.2, as the case may be, the Lenders' Representative may, without prejudice to any of the other rights or remedies of the Senior Lenders, invite, negotiate and procure offers, either by private negotiations or public auction or tenders for the take over and transfer of the Project including the Concession to the Nominated Company upon such Nominated Company's assumption of the liabilities and obligations of the Concessionaire towards the Authority under the Concession Agreement and towards the Senior Lenders under the Financing Agreements.

3.4.2 To be eligible for substitution in place of the Concessionaire, the Nominated Company shall be required to fulfil the eligibility criteria that were laid down by the Authority for shortlisting the bidders for award of the Concession; provided that the Lenders' Representative may represent to the Authority that all or any of such criteria may be waived in the interest of the Project, and if the Authority determines that such waiver shall not have any material adverse effect on the Project, it may waive all or any of such eligibility criteria.

3.4.3 Upon selection of a Nominated Company, the Lenders' Representative shall request the Authority to:

(a) accede to transfer to the Nominated Company the right to construct, operate and maintain the Project in accordance with the provisions of the Concession Agreement;

(b) endorse and transfer the Concession to the Nominated Company, on the same terms and conditions, for the residual Concession Period; and

(c) enter into a Substitution Agreement with the Lenders' Representative and the Nominated Company on the same terms as are contained in this Agreement.

3.4.4 If the Authority has any objection to the transfer of Concession in favour of the Nominated Company in accordance with this Agreement, it shall within 15 (fifteen) days from the date of proposal made by the Lenders' Representative, give a reasoned order after hearing the Lenders' Representative. If no such objection is raised by the Authority, the

Nominated Company shall be deemed to have been accepted. The Authority thereupon shall transfer and endorse the Concession within 15 (fifteen) days of its acceptance/deemed acceptance of the Nominated Company; provided that in the event of such objection by the Authority, the Lenders' Representative may propose another Nominated Company whereupon the procedure set forth in this Clause 3.4 shall be followed for substitution of such Nominated Company in place of the Concessionaire.

3.5 Selection to be binding

The decision of the Lenders' Representative and the Authority in selection of the Nominated Company shall be final and binding on the Concessionaire. The Concessionaire irrevocably agrees and waives any right to challenge the actions of the Lenders' Representative or the Senior Lenders or the Authority taken pursuant to this Agreement including the transfer/assignment of the Concession in favour of the Nominated Company. The Concessionaire agrees and confirms that it shall not have any right to seek revaluation of assets of the Project or the Concessionaire's shares. It is hereby acknowledged by the Parties that the rights of the Lenders' Representative are irrevocable and shall not be contested in any proceedings before any court or Authority and the Concessionaire shall have no right or remedy to prevent, obstruct or restrain the Authority or the Lenders' Representative from effecting or causing the transfer by substitution and endorsement of the Concession as requested by the Lenders' Representative.

4 PROJECT AGREEMENTS

4.1 Substitution of Nominated Company in Project Agreements

The Concessionaire shall ensure and procure that each Project Agreement contains provisions that entitle the Nominated Company to step into such Project Agreement, in its discretion, in place and substitution of the Concessionaire in the event of such Nominated Company's assumption of the liabilities and obligations of the Concessionaire under the Concession Agreement.

5 TERMINATION OF CONCESSION AGREEMENT

5.1 Termination upon occurrence of Financial Default

At any time after issue of a Notice of Financial Default, the Lenders' Representative may by a notice in writing require the Authority to terminate the Concession Agreement forthwith, and upon receipt of such notice, the Authority shall undertake Termination under and in accordance with the provisions of Article 37 of the Concession Agreement.

5.2 Termination when no Nominated Company is selected

In the event that no Nominated Company acceptable to the Authority is selected and recommended by the Lenders' Representative within the period of 180 (one hundred and eighty) days or any extension thereof as set forth in Clause 3.3.2, the Authority may terminate the Concession Agreement forthwith in accordance with the provisions thereof.

5.3 Realisation of Debt Due

The Authority and the Concessionaire hereby acknowledge and agree that, without prejudice to their any other right or remedy, the Lenders' Representative is entitled to receive from the Concessionaire, without any further reference to or consent of the Concessionaire, the Debt Due upon Termination of the Concession Agreement. For realisation of the Debt Due, the Lenders' Representative shall be entitled to make its claim from the Escrow Account in accordance with the provisions of the Concession Agreement and the Escrow Agreement.

6 DURATION OF THE AGREEMENT

6.1 Duration of the Agreement

This Agreement shall come into force from the date hereof and shall expire at the earliest to occur of the following events:

(a) Termination of the Agreement; or

(b) no sum remains to be advanced, or is outstanding to the Senior Lenders, under the Financing Agreements.

7 INDEMNITY

7.1 General indemnity

7.1.1 The Concessionaire will indemnify, defend and hold the Authority and the Lenders' Representative harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense of whatever kind and nature arising out of any breach by the Concessionaire of any of its obligations under this Agreement or on account of failure of the Concessionaire to comply with Applicable Laws and Applicable Permits.

7.1.2 The Authority will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Authority to fulfil any of its obligations under this Agreement, materially and adversely affecting

the performance of the Concessionaire's obligations under the Concession Agreement or this Agreement, other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Authority, its officers, servants and agents.

7.1.3 The Lenders' Representative will indemnify, defend and hold the Concessionaire harmless against any and all proceedings, actions and third party claims for any loss, damage, cost and expense arising out of failure of the Lenders' Representative to fulfil its obligations under this Agreement, materially and adversely affecting the performance of the Concessionaire's obligations under the Concession Agreement, other than any loss, damage, cost and expense, arising out of acts done in discharge of their lawful functions by the Lenders' Representative, its officers, servants and agents.

7.2 Notice and contest of claims

In the event that any Party hereto receives a claim from a third party in respect of which it is entitled to the benefit of an indemnity under Clause 7.1 or in respect of which it is entitled to reimbursement (the "**Indemnified Party**"), it shall notify the other Party responsible for indemnifying such claim hereunder (the "**Indemnifying Party**") within 15 (fifteen) days of receipt of the claim and shall not settle or pay the claim without the prior approval of the Indemnifying Party, such approval not to be unreasonably withheld or delayed. In the event that the Indemnifying Party wishes to contest or dispute the claim, it may conduct the proceedings in the name of the Indemnified Party and shall bear all costs involved in contesting the same. The Indemnified Party shall provide all cooperation and assistance in contesting any claim and shall sign all such writings and documents as the Indemnifying Party may reasonably require.

8 DISPUTE RESOLUTION

8.1 Dispute resolution

8.1.1 Any dispute, difference or claim arising out of or in connection with this Agreement which is not resolved amicably shall be decided by reference to arbitration to a Board of Arbitrators comprising one nominee each of the Authority, Concessionaire and the Lenders' Representative. Such arbitration shall be held in accordance with the Rules of Arbitration of the International Centre for Alternative Dispute Resolution, New Delhi (the "Rules") or such other rules as may be mutually agreed by the Parties, and shall be subject to provisions of the Arbitration and Conciliation Act, 1996.

8.1.2 The Arbitrators shall issue a reasoned award and such award shall be final

and binding on the Parties. The venue of arbitration shall be Delhi and the language of arbitration shall be English.

9 MISCELLANEOUS PROVISIONS

9.1 Governing law and jurisdiction

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

9.2 Waiver of sovereign immunity

The Authority unconditionally and irrevocably:

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

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

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

(d) consents generally in respect of the enforcement of any 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).

9.3 Priority of agreements

In the event of any conflict between the Concession Agreement and this Agreement, the provisions contained in the Concession Agreement shall prevail over this Agreement.

9.4 Alteration of terms

All additions, amendments, modifications and variations to this Agreement shall be effectual and binding only if in writing and signed by the duly authorised representatives of the Parties.

9.5 Waiver

9.5.1 Waiver by any Party of a default by another Party in the observance and performance of any provision of or obligations under this Agreement:

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

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

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

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

9.6 No third party beneficiaries

This Agreement is solely for the benefit of the Parties and no other person or entity shall have any rights hereunder.

9.7 Survival

9.7.1 Termination of this Agreement:

(a) shall not relieve the Parties of any obligations hereunder which expressly or by implication survive termination hereof; and

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

9.7.2 All obligations surviving the cancellation, expiration or termination of this

Agreement shall only survive for a period of 3 (three) years following the date of such termination or expiry of this Agreement.

9.8 Severability

If for any reason whatever any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected in any manner, and the Parties will negotiate in good faith with a view to agreeing to one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable to such invalid, illegal or unenforceable provision. Failure to agree upon any such provisions shall not be subject to dispute resolution under Clause 8 of this Agreement or otherwise.

9.9 Successors and assigns

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

9.10 Notices

All notices or other communications to be given or made under this Agreement shall be in writing, shall either be delivered personally or sent by courier or registered post with an additional copy to be sent by facsimile or e-mail. The address for service of each Party, its facsimile number and e-mail address are set out under its name on the signing pages hereto. A notice shall be effective upon actual receipt thereof, save that where it is received after 5.30 (five thirty) p.m. on any day, or on a day that is a public holiday, the notice shall be deemed to be received on the first working day following the date of actual receipt. Without prejudice to the foregoing, a Party giving or making a notice or communication by facsimile or e-mail shall promptly deliver a copy thereof personally, or send it by courier or registered post to the addressee of such notice or communication. It is hereby agreed and acknowledged that any Party may by notice change the address to which such notices and communications to it are to be delivered or mailed. Such change shall be effective when all the Parties have notice of it.

9.11 Language

All notices, certificates, correspondence and proceedings under or in connection with this Agreement shall be in English.

9.12 Authorised representatives

Each of the Parties shall by notice in writing designate their respective authorised representatives through whom only all communications shall be made. A Party hereto shall be entitled to remove and/or substitute or make fresh appointment of such authorised representative by similar notice.

9.13 Original Document

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

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

SIGNED, SEALED AND DELIVERED
For and on behalf of
CONCESSIONAIRE by:

(Signature)
(Name)
(Designation)
(Address)
(Fax No.)
(Email address)

SIGNED, SEALED AND DELIVERED
For and on behalf of
Bihar State Road Development Corporation Limited by:

(Signature)
(Name)
(Designation)
(Address)
(Fax No.)
(Email address)

SIGNED, SEALED AND DELIVERED

For and on behalf of
SENIOR LENDERS by the Lenders' Representative:

(Signature)
(Name)
(Designation)
(Address)
(Fax)
(Email address)

In the presence of:

1.

2.

BIHAR STATE ROAD DEVELOPMENT CORPORATION LIMITED
(A GOVT. OF BIHAR UNDERTAKING)

Development of Greenfield Bridge across River Ganges and its approaches connecting Bakhtiyarpur Bypass of NH-31 near village Karjan & NH-28 at Tajpur in the State of Bihar on DBFOT (Toll) basis

Concession Agreement
between
Bihar State Road Development Corporation Limited
And
Navayuga Jahnavi Toll Bridge Private Limited

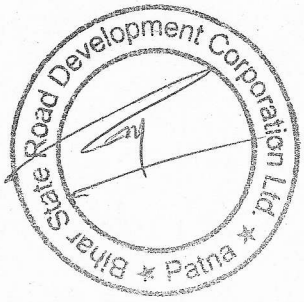
Volume- II
Part – II : Manual for Specification and Standards

"Development of Greenfield Bridge across River Ganges and its approaches connecting Bakhtiyarpur Bypass of NH-31 near village Karjan & NH-28 at Tajpur in the State of Bihar on DBFOT (Toll) basis"



Four-laning of Highways
through
Public Private Partnership

MANUAL
OF
SPECIFICATIONS & STANDARDS



Planning Commission
Government of India
New Delhi

"Manual for Specification & Standards"



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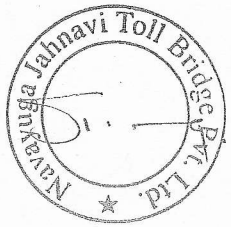

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Foreword

The Eleventh Plan envisages an investment of Rs. 3,14,152 crore (US$ 80 billion) in the road sector, of which Rs. 1,06,792 crore (US$ 27 billion) is expected from Public Private Partnerships (PPPs) that would serve as the vehicle for attracting private capital in public infrastructure projects aimed at improving efficiencies and reducing costs. Besides the Central Government, several states are pursuing PPPs for developing their respective highways.

A well-defined policy and regulatory framework consistent with international best practices has since been adopted for application to PPP projects in the highway sector. This is reflected in the standardised documents for bidding and award of projects. In particular, the Government of India has adopted a Model Concession Agreement (MCA) for PPPs in National Highways. On similar lines, the Planning Commission has published an MCA for State Highways. These MCAs follow the Design, Build, Finance and Operate (DBFO) approach that requires the Concessionaire to bear the responsibility for detailed design. However, the responsibility for providing safe and reliable roads ultimately rests with the Government and the MCA, therefore, mandates a Manual of Standards and Specifications that the concessionaire must conform to.

Consistent with the DBFO approach, only the core requirements of design, construction, operation and maintenance of the project highway are to be specified. In sum, the framework should focus on the 'what' rather than the 'how' in relation to the delivery of services by the concessionaire. This would enable cost efficiencies to occur because the shift to output-based specifications would provide the private sector with a greater opportunity to add value by innovating and optimising designs in a way normally denied to it under conventional input based procurement specifications.

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For evolving standards conforming to the DBFO approach, the Planning Commission asked the Indian Roads Congress (IRC), the apex institution of highway engineers in India, to develop this Manual of Standards and Specifications for four-lane highways. The Manual has been evolved after extensive consultations with experts and stakeholders. Following the conventions of IRC, deliberations on this Manual were undertaken in several workshops where experts drawn from the Central and State governments, private sector entities, academia and research organisations participated. A Round Table was also organised at the Planning Commission where representatives of Central and State Governments participated, besides several other stakeholders and experts. The present document represents a broad consensus arising out of the aforesaid consultations spanning over two years. It also conforms to the relevant provisions of the Two-lane Manual that has since been approved by the Council of the Indian Roads Congress.

Road building agencies of the Central and State Governments could either adopt this Manual in its present form or make such modifications as may be relevant for their purposes. In the latter case, they should publish the modified Manual so that it could be applied to their respective PPP projects. The Manual would, by reference, form an integral part of the MCA and would be binding on the concessionaire. Its provisions would be enforceable and any breach would expose the concessionaire to penalties, including termination of the concession.

The Manual is to be used in relation to Schedule D of the MCA. Besides integrating this Manual into the concession agreement, the said schedule permits deviations from the Manual to address project-specific requirements. However, all such deviations would need to be stated precisely with a view to enabling bidders to assess their costs with some degree of accuracy.

Since the concessionaire would be contractually bound by the provisions of the Manual, care has been taken to ensure that it is consistent with the provisions of the MCA. This Manual

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and the MCA together should facilitate the respective Governments in taking up a large programme for development of safe and reliable roads through PPPs, with least cost to the users and to the public exchequer.

The Manual reflects a delicate balance that was arrived at after extensive deliberations with a view to ensuring development of quality roads and at the same time improving their financial viability by optimizing on costs and obligations. Modifications, if any, should be made by the executing agencies with due regard to their legal, financial and technical implications on the underlying contractual framework.

The office-bearers of IRC, especially its President and Secretary General are to be complimented for their commendable effort in producing this volume with the assistance of eminent experts. The consultative process adopted by the IRC and its experts has helped build a consensus that would enhance the acceptability of this Manual among users, experts and stakeholders. Their contribution would go a long way towards the development of highways through PPPs - a modality that has become inevitable for attracting ever larger volumes of investment to this sector.

(Gajendra Haldea)
Adviser to Deputy Chairman,
Planning Commission

March 11, 2008

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Preface

The Planning Commission has published two separate Model Concession Agreements for Public-Private Partnership, one for National Highways and the other for State Highways. This has been done with a view to attracting private investment in the Highway Sector. A provision has been made in Schedule "D" of both the Concession Agreements to incorporate the Manual for Specifications and Standards by reference as this would help in bringing uniformity of approach to prescribe performance based parameters.

The Planning Commission initially assigned a consultancy project to the Indian Roads Congress (IRC) for preparing the Manual for 4-Laning of National Highways. An Expert Group comprising the following was, accordingly, constituted by the IRC, as per the terms of agreement for preparation of the document:

Mr Ninan Koshi	-	Former DG(RD)
Mr D.P. Gupta	-	Former DG(RD)
Mr S.C. Sharma	-	Former DG(RD)
Mr R.S. Sharma	-	the then Secretary General, IRC
Mr S.K. Kaistha	-	Technical Adviser, IRC
Mr N.K. Patel	-	Technical Adviser, IRC
Mr N.K. Sharma	-	Technical Adviser, IRC

The first draft document prepared by the Expert Group was submitted to the Planning Commission in January, 2006. The Expert Group reviewed and modified this draft document in light of the discussions with Shri Gajendra Haldea, Adviser to Deputy Chairman, Planning Commission. This modified second draft was circulated to different stakeholders like the Ministry of Shipping, Road Transport & Highways, National Highways Authority of India, select consulting and construction firms,

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entrepreneurs, State PWDs, Central Road Research Institute, IIT Delhi and Planning Commission in June, 2006. Subsequently, a Workshop was held under the Chairmanship of the then DG (RD), MOSRT&H, Shri Indu Prakash at the IRC Headquarters in R.K. Puram, New Delhi on September 11, 2006. The Expert Group reviewed the written comments/suggestions from the stakeholders and suitably modified the document incorporating these comments/suggestions.

Planning Commission held a Round Table under the Chairmanship of Member-Secretary Planning Commission on 17th September, 2007 to elicit the views of different stakeholders on the draft document prepared by the Expert Group of IRC. The Expert Group met a number of times to deliberate on the comments made during the Round Table and a modified document was sent to the Planning Commission on 25th January, 2008. Planning Commission has, subsequently, decided to publish this document as a Manual for Specifications and Standards of Four-Laning of Highways on BOT basis.

It is felt that this document will go a long way in facilitating suitable proposals for four-laning of Highways. Keeping in view the fact that the consultants and engineers of far flung States do not have easy access to IRC codes, Manuals and other reference documents, the document has been prepared in a simple and little elaborative format, explaining the different steps as well as relevant extracts of IRC Codes, Standards and Specifications, to facilitate easy adaptability by the engineers and consultants of different States. IRC may consider publishing it as its own document, by getting this document approved by the different Technical Committees of IRC as per procedure laid down for this purpose. Comments and suggestions from the actual users will be welcome for this purpose.

The IRC wishes to acknowledge with thanks, the contribution made by the different experts engaged, Shri R.S. Sharma, former Secretary General, IRC and Shri Sharad Varshney, Additional Director (Tech.), IRC. The IRC also wishes

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to acknowledge the efforts made by Shri Naveen Tewari, Section Officer, Ms. Bharati & Shri Sandeep Negi stenographers of IRC for their secretarial and stenographic assistance.

(V.K. Sinha)

February 20, 2008 Secretary General, IRC

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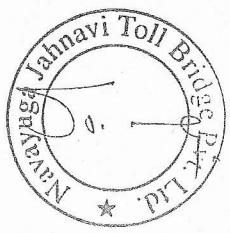
List of Symbols and Abbreviations

AASHTO	:	American Association of State Highway and Transportation Officials
ADT	:	Average Daily Traffic
ARS	:	Alkali-Silika Reaction
ASTM	:	American Society of Testing and Materials
BI	:	Bump Integrator
BIS	:	Bureau of Indian Standards
CBR	:	California Bearing Ratio
CC	:	Cement Concrete
COD	:	Commercial Operation Date
CPWD	:	Central Public Works Department
DBM	:	Dense Bituminous Macadam
DLC	:	Dry Lean Concrete
EDR	:	Equivalent Damage Ratio
ESC	:	Environmental Stress Cracking
FWD	:	Falling Weight Deflectometer
GI	:	Galvanised Iron
GSB	:	Granular Sub Base
HDPE	:	High Density Polyethylene
HFL	:	High Flood Level
HPC	:	High Performance Concrete
HYSD	:	High Yield Strength Deformed (Bars)
IE	:	Independent Engineer
IRC	:	Indian Roads Congress
IS	:	Indian Standards
LCV	:	Light Commercial Vehicle
LL	:	Liquid Limit
LTDS	:	Long Term Design Strength
MOSRTH	:	Ministry of Shipping, Road Transport and Highways
MCA	:	Model Concession Agreement
MS	:	Mild Steel
NBC	:	National Building Code
NHAI	:	National Highways Authority of India
NP	:	Non Pressure
OMC	:	Optimum Moisture Content
PCC	:	Plain Cement Concrete
PCU	:	Passenger Car Unit
PHPD	:	Peak Hour Peak Direction
PI	:	Plasticity Index
PPM	:	Parts per million
PQC	:	Pavement Quality Concrete
PSC	:	Pre Stressed Concrete
PWD	:	Public Works Department
QAM	:	Quality Assurance Manual
QAP	:	Quality Assurance Plan
QS	:	Quality System
RBS	:	Road Boundary Stones
RCC	:	Reinforced Cement Concrete
ROB	:	Road over Bridge (Road over railway line)
ROW	:	Right of Way
RUB	:	Road under Bridge (Road under railway line)
TMT	:	Thermo Mechanically Treated
VDF	:	Vehicle Damage Factor
WBM	:	Water Bound Macadam
WMM	:	Wet Mix Macadam

Section 1

General





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SECTION 1

GENERAL

1.1 The scope of the work shall be as defined in the Concession Agreement. Four Laning of the Project Highway shall be undertaken and completed by the Concessionaire as per the Specifications and Standards set forth in this Manual.

1.2 The Project Highway and the project facilities shall conform to the design requirements set out in this Manual which are the minimum prescribed. The project report and other information provided by the Government shall be used by the Concessionaire only for its own reference and for carrying out further investigations. The Concessionaire shall be solely responsible for undertaking all the necessary surveys, investigations and detailed designs in accordance with good industry practices and due diligence, and shall have no claim against Government for any loss, damage, risk, costs, liabilities or obligations arising out of or in relation to the project report and other information provided by the Government.

1.3 At least 2 weeks prior to commencement of the work, the Concessionaire shall draw up a Quality Assurance Manual (QAM) covering the Quality System (QS), Quality Assurance Plan (QAP) and documentation for all aspects of the bridge and road works and send three copies each to the Independent Engineer (IE) for review. The class of quality assurance shall not be less than Q-3. (Refer IRC:SP:47 and IRC:SP:57)

1.4 The Codes, Standards and Technical Specifications applicable for the design and construction of project components are:

(i) Indian Roads Congress (IRC) Codes and Standards (Refer Appendix-2).

(ii) Specifications for Road and Bridge Works issued by the Ministry of Shipping, Road Transport & Highways (MOSRTH) hereinafter referred to as MOSRTH or Ministry's Specifications.

(iii) Any other standards referred to in the Manual and any supplement issued with the bid document.

1.5 Latest version of the Codes, Standards, Specifications, etc., notified/published at least 30 days before the last date of bid submission shall be considered applicable.

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1.6 The terms 'Ministry of Surface Transport', 'Ministry of Road Transport and Highways' and 'Ministry of Shipping, Road Transport & Highways' or any successor or substitute thereof shall be considered as synonymous.

1.7 The terms 'Inspector' and 'Engineer' used in MOSRTH Specifications shall be deemed to be substituted by the term "Independent Engineer", to the extent it is consistent with the provisions of the Concession Agreement and this Manual.

1.8 In case of any conflict or inconsistency in the provisions of the applicable IRC Codes, Standards or MOSRTH Specifications, the provisions contained in this Manual and the Specifications and Standards specified in this Manual shall apply.

1.9 In the absence of any specific provision on any particular issue in the aforesaid Codes or Specifications read in conjunction with the Specifications and Standards contained in this Manual, the following standards shall apply in order of priority.

(i) Bureau of Indian Standards (BIS)

(ii) British Standards, or American Association of State Highway and Transportation Officials (AASHTO) Standards, or American Society for Testing and Materials (ASTM) Standards

(iii) Any other specifications/standards proposed by the Concessionaire and reviewed by the IE.

1.10 All items of building works shall conform to the State Public Works Department (State PWD), Central Public Works Department (CPWD) Specifications for Class 1 building works and standards given in the National Building Code (NBC). For the Project Highway through the state entity, to the extent specific provisions for building works are made in State PWD/IRC/MOSRTH/ Specifications, the same shall prevail over the CPWD/NBC provisions. For this purpose, building works shall be deemed to include toll plaza complex, road furniture, roadside facilities, landscape elements and/ or any other works incidental to the building works.

1.11 Guidelines for Preparing Schedules of the Concession Agreement

Certain paras (full or part) in Sections 1 to 14 of this Manual refer to the Schedules of the Concession Agreement. While finalizing the feasibility/project report for

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the Project Highway, and the scope of the project, each of these paras should be carefully examined and addressed by the Government with a view to making appropriate provisions in the Schedules of the Concession Agreement. (A list of the paras that refer to such Schedules has been provided at Appendix-1 for ready reference).

1.12 Alternative Standards and Specifications

The requirements stated in the Manual for the design of the Project Highway are the minimum. The Concessionaire will, however, be free to adopt international practices, alternative specifications, materials and standards to bring in innovation in the design and construction provided they are comparable with the standards prescribed in the Manual. The specifications and techniques which are not included in the MOSRTH Specifications/IRC Specifications/State PWD Specifications shall be supported with authentic standards and specifications like AASHTO, Euro Codes, British Standards and Australian Code etc. Such a proposal shall be submitted by the Concessionaire to the Independent Engineer for review and comments, if any. In case, the Independent Engineer is of the opinion that the proposal submitted by the Concessionaire is not in conformity with any of the international standards or codes, then he will record his reasons and convey the same to the Concessionaire for compliance. A record shall be kept by the Independent Engineer, of the non-compliance by the Concessionaire of the minimum Specifications and Standards specified in the Manual and shall be dealt with in terms of the provisions of the Concession Agreement. The Concessionaire shall be responsible for adverse consequences, if any, arising from any such non-compliance.

1.13 Utilities

The Concessionaire shall maintain and shift the existing utilities as per provisions of the Concession Agreement. The Government shall specify in schedule B of the Concession Agreement, details of the new utilities which are to be constructed or provided for along or across the Project Highway within the site. The Concessionaire shall allow / provide such utilities as per provisions of the Concession Agreement. The utilities shall be accommodated within the earmarked strip of land at the edges of the Right of Way (ROW) and/or locations that may be specified by the Government.

1.14 Before taking up any construction or maintenance operations like widening, strengthening, resurfacing, repairs etc., the Concessionaire shall first work out a plan

to ensure the following:

(i) Safety of traffic during the period of construction and the reduction of potential delays and inconvenience to road users.

(ii) Safety of the workers engaged in construction.

(iii) The arrangement for traffic during construction shall conform to the requirements of Clause 112 of MOSRTH Specifications. The Concessionaire shall furnish and erect the barricades, traffic signs and markings, and make arrangements for adequate lighting, equipment and flagman etc. as required in accordance with IRC:SP:55.

The Concessionaire shall communicate the proposal for safety of traffic and workers during construction to the Independent Engineer for review and comments, if any.

The Concessionaire shall also be responsible for ensuring compliance of all labour laws and regulations including those relating to the welfare of workers engaged both directly and indirectly on the Project Highway, besides their occupational safety and health.

1.15 The Concessionaire shall set up an adequately equipped field laboratory for testing of materials and finished products as prescribed in Clause 121 of MOSRTH Specifications. It shall make necessary arrangements for additional/confirmatory testing of any materials/products for which facilities at site laboratory are not available.

1.16 Review and comments by Independent Engineer

In cases where the Concessionaire is required to send any drawings or documents to the Independent Engineer for review and comments, and in the event such comments are received by the Concessionaire, it shall duly consider such comments in accordance with the Concession Agreement and Good Industry Practices for taking appropriate action thereon.

1.17 Definitions and Interpretation

1.17.1 All the obligations of the Concessionaire arising out of the provisions of this Manual shall be subject to, and shall conform to the provisions of the Concession Agreement.

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1.17.2 The rules of interpretation as specified in Clause 1.2 of the MCA shall apply mutatis mutandis to this Manual.

1.17.3 The definitions contained in the Model Concession Agreement for Public Private Partnership in Highways (MCA), as published by the Planning Commission, Government of India, shall apply to the provisions of this Manual unless the context otherwise requires. Terms or words not defined herein shall be governed by the definitions contained in the IRC Standards unless the context otherwise requires.

1.17.4 Built up area shall mean sections of the Project Highway that are situated within the limits of a municipal town [and shall include sections of 200 m or more in non-municipal areas where dwellings/shops have been built on one or both sides of the Project Highway on at least 70 per cent of the total length comprising such section]. or as defined by the Government.

1.18 This Manual is for 4-laning of the Project Highway. However, in some stretches, as indicated in Schedule-B of the Concession Agreement, 6-lane divided carriageway shall be provided as part of 4-laning of the Project Highway. This shall not be construed as 6-laning of the Project Highway.

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Section 2

Geometric Design and General Features

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SECTION 2

GEOMETRIC DESIGN AND GENERAL FEATURES

2.1 General

(i) This section lays down the standards for geometric design and general features for upgrading the existing two-lane highway to four-lane divided carriageway.

(ii) (a) In built-up areas, 6-lane divided carriageway along with service roads shall be provided as part of 4-laning of the Project Highway. However, if adequate land is not available or there are other constraints, the Government would dispense with the requirement of 6-laning and only 4-laning with or without service road and footpath shall be provided by the Concessionaire. Such stretches, where requirement of 6-laning is dispensed with, shall be indicated in Schedule B of the Concession Agreement clearly specifying the scope of work.

(b) Where there are constraints of ROW width, the Government may specify construction of a bypass. The alignment of the bypass shall be specified by the Government. The land for the bypass shall be acquired by the Government and where the land is yet to be acquired, the date of handing over the land to the Concessionaire shall be indicated. The bypass shall be 4-lane and access controlled with service roads and provision for future widening to 6-lane.

(iii) The geometric design of the Project Highway shall conform to the standards set out in this section as a minimum. The Concessionaire shall ensure that liberal geometric standards are followed to the extent feasible within the given Right of Way.

(iv) As far as possible, uniformity of design standards shall be maintained throughout the length of the Project Highway. In case of any change, it shall be effected in a gradual manner.

(v) Where the existing road geometrics are deficient with respect to minimum requirements and its improvements to the prescribed standards require acquisition of additional land, such stretches shall be specified in Schedule B of the Concession Agreement. Additional land, as required, shall be provided by the Government.

(vi) Existing horizontal curves, which are found deficient in radius, layout, transition

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lengths or super-elevation shall be corrected to the specified standards, as per IRC:73.

(vii) Any deficiencies in the vertical profile in respect of grades, layout of vertical curves and sight distance shall be corrected to meet the minimum specified requirements, as per IRC:73.

2.2 Design Speed

2.2.1 The design speeds given in Table 2.1 shall be adopted for various terrain classifications. (Terrain is classified by the general slope of the ground across the highway alignment).

Table 2.1 : Design Speed

Nature of Terrain	Cross slope of the ground	Design speed (km/hr)	
		Ruling	Minimum
Plain	Less than 10 per cent	100	80
Rolling	Between 10 and 25 per cent	80	65
Mountainous	Between 25 and 60 per cent	50	40
Steep	More than 60 per cent	40	30

2.2.2 Short stretches (say less than 1 km) of varying terrain met with on the road stretch shall not be taken into consideration while deciding the terrain classification for a given section of Project Highway.

2.2.3 In general, the ruling design speed shall be adopted for the various geometric design features of the road. Minimum design speed shall be adopted only where site conditions are restrictive and adequate land width is not available. The Concessionaire shall improve the alignment as per the requirement for ruling design speed as and when the Government provides land. Such stretches shall be indicated in Schedule B of the Concession Agreement. Land for such stretches shall be provided by the Government not later than five years from the Commercial Operation Date (COD). Abrupt changes in design speed shall be avoided.

2.3 Right-of-Way

The Right-of-Way is the total land width required for the Project Highway to accommodate the roadway (carriageway, shoulders and median), side drains, service roads, tree plantation, utilities, etc. The ROW available for the Project Highway shall

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be as given in Schedule-A of the Concession Agreement. The Government should acquire additional land accordingly. The land to be so acquired shall be indicated in Annexure II of Schedule A of the Concession Agreement. The desirable Right of Way for non-urban and urban areas should be as prescribed in IRC:73 and IRC:86 respectively.

2.4 Lane width of Carriageway

The standard lane width of the Project Highway shall be 3.5 m.

2.5 Shoulders

2.5.1 *Width of Shoulders*

The normal shoulder width on the outer side (left side of carriageway) shall be as given in Table 2.2.

Table 2.2 : Width of Shoulder

Type of Section	Width of Shoulder (m)	
	Plain and Rolling Terrain	Mountainous and Steep Terrain[1]
Open country with isolated built up area	3.5	1.5
Built up area	2.0	2.0
Approaches to grade separated structures/bridges	2.0	2.0

2.5.2 *Type of Shoulder*

The type of shoulder shall be as below:

(i) In the built up section and approaches to the grade separated structures, the shoulder shall be paved in full width.

(ii) In open country with isolated built up area in plain and rolling terrain, 2.0 m width adjacent to the carriageway shall be paved and balance 1.5 m shall be covered

[1] *In mountainous and steep terrain, the scope of work defined by the Government may be two-lane carriageways on different alignments (contours). In that case, the Manual of Specifications and Standards for two-lanning of Highways shall apply to the two-lane carriageways on different alignments (contours).*

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with 150 mm thick layer of granular material conforming to the requirements given in para 5.7.1. In open country with isolated built up area in mountainous and steep terrain, the shoulders shall be of locally available hard material.

(iii) In high embankments, the granular shoulder may be raised with provision of kerb channel to channelize the drainage as an erosion control device. (Refer to Para 6.4)

(iv) The composition and specification of the paved shoulder shall be same as of the adjoining carriageway insofar as it relates to the non-bituminous layers (granular layers). In place of Dense Bituminous Macadam (DBM) layer, which is provided in the main carriageway, Water Mix Macadam (WMM) may be provided in the paved shoulders. The wearing course may be provided in the form of an appropriate bituminous surface not less than 25 mm in thickness.

(v) In the case of rigid pavement, the paved shoulder shall be of the same thickness and specifications as that of the rigid pavement.

2.6 Median

2.6.1 The median shall be either flush with the carriageway or depressed. The width of median is the distance between inside edges of carriageways. The type of median shall depend upon the availability of Right of Way. The minimum width of median, subject to availability of Right of Way, for various locations shall be as in Table 2.3.

Table 2.3 : Width of Median

Type of Section	Minimum Width of median (m)		
	Plain and Rolling Terrain		Mountainous and Steep Terrain
	Flush median	Depressed median	Flush median
Open country with isolated built up area	2.0	7.0	2.0
Built up area	2.0	Not Applicable	2.0
Approach to grade separated structures	2.0	Not Applicable	2.0

Note: In mountainous and steep terrain, the scope of work defined by the road agency may be two-lane carriageways on different alignments (contours).

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2.6.2 In situations where the right of way is less than 40 m and it is not possible to accommodate depressed median of 7m width, a raised median with non-mountable kerb (height 225 mm) shall be provided. The width of raised portion shall not be less than 4.0 m. If an exception is to be made for project specific reasons, the same should be included in Schedule B of the Concession Agreement.

2.6.3 The median shall have suitably designed drainage system so that water does not stagnate in the median.

2.6.4 A minimum 0.6 m width of depressed median adjacent to carriageway in either direction and full width of flush median excluding barrier shall be paved with same specification as of the adjoining carriageway.

2.6.5 As far as possible, the median shall be of uniform width in a particular section of the highway. However, where changes are unavoidable, a transition of 1 in 20 shall be provided.

2.6.6 In the case of depressed median, metal beam type crash barriers shall be provided at either end of the median. Suitable shrubs as per Section 12 of this Manual shall be provided.

2.6.7 In the case of flush type medians, concrete or metal beam type crash barriers shall be provided in the middle of the median. Suitable antiglare measures such as vegetation, metal/plastic screens shall be provided in flat stretches or in horizontal curves to reduce headlight glare from opposite traffic. The total height of screen including the height of the barrier shall be 1.5 m.

2.7 Roadway Width

2.7.1 The width of roadway shall depend upon the width of carriageway, shoulders and the median.

2.7.2 On horizontal curves with radius up to 300 m, width of pavement and roadway in each carriageway shall be increased as per Table 2.4.

Table 2.4 : Extra Width of Pavement and Roadway in each carriageway

Radius of Curve	Extra Width
Upto 40 m	1.5 m
41-60 m	1.2 m
61-100 m	0.9 m
101-300 m	0.6 m

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2.8 Camber or Crossfall

2.8.1 The camber or crossfall on straight sections of road carriageway, paved shoulders and paved portion of median shall be 2.5 per cent for bituminous surface and 2.0 per cent for cement concrete surface.

2.8.2 The camber shall be unidirectional for either side carriageway sloping towards the shoulder in straight reaches and towards the lower edge on horizontal curves. The camber on the existing road shall be modified to unidirectional camber.

2.8.3 The camber for granular shoulders on straight portions shall be at least 0.5 per cent steeper than the slope of the pavement and paved shoulder subject to a minimum of 3.0 per cent and maximum of 4.0 per cent. On super elevated sections, the earthen portion of the shoulder on the outer side of the curve would be provided with reverse crossfall so that the earth does not drain on the carriageway and the storm water drains out with minimum travel path.

2.9 Horizontal Alignment

2.9.1 While designing the horizontal alignment, the following general principles shall be kept in view.

(i) Alignment should be fluent and it should blend well with the surrounding topography.

(ii) On new roads, the curves should be designed to have largest practical radius, but in no case less than ruling value corresponding to the ruling design speed.

(iii) As a normal rule, sharp curves should not be introduced at the end of long tangent since these can be extremely hazardous.

(iv) The curves should be sufficiently long and they should have suitable transitions to provide pleasing appearance.

(v) Reverse curves shall be avoided as far as possible. Where unavoidable, sufficient length between two curves shall be provided for introduction of requisite transition curves, and required super elevation.

(vi) Curves in the same direction, separated by short tangents known as broken back curves, should be avoided as far as possible. Where possible such portions may be designed with longer single curve.

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(vii) To avoid distortion in appearance, the horizontal alignment should be coordinated carefully with the longitudinal profile.

(viii) Hairpin bends in hilly terrain should be avoided as far as possible. Where unavoidable, they may be designed either as a circular curve with transition curves at each end or as a compound circular curve. Design criteria given in IRC:52 shall be adopted for the design of hairpin bends. At hairpin bends, the full roadway width should be surfaced.

2.9.2 All horizontal curves shall consist of circular portion flanked by spiral transitions at both ends.

2.9.3 *Super elevation*

(i) Super elevation shall be provided on curves as per details given in IRC:73 corresponding to the design speed adopted.

(ii) Super elevation shall be limited to 7 per cent, if radius of curve is less than the desirable minimum radius. It shall be limited to 5 per cent if radius is more than desirable minimum radius. To avoid skidding, friction course shall be provided in the curved portion.

(iii) Super elevation shall not be less than the minimum specified cross fall/camber.

2.9.4 *Radii of Horizontal Curves*

The desirable minimum and absolute minimum radii of horizontal curves for various classes of terrain are given in Table 2.5.

Table 2.5 : Minimum Radii of Horizontal Curves

Nature of terrain	Desirable minimum	Absolute minimum
Plain	360 m	230 m
Rolling	230 m	155 m
Mountainous	90 m	60 m
Steep	60 m	30 m

The radius of horizontal curves for various terrain conditions shall not be less than the desirable values given in Table 2.5 except where site conditions are restrictive and adequate land is not available. Where such restrictions exist, the radius of curve shall not be less than the specified absolute minimum value.

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2.9.5 *Transition curves*

Minimum length of transition curve shall be as per IRC:73.

2.10 Sight Distance

2.10.1 Visibility is an important requirement for the safety of travel on roads. For this, it is necessary that sight distance of adequate length is available in different situations, to permit drivers enough time and distance to control their vehicles so that chances of accidents are minimized.

The safe stopping sight distance and desirable minimum sight distance for divided carriageway for various design speeds are given in Table 2.6. The desirable values of sight distance (Intermediate Sight Distance) shall be adopted unless there are site constraints. A minimum of safe stopping sight distance shall be available throughout.

Table 2.6 : Safe Sight Distance

Design Speed (km/hr)	Safe Stopping sight distance (m)	Desirable minimum sight distance (m) (Intermediate Sight Distance)
100	180	360
80	120	240
65	90	180
50	60	120
40	45	90
30	30	60

2.10.2 The requisite sight distance shall be available across the inside of horizontal curves.

2.10.3 Where horizontal and summit curves overlap, the design shall provide for the required sight distance both in the vertical direction along the pavement and in the horizontal direction on the inside of curve.

2.11 Vertical Alignment

2.11.1 The vertical alignment should provide for a smooth longitudinal profile. Grade changes shall not be too frequent as to cause kinks and visual discontinuities in the

profile. In this regard, directions given in IRC:73 should be kept in view. The ruling and limiting gradients are given in Table 2.7.

Table 2.7 : Recommended Gradients

Nature of terrain	Ruling gradient	Limiting gradient
Plain and rolling	3.3%	5.0%
Mountainous	5.0%	6.0%
Steep	6.0%	7.0%

2.11.2 Gradients upto the value corresponding to ruling gradient shall be adopted as far as possible. Limiting gradients shall be adopted only in very difficult situations and for short lengths.

2.11.3 Long sweeping vertical curves shall be provided at all grade changes. These shall be designed as square parabolas.

2.11.4 For design of vertical curves and its coordination with horizontal curves, reference may be made to IRC:SP:23.

2.12 Lateral and Vertical Clearance at Underpasses

Wherever a cross road is proposed to be taken below the Project Highway, minimum clearances at underpasses shall be as follows:

2.12.1 *Lateral Clearance*

(i) Full roadway width at the approaches shall be carried through the underpass. Provision shall also be made for future expansion of the cross road for at least next 20 years.

(ii) Guardrails / crash barriers / traffic attenuators shall be provided for protection of vehicles from colliding with the abutments and piers and the deck of the structures.

(iii) The width of cattle and / or pedestrian underpass shall not be less than 5 m.

2.12.2 *Vertical Clearance*

Vertical clearance at underpasses shall not be less than the values given below:

Vehicular underpass 5.5 m

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(ii) Pedestrian and Cattle underpass 3.0 m

To minimize frequent ups and downs in the vertical profile of the highway, the feasibility of depressing the floor of the underpass structures shall be explored and adopted, if found feasible, considering the effective drainage. Wherever existing slab culverts and minor bridges allow a vertical clearance of more than 2m, these can be used for pedestrian and cattle crossing by providing necessary flooring.

2.13 Lateral and Vertical Clearance at Overpasses

Wherever any structure is provided over the Project Highway; the minimum clearances shall be as follows:

2.13.1 *Lateral Clearance*

Full roadway width including service roads, if any, shall be carried through the overpass structure. Provision shall also be made for future widening of the Project Highway to 6-lane with service roads. The abutments and piers shall be provided with suitable protection against collision of vehicles. Guardrails/crash barriers/traffic attenuators shall be provided on abutment side and on sides of piers for this purpose. The ends of guardrails shall be turned away from the line of approaching traffic.

2.13.2 *Vertical Clearance*

A minimum 5.5 m vertical clearance shall be provided from all points of the carriageway of the Project Highway to the nearest surface of the overpass structure.

2.14 Access Control

2.14.1 *Access*

Access to the Project Highway shall be partially controlled. In general access to the Project Highway shall be provided at the following locations:

(i) Intersection with National Highways

(ii) Intersection with State Highways

(iii) Intersection with Major District Roads

(iv) Intersection with Village Roads/Other District Roads, subject to a minimum distance of 3 km from the nearest intersection

2.14.2 *Service Roads*

2.14.2.1 The location, length and width of service roads, to be constructed by the Concessionaire in open country shall be specified in Schedule-B of the Concession Agreement.

2.14.2.2 Service roads shall be constructed and maintained in accordance with the provisions of the Concession Agreement.

2.14.2.3 For the stretches where total length of a bridge is less than 60 m, the service road, if any, shall continue across the stream and suitably designed vented causeway structure shall be provided if so specified by the Government. In cases involving bridges of 60 m length or more, separate bridge structures shall not be provided and service road shall be merged with the Project Highway at 50 m distance before the bridge structure.

2.14.2.4 The crust composition of service roads shall not be lower than that specified in IRC:37 for 2(two) msa design traffic unless specified otherwise. The roughness of service roads shall not be more than 2,500 mm/km at the time of completion of construction, when measured by the Fifth Wheel Bump Integrator.

2.14.2.5 Wherever service roads are provided, provision shall be made for proper entry and exit ramps between the main highway and the service roads, duly keeping in view future widening of main highway to six-lanes. The layout shall be as per Figure 2.1 A to 2.1 D.

2.15 Grade Separated Structures

2.15.1 The type, location, length, number and the openings required to be provided for various types of grade separated structures shall be as specified by the Government in Schedule-B of the Concession Agreement. The approach gradient to the grade separated structure shall not be more than 2.5 per cent (1 in 40).

2.15.2 *Vehicular Underpass/Overpass*

The vehicular under/overpass structures shall be provided at the intersection of the Project Highway with all the National Highways and State Highways. Such under/over passes shall also be provided across other categories of roads carrying an average daily traffic of more than 5000 Passenger Car Units (PCUs) on the date of inviting bids. The structure may be either an underpass or an overpass depending upon the nature of terrain, vertical profile of road, availability of adequate right of

way, etc. Unless otherwise specified in Schedule-B of the Concession Agreement, the Project Highway shall be carried at the existing level.

2.15.3 *Cattle and Pedestrian Underpass/Overpass*

(i) For inhabited areas, a grade-separated structure for crossing of cattle and pedestrians shall be provided at every 1000 m and in rural areas, an underpass/ overpass shall be provided at an average spacing of about 2.5 km. For the avoidance of doubt, such underpasses/overpasses shall not be necessary within a distance of 2.5 km from Vehicular underpasses. The locations of cattle and pedestrian underpasses/overpasses shall be indicated in Schedule-B of the Concession Agreement.

(ii) The width of Pedestrian or Cattle crossing shall not be less than 5 m.

(iii) The pedestrian crossings shall have provision for movement of disabled persons.

(iv) Underpasses shall be preferred to overpasses.

(v) Pedestrian underpass/overpass shall also be provided within a distance of 200 m from a school or hospital.

2.15.4 Road Over Bridges (ROBs)/Road Under Bridges (RUBs) shall be provided as per Section-7 of this Manual.

2.16 Median openings

2.16.1 Median openings shall not be spaced closer than 5 km. Additional controlled openings shall also be provided for inspection, and diversion of traffic during repair and rehabilitation.

2.16.2 Median opening shall not be provided in front of the service road entry. The distance between the service road entry and the median opening shall be at least equal to the sum of length of acceleration lane, weaving length, and deceleration length. Location of opening shall be so decided as to minimize intraflow.

2.16.3 All median openings shall be provided with additional 3.5 m wide shelter lane by the side of median in both directions for waiting of vehicles to take U turn. Wherever required, horizontal geometrics of the road shall be suitably adjusted.

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2.17 Fencing

The Concessionaire shall provide fencing between the service road and the Project Highway to prevent the local vehicles and animals entering the highway. The fencing shall be of galvanized iron chain link with galvanized iron channel sections or metal beam crash barriers. Similarly, in all urban and semi urban sections suitable fencing/ railing or crash barriers shall be provided between the Project Highway and service roads.

2.18 Typical Cross Sections

Typical cross sections of Project Highway are given in Fig 2.2 to 2.10 for various locations as below:

Figure 2.2 shows typical cross section Type-A1 for 4-lane divided highway in open country with isolated built-up area in plain/rolling terrain, without service roads and with depressed median.

Figure 2.3 gives typical cross section Type-A2 for 4-lane divided highway in open country with isolated built-up area in plain/rolling terrain with service roads on both sides and with depressed median.

Figure 2.4 shows typical cross section Type-A3 for 4-lane divided highway in open country with isolated built-up area in plain/rolling terrain, without service roads and with flush median.

Figure 2.5 gives typical cross section Type-A4 for 4-lane divided highway in open country with isolated built-up area in plain/rolling terrain with service roads on both sides and with flush median.

Figure 2.6 shows typical cross section Type-B for 6-lane divided highway in built-up section in plain and rolling terrain with service roads on both sides and with flush median.

Figure 2.7 shows typical cross section Type-C1 for 4-lane divided highway on different contours in open country with isolated built-up area in mountainous terrain.

Figure 2.8 shows typical cross section Type-C2 for 4-lane divided highway on different contours in built up section in mountainous terrain.

Figure 2.9 shows typical cross section Type-C3 for 4-lane divided highway at same level in open country with isolated built-up area in mountainous terrain.

Figure 2.10 shows typical cross section Type-C4 for 4-lane divided highway at same level in built up section in mountainous terrain.

2.19 Capacity of Four-lane highway

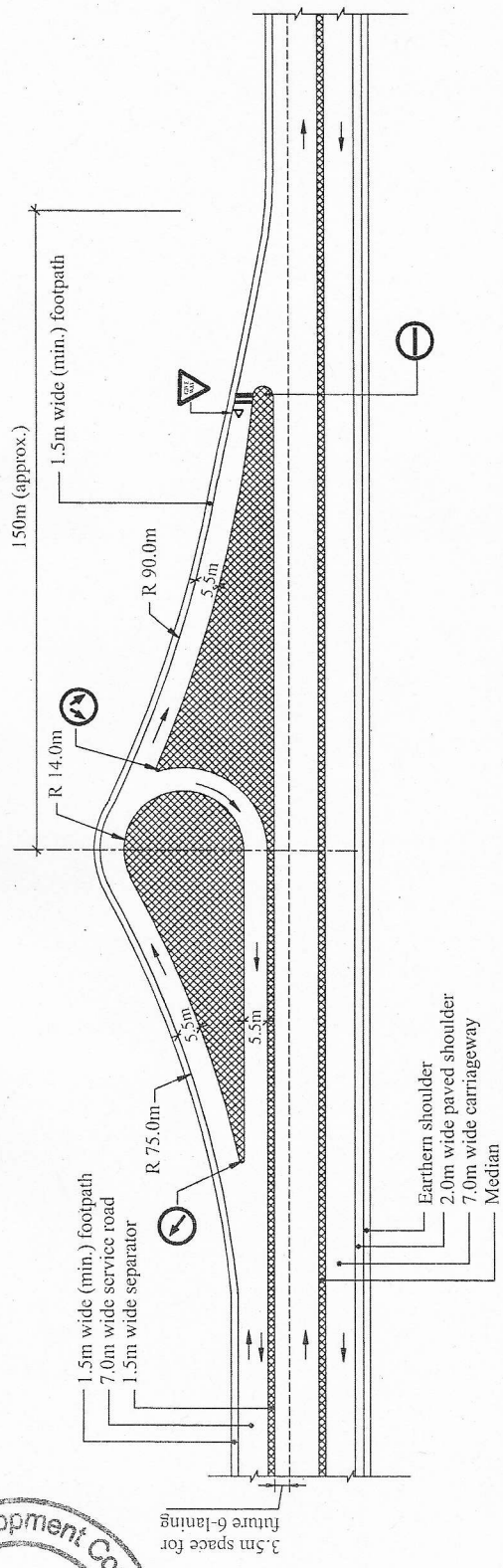
For the purpose of augmentation of the facilities and upgradation of the Project Highway, the design service volume for different terrain conditions and level of service shall be as specified in Table 2.8.

Table 2.8 : Design Service Volume for Four-Lane Highways in PCUs per day

Terrain	Design Service Volume in PCUs per day	
	Level of Service 'B'	Level of Service 'C'
Plain and rolling	40,000	60,000
Mountainous and steep	20,000	30,000

2.20 Warrants for Six-Laning

Unless otherwise specified in the Concession Agreement, the Project Highway shall be widened to 6-lane when total traffic excluding the traffic on service roads reaches the design service volume corresponding to Level of Service 'C' for 4-lane Highway specified in Table 2.8.



Note:
1. Detailed System of Road Marking as per IRC:35.
2. Detailed System of Road Signs as per IRC:67.

Suggestive layout for entry ramp to highway
(At the end of service road)

Fig. 2.1A

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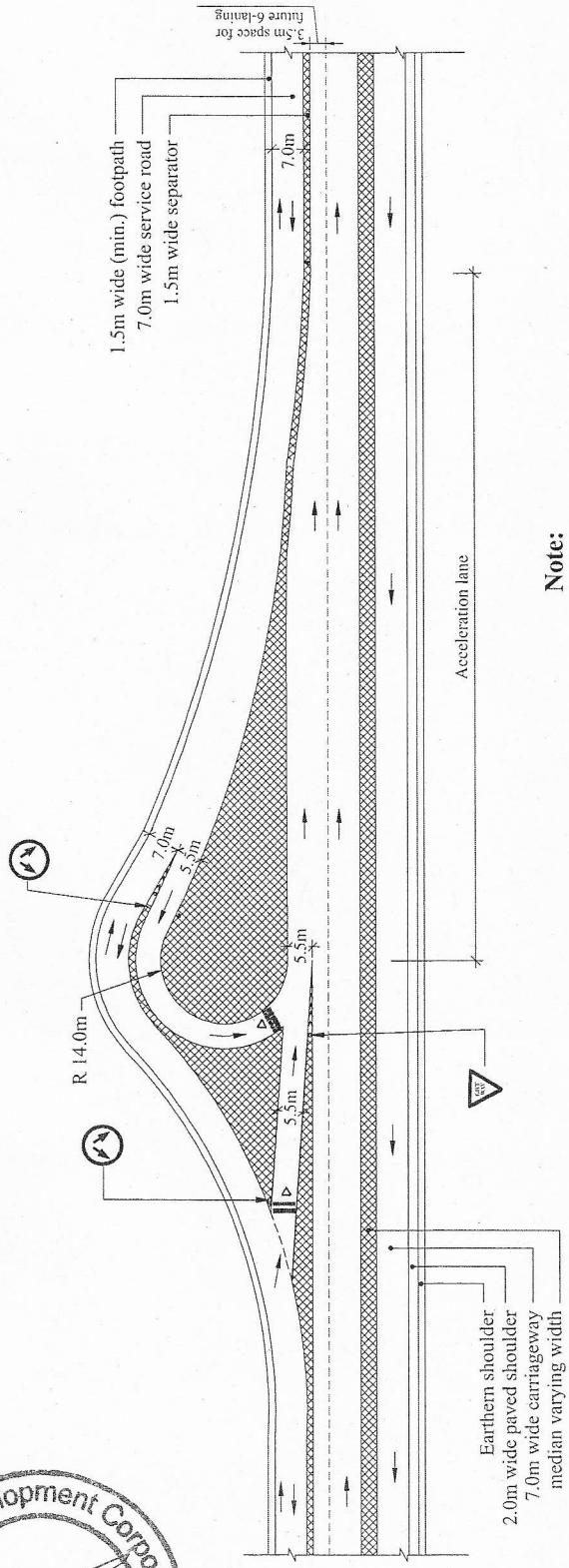

Note:
1. Detailed System of Road Marking as per IRC:35.
2. Detailed System of Road Signs as per IRC:67.

Suggestive layout for entry ramp to highway
(Service road on both sides of entry ramp)

Fig. 2.1B

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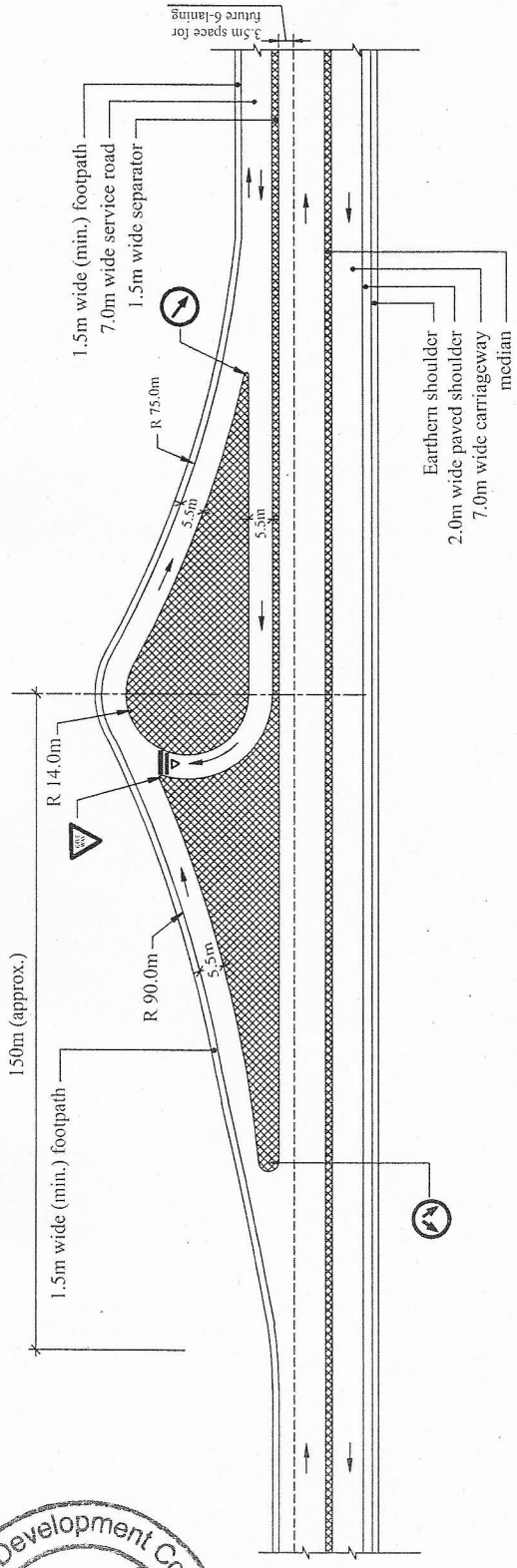

Note:

1. Detailed System of Road Marking as per IRC:35.
2. Detailed System of Road Signs as per IRC:67.

Suggestive layout for exit ramp from highway
(At the end of service road)

Fig. 2.1C

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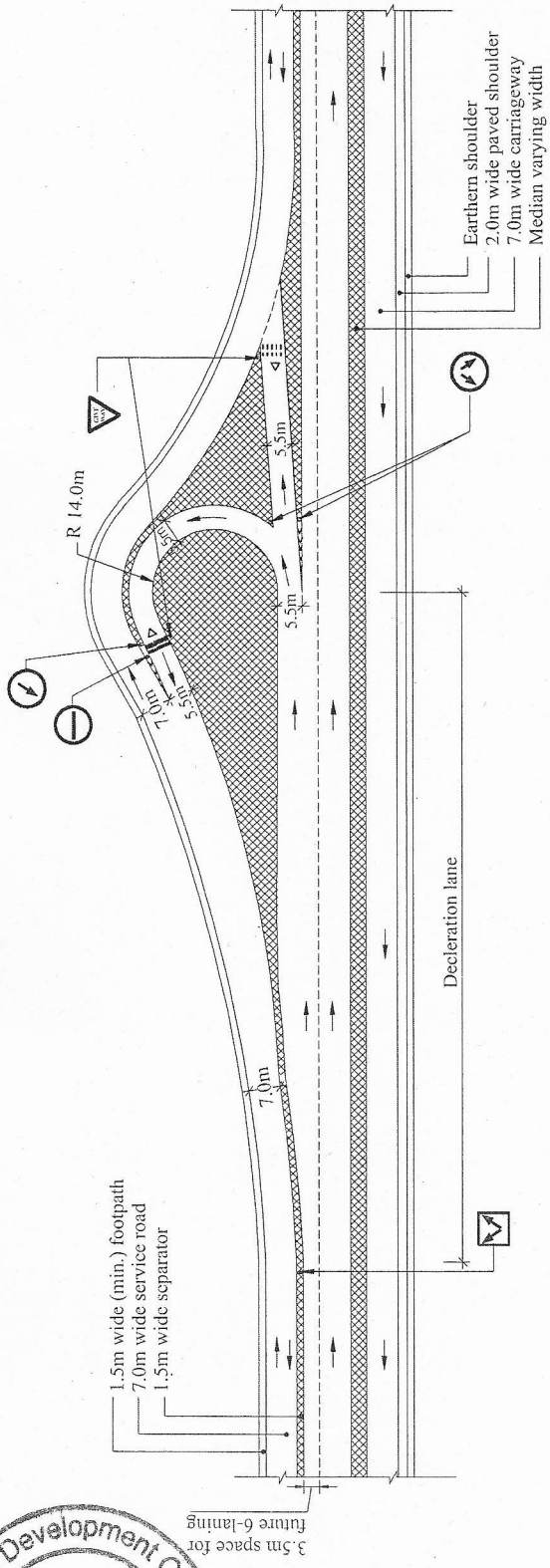
pc/coi



Note:
1. Detailed System of Road Marking as per IRC:35.
2. Detailed System of Road Signs as per IRC:67.

Suggestive layout for exit ramp from highway
(Service road on both sides of exit ramp)

Fig. 2.1D

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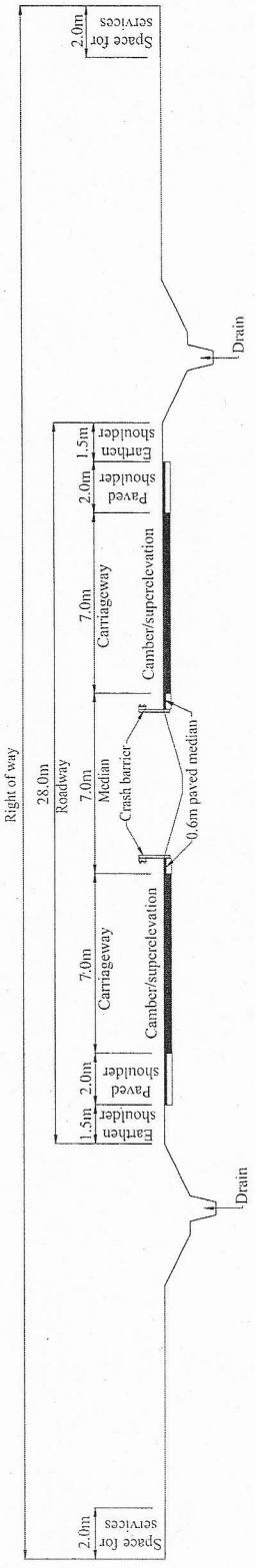

Typical cross section type-A1

(Open country-plain/rolling terrain)

4-lane divided highway without service roads and with depressed median

Fig. 2.2

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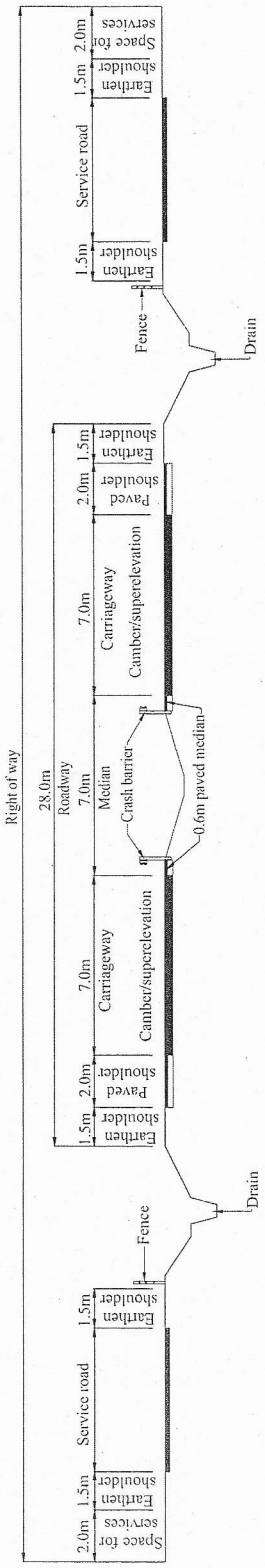

Typical cross section type-A2
(Open country-plain/rolling terrain)
4-lane divided highway with service roads and with depressed median

Fig. 2.3

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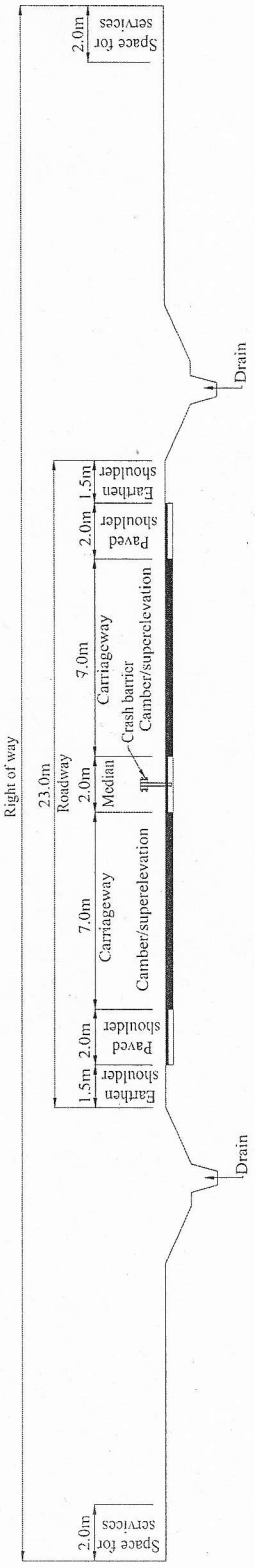

Typical cross section type-A3
(Open country-plain/rolling terrain)
4-lane divided highway without service roads and with flush median

Fig. 2.4

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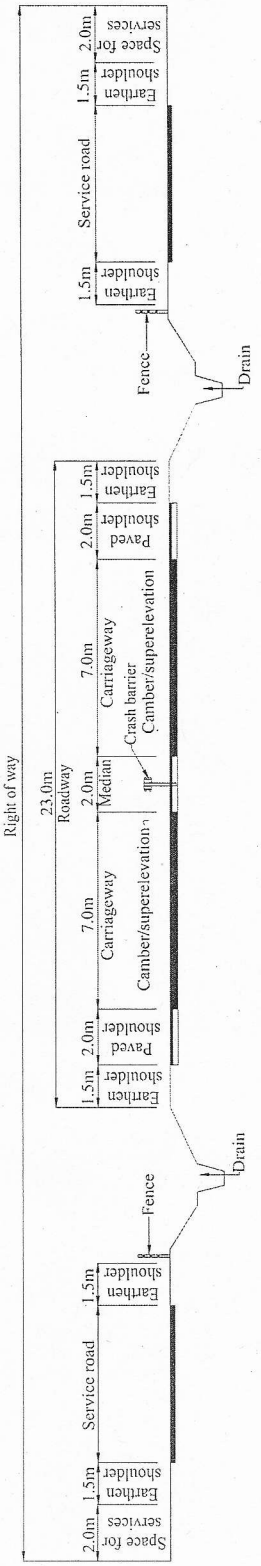

Typical cross section type-A4
(Open country-plain/rolling terrain)
4-lane divided highway with service roads and with flush median

Fig. 2.5

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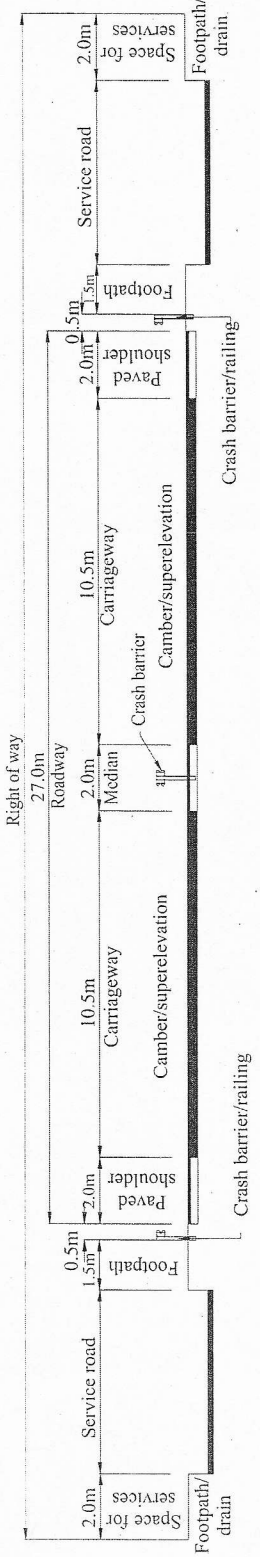

Typical cross section type-B1

(Built-up section - plain/rolling terrain)

6-lane divided highway with service roads and with flush median

Fig. 2.6

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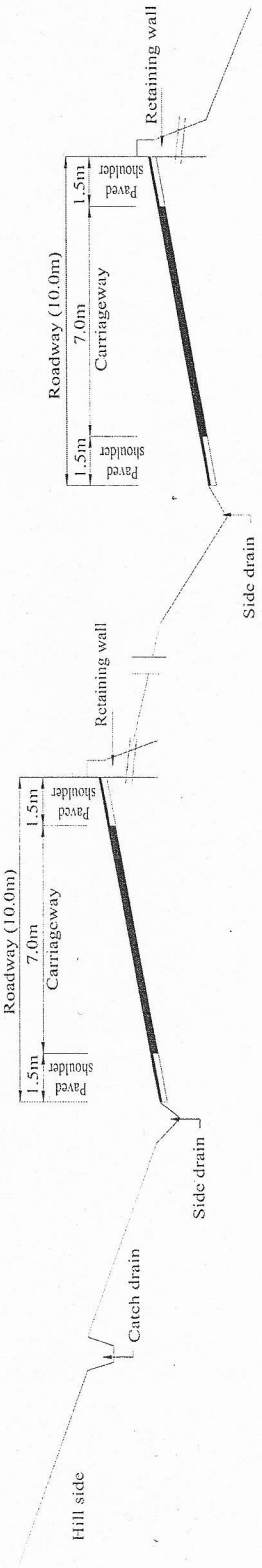
pc/coi



Typical cross section type-C1
(Open country - mountainous terrain)
4-lane divided highway on different contours

Fig. 2.7

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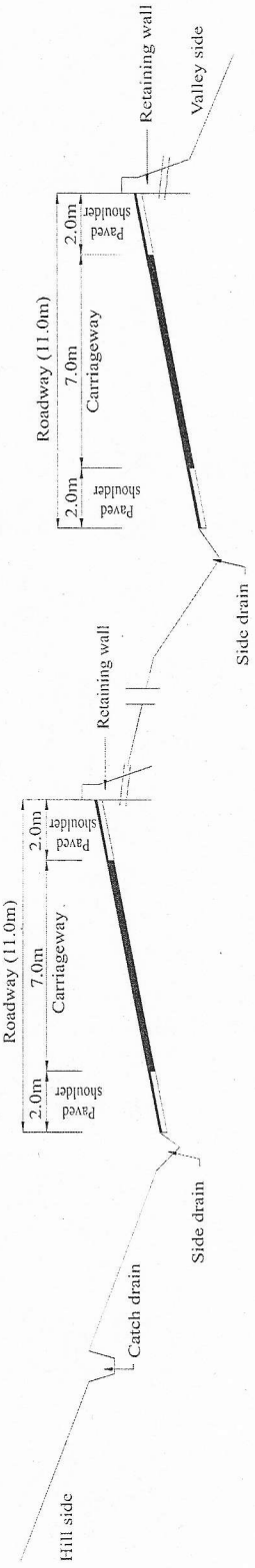

Typical cross section type-C2

(Built-up section - mountainous terrain)

4-lane divided highway on different contours

Fig. 2.8

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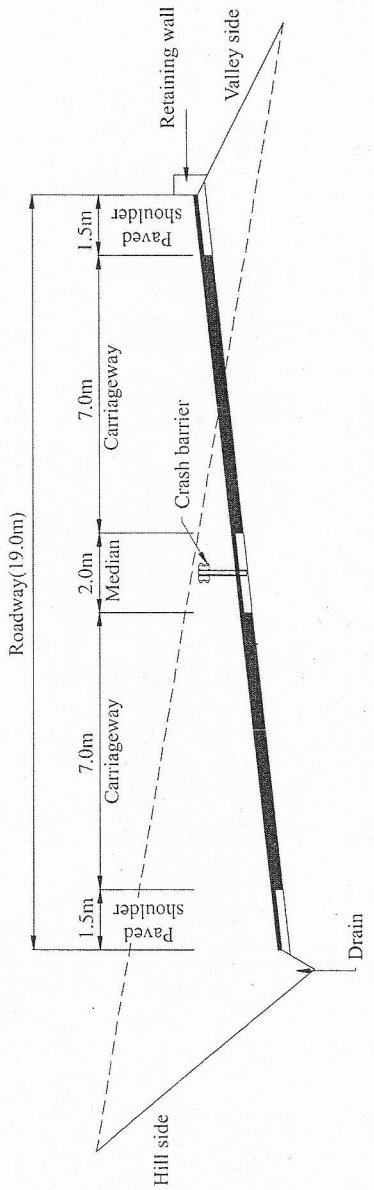
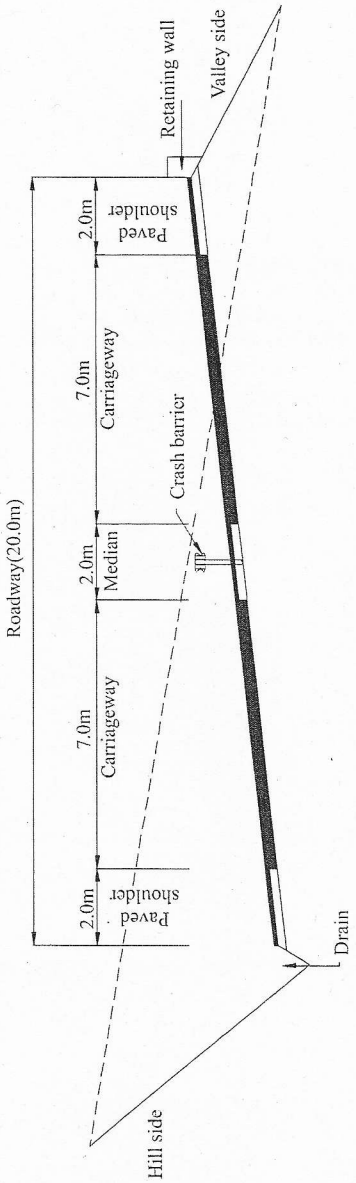


Typical cross section type-C3
(Open country - mountainous terrain)
4-lane divided highway at same level

Fig. 2.9



Typical cross section type-C4
(Built-up section - mountainous terrain)
4-lane divided highway at same level

Fig. 2.10

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Section 3

Intersections and Grade Separators

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SECTION 3

INTERSECTIONS AND GRADE SEPARATORS

3.1 Introduction

3.1.1 Subject to the provisions of this Manual, properly designed intersections shall be provided at all road crossings/junctions. The types and locations of Interchanges and Grade-separated Intersections without ramps shall be specified in Schedule-B of the Concession Agreement. The intersections to be provided shall be one of the following types:

(i) At-grade Intersections
(ii) Grade separated Intersections without ramps
(iii) Interchanges

3.1.2 The existing intersections, which are deficient with respect to the minimum requirements shall be improved to the prescribed standards. Additional land, if any, required for improving the existing intersections shall be provided by the Government.

3.2 At-grade Intersections

3.2.1 *General*

(i) The type of intersections to be adopted shall be decided on the basis of parameters like number of intersecting legs, traffic volume/speed, available right-of-way, type of traffic control (signalized/non-signalized) etc. Necessary traffic surveys for the design of road junctions shall be carried out as per IRC:SP:19.

(ii) Normally, the type of intersection shall be:
(a) Three leg intersection
(b) Four leg intersection
(c) Multi leg intersection/rotary.

(iii) The intersections shall be designed having regard to flow, speed, composition, distribution and future growth of traffic. Design shall be specific to each site with due regard to physical conditions of the site available. The design of different elements of intersection shall be done as per IRC:SP:41 "Guidelines on Design of At-grade Intersections in Rural and Urban Areas" including other criteria given in the subsequent paras. MOSRTH-Type Designs for Intersection

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on National Highways may also be referred to, wherever required to develop suitable layout and design of At-grade Intersections.

(iv) The design shall aim at simplicity and uniformity in design standards. Complex designs which may involve complicated decision-making by drivers shall be avoided.

(v) The entry and exit traffic from the cross road should have proper merging and exit islands with the Project Highway.

(vi) The intersection control shall be of 'Stop Control' unless specified otherwise. This will mean that traffic on the minor road must stop prior to entering the Project Highway. When roads of equal importance intersect, priority shall be given to the traffic on the right.

(vii) At the intersection, the alignment should be as straight and the gradient as flat as practicable. The gradients in excess of 2 per cent will normally not be allowed at intersections.

(viii) Any deficiency in the alignment and grade of intersecting roads shall be corrected to improve traffic conditions and safety.

(ix) The sight distance to be adopted shall normally be intermediate sight distance as specified in Section 2. However, in exceptional circumstances, it should not be less than minimum stopping sight distance specified in Section 2. At such locations, cautionary speed limit signboards shall be displayed.

(x) At multi leg intersections, the points of conflict should be studied carefully and possibilities of realigning one or more of the intersecting legs and combining some movements to reduce the conflicting movements shall be examined. The object shall be to simplify the design and appropriate control devices added to ensure more efficient and safe operation.

3.2.2 *Design Standards*

Design standards shall be as per IRC: SP:41. Salient features are given below:

(i) Design Speed: The approach speed shall be taken as the design speed adopted for the section of Project Highway on which the intersection is located. The design speed for various intersection elements shall be taken as 60 per cent of the approach speed.

(ii) Design Traffic Volume: The traffic volume for the design of intersection and

its distribution at peak hours shall be assessed up to the end of operation period, taking into consideration the past trend, likely new development of land, socio-economic changes, etc.

(iii) Design Vehicle: Semi-trailer combination (refer IRC:3) shall be used in the design of intersections.

(iv) The number of lanes to be provided at the intersection shall be governed by peak hour traffic volume in each direction of travel. Widening of carriageway shall be achieved by a taper of not less than 1 in 20.

(v) Type and radius of curve of intersection: The type and radii of curves would depend upon the types of vehicles turning at the intersection and shall be decided based on the traffic data.

(vi) Auxiliary lanes: The auxiliary lanes of adequate length as per the assessment of turning and merging traffic shall be provided in the form of storage lane, acceleration lane and deceleration lane.

(vii) The right turn deceleration lane shall also be provided in the central reserve (median).

(viii) Visibility at intersection: A minimum safe stopping sight distance appropriate for the approach speeds shall be available for the traffic on the Project Highway.

3.2.3 *Traffic Control Devices*

(i) Road markings: Typical road markings for road intersection as given in IRC:SP:41 and IRC:35 shall be followed. The specifications of road marking shall be as given in Section 9 of this Manual.

(ii) Signs: Traffic signs at the junctions shall be provided as per IRC:67 and Section 9 of this Manual.

(iii) Reflectors: To guide the traffic, reflectors in the form of cat's eyes, delineators, etc shall be provided, in addition to the road markings, especially at the channelising islands.

3.2.4 *Detailed Designs and Data for review by the IE*

The Concessionaire shall submit the details of the ground surveys, traffic data, traffic forecast, design and drawings of the intersections showing all safety features to the Independent Engineer for review and comments, if any.

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3.3 Grade Separated Intersections without Ramps

3.3.1 *General*

(i) Grade separated intersections, without ramps, shall be provided at locations where traffic on cross roads is moderate to heavy. Under this type, two cross roads separate at different grades (as Road Under Bridge or Road Over Bridge). All drivers desiring to turn to and from the cross road are required to use other existing routes and enter or leave the Project Highway at other locations.

(ii) Grade separated intersections without ramps shall be provided at the locations indicated in Schedule B of the Concession Agreement.

(iii) The road to be carried over or under the structure shall be specified by the Government in Schedule-B of the Concession Agreement. Where the arrangement is not specified, a detailed study shall be carried out by the Concessionaire to determine whether the Project Highway shall be carried over or under the structure. Generally, the road which is carrying a lower volume of traffic shall be constructed over the road which is carrying a greater volume of traffic. The arrangement shall be finalized in consultation with the Independent Engineer.

(iv) All features pertaining to structures for this type of grade separator shall be same as provided in Section-2 of this Manual.

3.3.2 *Geometric Standards for design of various elements*

The geometric design standards for various elements of this type of grade separators shall be as given in paras 3.2.1 and 3.2.2.

3.3.3 *Design of Structure*

For design of structure of grade-separated structures details given in Section 7 of this Manual shall be followed. Minimum length of viaduct required to be provided at various grade-separated structures shall be specified by the Government in Schedule-B of the Concession Agreement.

3.3.4 *Traffic Control Devices*

Details given in Paras 3.2.3 and 3.4.6 shall apply.

3.3.5 *Detailed Designs and Data for review by the IE*

The Concessionaire shall submit the details of the ground surveys, traffic data, traffic

forecast, design and drawings of the grade separated intersections and the structures, showing all safety features to the Independent Engineer for review and comments, if any.

3.4 Interchanges

3.4.1 *General*

(i) An interchange is a grade-separated intersection with connecting roadways (ramps) for turning traffic between highway approaches. Such an interchange will be necessary at all crossings of a highway, which is to be developed to completely access-controlled standards. An interchange may also be justified at locations where traffic on cross roads is heavy and when an at-grade intersection fails to handle the volume of turning, merging and diverting traffic leading to heavy delays and fatal and major accidents.

(ii) An interchange may be justified at the crossing of the Project Highway with another highway, and where the total traffic of all the arms of the intersection is in excess of 10,000 PCUs in peak hour.

(iii) The decision to provide interchange at such locations shall be taken by the Government and the requirement shall be clearly spelt out in Schedule B of the Concession Agreement, which shall also indicate specifications and traffic streams to be grade separated.

(iv) The detailed design and layout of the interchange shall conform to the broad parameters and requirements specified by the Government in Schedule B of the Concession Agreement. Based on detailed survey and investigations, the Concessionaire shall develop appropriate detailed drawings and designs and submit to the Independent Engineer for review and comments, if any.

3.4.2 *Types of Interchanges*

(i) Interchanges are generally described by the pattern of the various turning roadways or ramps, which determine their geometric configuration. The common geometric configurations of interchanges are the trumpet, diamond, cloverleaf, rotary and directional. Within each type of interchange, there can be several variations such as split diamond, partial cloverleaf, etc. depending on the ramp arrangements.

(ii) The type of interchange, the shape and pattern of the interchange ramps and

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loops and their designs shall be governed by factors such as the importance of the intersecting highway, the number of intersecting legs, the design volumes of through and turning traffic movements including their composition, the design speeds, available right-of-way and topography. The interchange site shall be studied in detail and alternative designs made, to determine the most suitable arrangement of structures and ramps satisfying the specified requirements.

3.4.3 *Geometric Design Standards for Interchange Elements*

The geometric design standards shall be as per IRC:92 appropriate for the design speed adopted for the Project Highway. The design speed for ramps shall not be less than 40 km per hour. The desirable values of various parameters given in IRC:92 shall be adopted unless there are severe site constraints.

3.4.4 *Design Traffic*

The traffic volume for the design of various elements of interchange including ramps shall be assessed up to the end of the Concession Period, or 20 years whichever is more taking into consideration the past trend, likely new development of land, socio-economic changes, etc. For remodeling of existing interchanges, facility shall be designed to cater for traffic projection for the next 20 years.

3.4.5 *Design of Structure*

For design of structure of grade-separated structures comprising of main structure and ramps, the details given in Section 7 of this Manual shall be followed. Minimum length of viaduct required to be provided at various grade-separated structures shall be specified by the Government in Schedule-B of the Concession Agreement.

3.4.6 *Traffic Control Devices*

Traffic signs (refer IRC:67) shall be provided at suitable locations to:

(i) serve as advance notice of the approaches to the interchange;

(ii) direct drivers into appropriate lanes for diverging/merging movements;

(iii) identify routes and directions;

(iv) provide other information of importance to the drivers; and

(v) show distances to destinations.

The specifications for road markings shall be as given in IRC:35 and as prescribed in Section 9.2 of this Manual.

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3.4.7 *Lighting*

Lighting requirement shall be as per Section 13.3 of this Manual. The top and underside of the grade separated structures and interchange area at the ground level upto 50 m beyond the point from where flaring of the main carriageway takes place shall be provided with lighting.

3.4.8 *Detailed Design and Data for review by the IE*

The Concessionaire shall submit the details of the ground surveys, traffic data, traffic forecast, design and drawings of the interchange showing all safety features to the Independent Engineer for review and comments, if any.

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Section 4

Road Embankment

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SECTION 4

ROAD EMBANKMENT

4.1 General

4.1.1 The design and construction of the road embankment and cuttings shall be carried out in accordance with the requirements, standards and specifications given in this Section. This Section also covers specifications for subgrade and earthen shoulders.

4.1.2 Efforts should be made to remove the inherent deficiencies in plan and profile of the existing road. It shall be ensured that the final centre line of the road and the road levels are fixed with great care duly considering all the relevant factors covering structural soundness, safety and functional requirements.

4.1.3 The existing road embankment shall be widened / modified to the specified cross-sectional details.

4.2 Road Embankment

4.2.1 The width of the embankment shall be in accordance with the cross-sectional details specified in Section-2 of the Manual.

4.2.2 The height of the embankment shall be based on the final road levels. The following principles shall be kept in view while fixing the road level:

(i) No section of the road is overtopped.

(ii) The bottom of subgrade is generally 1.0 m above the high flood level/high water table. However, in the case of existing old roads where it may be difficult to fulfil this criterion without needing reconstruction or raising in substantial length, the criteria may be relaxed depending on site conditions, ensuring that the bottom of subgrade is 0.6 m above High Flood Level (HFL). The HFL should be decided by intelligent inspections, local observations, enquiries and studying the past records. If raising of any section (s) of the existing road is required, the same shall be specified in Schedule B of the Concession Agreement.

4.2.3 Portions forming approaches to structures shall provide smooth vertical profile and fulfil the minimum free board requirement.

4.2.4 Deficiencies in the existing vertical profile of the road shall be corrected.

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4.2.5 Construction of embankment, subgrade, and earthen shoulders shall conform to the requirements of Clause 305 of the MOSRTH Specifications as a minimum requirement.

4.2.6 *Materials and Physical Requirements*

4.2.6.1 Sourcing of materials for embankment and subgrade construction, as well as compliance with environmental requirements in respect of excavation and borrow areas under the applicable laws shall be the sole responsibility of the Concessionaire.

4.2.6.2 Borrow pits shall not be located within the right of way or along the road. Clause 305.2.2 of MOSRTH Specifications shall apply.

4.2.6.3 The materials used in embankment, subgrade and earthen shoulders shall be soil, moorum, gravel, a mixture of these or any other material conforming to the requirements of Clause 305.2 of MOSRTH Specifications. Pond ash can also be used subject to requirement indicated in Para 4.2.16 of this Section.

4.2.6.4 The following types of materials shall be considered unsuitable for embankment construction and shall not be used:

(i) Materials from swamps, marshes and bogs;

(ii) Peat, log, stump and perishable material; any soil that is classified as OL, OI, OH in accordance with IS:1498;

(iii) Materials susceptible to spontaneous combustion;

(iv) Materials in frozen conditions;

(v) Clay having Liquid Limit (LL) exceeding 70 and Plasticity Index (PI) exceeding 45;

(vi) Materials with salt resulting in leaching in the embankment;

(vii) Expansive clays, 'Free Swelling Index' exceeding 50 per cent when tested as per IS:2720 (Part 40).

4.2.6.5 Fill material with a soluble sulphate content exceeding 1.9 gm of sulphate (expressed as SO_3) per litre when tested in accordance with BS:1377 Test 10, but using a 2:1 water/soil ratio shall not be deposited within 500 mm of concrete or other cement bound materials.

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4.2.6.6 Materials with a sulphate content (expressed as SO_3) exceeding 0.5 per cent by mass, when tested in accordance with BS:1377 Test 9, shall not be deposited within 500 mm of metallic items.

4.2.6.7 Expansive clays/black cotton soil shall not be used for subgrade construction.

4.2.6.8 Where expansive clay with acceptable Free Swelling Index value is used as a fill material, subgrade and top 500 mm portion of the embankment just below subgrade shall be non-expansive in nature.

4.2.6.9 The size of the coarse material in the mixture of earth shall not exceed 75mm when placed in the embankment and 50 mm when placed in the subgrade.

4.2.6.10 Only the materials satisfying the density requirements given in Table 4.1 shall be employed for the construction of the embankment and the subgrade.

Table 4.1 : Density of materials of embankment and subgrade

Type of Work	Maximum Dry Density with heavy Compaction – IS:2720 (Part 8)
Embankment upto 3 m height, not subjected to extensive flooding.	Not less than 15.2 kN/cu. m
Embankments exceeding 3 m height or embankments of any height subject to long periods of inundation.	Not less than 16.0 kN/cu. m
Subgrade and earthen shoulders/ verges/backfill.	Not less than 17.5 kN/cu. m

4.2.6.11 The density requirements specified in Table 4.1 shall not be applicable to light weight material e.g. pond ash.

4.2.6.12 The material to be used in subgrade shall satisfy the design California Bearing Ratio (CBR) at the specified density and moisture content.

4.2.6.13 The embankment and subgrade shall be compacted to satisfy the minimum compaction requirements given in Table 4.2.

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Table 4.2 : Compaction of embankment and subgrade

Type of Work/Material	Relative Compaction as percentage of max. laboratory dry density - IS:2720 (Part 8)
Subgrade and earthen shoulders	Not less than 97
Embankment	Not less than 95
Expansive Clays (of acceptable FSI) (a) Subgrade and 500 mm portion just below the subgrade. (b) Remaining portion of Embankment	 Not allowed Not less than 90

4.2.7 *Structural features and design of embankment*

4.2.7.1 Embankment shall be designed to ensure the stability of the roadway (refer IRC:75) and shall incorporate only those materials, which are suitable for embankment construction as per Para 4.2.6 of this Section.

4.2.7.2 The design of side slopes shall be governed by slope stability, bearing capacity and safety considerations.

4.2.7.3 Side slopes shall not be steeper than 2H:IV unless soil is retained by suitable soil retaining structures. The reinforced earth structure where provided, shall conform to the requirements of Section 7 of the Manual.

4.2.7.4 The type of retaining structure shall be aesthetically pleasing and compatible with the adjoining structures.

4.2.7.5 Where the embankment is to be supported on a weak stratum, it shall be necessary to carry out adequate soil testing and to specially design the embankment and also adopt appropriate remedial / ground improvement measures, in consultation with the Independent Engineer.

4.2.7.6 Where the embankment is more than 3 m height and fill material consists of heavy clay or any problematic soil, the embankment stability shall be analysed and ascertained for safe design.

4.2.7.7 High embankments (height 6 m or above) in all soils shall be designed from stability, bearing capacity and settlement considerations based on geotechnical and investigation data.

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4.2.7.8 For design of high embankments IRC:75 may be referred to.

4.2.7.9 The side slopes shall be protected against erosion by providing a suitable vegetative cover, kerb channel, chute, stone/cement concrete block pitching or any other suitable protection measures depending on the height of the embankment and susceptibility of soil to erosion. Drainage arrangement shall be provided as per Section 6 of this Manual.

4.2.7.10 Stone/cement concrete block pitching shall conform to Clause 2504 of the MOSRTH Specifications.

4.2.8 *Embankment Construction*

4.2.8.1 Embankment, subgrade and earthen shoulders shall be constructed in accordance with Clause 305.3 of the MOSRTH Specifications.

4.2.8.2 Any unsuitable material occurring in the embankment foundation shall be removed and replaced by acceptable fill material in accordance with Clause 305.3.4 of the MOSRTH Specifications.

4.2.8.3 Where construction of embankment and subgrade is required to be carried out under the special conditions such as given in paras 4.2.9 to 4.2.15, the earthwork shall be done in accordance with the procedure and requirements described in Clause 305.4 of the MOSRTH Specifications.

4.2.9 *Earthwork for widening existing road embankment*

Where an existing embankment / subgrade is to be widened and its slopes are steeper than 1V:4H, continuous horizontal benches each at least 300 mm wide shall be cut into the old slope for each lift of earthwork, for ensuring adequate bond with the fresh material to be added.

4.2.10 *Earthwork for embankment and subgrade to be placed against sloping ground*

Requirements of Clause 305.4.2 of MOSRTH Specifications shall apply.

4.2.11 *Earthwork over existing road surface*

Requirements of Clause 305.4.3 of MOSRTH Specifications shall apply.

4.2.12 *Embankment and subgrade around structures*

(i) The work shall be carried out in accordance with the requirements of Clause 305.4.4 of the MOSRTH Specifications.

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(ii) Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in Appendix 6 of IRC:78.

(iii) The filter medium shall conform to the requirements of Clause 2504 of MOSRTH Specifications.

4.2.13 *Construction of embankment on ground incapable of supporting construction equipment*

For construction of embankment on ground, which is not capable of supporting construction equipment, such as, marshy land, any of the methods given in Clause 305.4.5 of the MOSRTH Specifications may be used.

4.2.14 *Embankment construction under water*

Where construction of embankment is required to be done under water, only granular material or rock consisting of graded hard and durable particles with maximum size not exceeding 75 mm shall be used. The material shall be non-plastic with uniformity coefficient of not less than 10. For further details refer IRC:34.

4.2.15 *Earthwork for high embankment*

Where stage construction / controlled rate of filling is required for high embankments, the methodology together with details of necessary instrumentation and monitoring plan shall be communicated by the Concessionaire for review/comments, if any, of the Independent Engineer.

4.2.16 *Use of Pond Ash for Embankment Construction*

4.2.16.1 Where pond ash is used for embankment construction in pursuance of the instructions of the Ministry of Environment and Forests or otherwise, the embankment shall be designed and constructed in accordance with IRC:SP:58.

4.2.16.2 The thickness of soil cover shall not be less than 1 m for embankments upto 3 m high. For high embankments, the thickness of soil cover shall be increased as per design.

4.2.16.3 The side slopes of the embankment shall be protected against erosion by providing turfing or stone/cement concrete block pitching.

4.2.17 *Surface Finish and Quality Control of Works*

The surface finish and quality control of materials and works shall conform to the

requirements of Clauses 902 and 903 of MOSRTH Specifications and Para 5 of IRC:SP:58. (relevant to pond ash).

4.3 Roadway in Cutting

4.3.1 The width of the roadway in cutting shall be in accordance with the cross section details specified in Section 2 of this Manual.

4.3.2 The road level shall be fixed, keeping in view the following requirement:-

The difference between the bottom of subgrade and the highest water table is not less than 1.0 m. Exceptionally, where this requirement is not satisfied, drain shall be provided to lower down the water table.

4.3.3 *Soil Investigations for Cut Sections*

(i) Soil investigations shall be carried out to ascertain the type of cutting involved and in-situ soil conditions at the subgrade level. Reference may be made to IRC:SP:19.

(ii) The side slopes of cuttings shall be provided in accordance with the nature of the soil encountered. The slope shall be stable for the type of strata. Where required, benching including use of slope stability measures like pitching, breast walls, etc. shall be adopted to make the slopes stable and safe.

(iii) In the case of rock cutting, trial pits or boreholes shall be carried out at 30-50 m intervals to assess the type of rock.

4.3.4 Excavation for roadway in soil/rock shall be carried out in accordance with Clauses 301, 302 and 303 of MOSRTH Specifications, as relevant.

While executing excavation, adequate precautions against soil erosion, water pollution shall be taken as per Clause 306 of MOSRTH Specifications.

Appropriate drainage measures shall be taken to keep the site free of water in accordance with Clause 311 of MOSRTH Specifications.

No back filling shall be resorted to in order to obtain the required slopes.

Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or they do not give rise to recurrent slides after construction.

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In cut sections in hilly terrain, the problem of seepage flow is common. Where such conditions exist, necessary measures including provision of deep side drains to intercept the seepage flow and to avoid any damage to road and cut slopes shall be provided

4.3.5 *Excavation of road shoulders for widening of pavement*

For widening of existing pavements or providing paved shoulders, the existing shoulders shall be removed to their full width and to the requisite depth. Care shall be taken to see that no portion of the existing pavement designated for retention is loosened or disturbed.

4.3.6 *Preparation of cut formation*

(i) The cut formation, which serves as a subgrade, shall be prepared as per Clause 301.6 of MOSRTH Specifications.

(ii) Where the material in the subgrade has a density less than that specified in Table 4.1, the same shall be loosened to a depth of 500 mm and compacted in layers in accordance with the requirements of Clause 305 of MOSRTH Specifications.

(iii) Any unsuitable material encountered in the subgrade shall be removed and replaced with suitable material and compacted in accordance with Clause 305 of MOSRTH Specifications.

4.3.7 *Finishing Operations*

(i) All excavated surfaces shall be properly shaped and dressed.

(ii) No point on the completed slopes shall vary from the designated slopes by more than 150 mm (in case of soils) and 300 mm (in case of rocks) measured at right angle to the line of slope.

(iii) The finished cut formation shall satisfy the surface tolerances specified in Clause 902 of MOSRTH Specifications.

4.4 Soil Survey Investigations and Design Report

The Concessionaire shall carry out necessary soil surveys, and field and laboratory investigations for selecting appropriate borrow pits, identifying and treating problematic ground locations, if any, and for finalizing structural features and design of the

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embankment and cut sections and establishing improved ground properties. The soil survey and investigations report and design report shall be submitted to the Independent Engineer for review and comments, if any.

4.4.1 *Soil Survey Investigations Report*

(i) Road Embankment

The report shall include:

(a) Soil investigations and tests in accordance with the requirements specified in IRC:SP:19 and shall be reported in the Proforma given in Table 1 of IRC:SP:19. In addition to this, all tests as per the requirements of MOSRTH Specifications shall be reported.

(b) In respect of high embankment, additional investigations and soil tests as per IRC:75 and Appendix 10 of IRC:SP:19.

(c) Information regarding the topography, high flood level, natural drainage conditions, highest sub-soil water level, and the nature and extent of inundation, if any.

(d) The characteristics of embankment foundation including the presence of any unsuitable/weak strata, marshy areas, water logged areas, etc.

(e) Along the alignment of the road, where unstable strata, soft material or poor subsoil conditions have been met with at the foundation level, the soil profile shall be drawn after determining through borings, the type of soil at different levels. The boring shall be at intervals of 100 to 200 m to a depth of 2 m or more below the existing ground as necessary. In the case of high embankments, the borings shall be taken down to a depth equal to twice the height of the embankment.

(f) Any particular construction problems of the area or other important features.

(g) Geotechnical properties of pond ash, covering parameters specified in Table 1 of IRC:SP:58 and Optimum Moisture Content (OMC)-dry density relationship for heavy compaction. This information shall be furnished, in case pond ash is used in embankment construction.

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(ii) Cut Sections

The report shall include soil investigations and tests in accordance with the requirements specified in IRC:SP:19 and information regarding depth of water table, seepage flow, presence of any weak, unstable or problematic strata.

4.4.2 *Design Report*

The Concessionaire shall furnish the design report including the following to the Independent Engineer for review and comments, if any.

(i) Road Embankment

(a) The detailed design of the embankment, remedial / ground improvement treatment where required, and construction methodology for high embankments.

(b) Design of retaining walls / reinforced earth structures.

(c) Design of protection measures for embankment slope and drainage arrangement.

(d) Design of pond ash embankment in case use of pond ash is proposed.

(e) Any additional information relevant to the design of embankment.

(ii) Cut Section

(a) Type of cutting involved and proposed cut slopes.

(b) Design and details of erosion control, slope protection measures, etc.

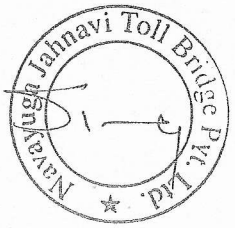
(c) Design and details of drainage arrangement for sub-soil and surface water.

(d) Any other additional information relevant to the design of cut slopes.

Section 5

Pavement Design





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SECTION 5

PAVEMENT DESIGN

5.1 General

5.1.1 The design and construction of new pavement sections, and of strengthening measures (overlay) for the existing pavement shall be carried out in accordance with the criteria, standards and specifications given in this section. Where alternative specifications or materials are proposed to bring in innovation in design etc., provisions of Para 1.12 of this Manual shall apply.

5.1.2 The design of new pavement sections or strengthening of existing pavements shall take into account all relevant factors for assuring reliable performance and shall also satisfy the specified minimum performance requirements.

5.1.3 The pavement condition and other data furnished by the Government are based on preliminary investigations only. The Concessionaire shall undertake the necessary soil, material and pavement investigations and traffic volume and axle load studies in accordance with the good industry practice for preparing detailed designs.

5.1.4 The materials, mixes and construction practice shall meet the requirements prescribed in the MOSRTH / IRC Specifications, unless specified otherwise.

5.1.5 Where problematic conditions such as expansive soils, swamps or marshes, flooding, poor drainage, frost susceptible areas etc. are found to exist, adequate measures shall be adopted to deal with such site conditions.

5.2 Type of Pavement

5.2.1 The type of pavement structure for new construction shall be flexible pavement unless specified otherwise.

5.2.2 Strengthening of the existing flexible pavement will be carried out by providing appropriate bituminous overlay, unless specified otherwise.

5.2.3 The Government may require provision of cement concrete pavement on the new carriageway and/or replacement of existing pavement depending upon specific site conditions. Such a requirement shall be specified in Schedule-B of the Concession Agreement and indicated as a deviation in Schedule-D of the Concession Agreement. The minimum design, construction, performance and maintenance requirements for

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cement concrete pavements shall be specified by the Government and Schedule-K of the Concession Agreement shall be modified accordingly.

5.3 Method of Design - New Pavements

5.3.1 *Method of Design of Flexible Pavement*

The new pavement shall be designed in accordance with the IRC:37 Guidelines for the Design of Flexible Pavements or any other international standard method/ guidelines for pavement design. The overall pavement structural composition shall not be less than the requirements specified in IRC:37.

However, where use of alternative standards, specifications or materials is proposed with modification in the pavement thickness and composition with respect to IRC:37, such proposals shall be supported with relevant standards, analytical design, material properties and performance reports; and provisions of Para 1.12 of this Manual shall apply.

5.3.2 *Method of Design of Rigid Pavement*

Rigid pavement shall be designed in accordance with the method prescribed in IRC:58.

5.4 Design Requirements for New Pavement Sections

5.4.1 *Flexible Pavement - Design Period and Strategy*

(i) Flexible pavement shall be designed for a minimum design period of 15 years or operation period whichever is more. Stage construction shall be permissible subject to the requirements specified in para (ii) below:

(ii) Alternative strategies or combination of initial design, strengthening and maintenance can be developed by the Concessionaire to provide the specified level of pavement performance over the operation period subject to satisfying the following minimum design requirements.

(a) The thickness of sub-base and base of pavement section are designed for a minimum design period of 15 years and the initial bituminous surfacing for a minimum design period of 10 years.

(b) The pavement shall be strengthened by bituminous overlay as and when required to extend the pavement life to full operation period. The thickness of bituminous overlay shall be determined on the basis of IRC:81.

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5.4.2 *Rigid Pavement - Design Period and Strategy*

(i) Rigid pavement shall be designed for a minimum design period of 30 years. The stage construction shall not be permitted in case of rigid pavement.

(ii) The cement concrete pavement shall be designed as per para 5.3.2 based on a flexural strength of 4.5 MPa. The Pavement Quality Concrete (PQC) shall rest over Dry Lean Concrete (DLC) subbase of 150 mm thickness.

(iii) The DLC will be M10 concrete (7 days' strength) as prescribed in IRC:SP:49. DLC will be extending beyond the PQC (including that in shoulder, if any) by 1 m on either side.

(iv) A properly designed drainage layer Granular Sub Base (GSB) of 150-200 mm thickness shall be provided. It shall be designed to obtain a drainage coefficient of 20 m per day.

5.4.3 *Pavement Performance Requirements*

(i) The pavement structure shall be capable of giving the specified performance over the entire operation period.

(ii) The new pavement surface shall satisfy the following standards, subject to tolerances provided in Clause 902 of MOSRTH Specifications.

(a)	Roughness In each lane measured by calibrated BI	Not more than 1800 mm/km for each lane in a km length
(b)	Rutting In wheel path measured by 3 m Straight Edge.	Nil
(c)	Cracking or any other distress	Nil

(iii) During the operation period, the pavement surface roughness or any structural or functional distress shall not exceed the values specified in Schedule-K of the Concession Agreement. Generally the pavement condition in terms of roughness, cracking and rutting should not deteriorate to the maximum values specified in Schedule-K for rectification, earlier than 5 years from the original level / from the year of rectification. Any treatment in the form of renewal/ overlay carried out or required to restore/correct/improve the riding quality or any distress shall be of such thickness and specification that will restore the riding quality to roughness not exceeding 1800 mm/km.

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(iv) During the operation and maintenance period, the pavement strength shall be evaluated periodically through deflection measurements (Refer to para 5.8 (iii) of this Section) and the stretches exhibiting any structural deficiency shall be rectified.

5.5 Design Traffic

5.5.1 The design traffic shall be estimated in terms of cumulative number of standard axles (8160 kg) to be carried by the pavement during the design period.

5.5.2 Estimate of the initial daily average traffic flow shall be based on at least 7 days, 24 hr classified traffic counts. IRC:9 may be used as guidance for carrying out the traffic census.

5.5.3 Any likely change in traffic due to proposed four laning of the facility and/or future development plans, land use, shall be duly considered in estimating the design traffic.

5.5.4 Traffic growth rate shall be established for each category of commercial vehicles to be considered for design of pavement. For traffic projections, the procedure outlined in IRC:108 may be followed. The Concessionaire shall adopt a realistic value of the rate of traffic growth, provided that annual rate of growth of commercial vehicles shall not be adopted less than 5 per cent.

5.5.5 Axle load surveys shall be carried out to estimate the Vehicle Damage Factor (VDF) for each category of commercial vehicles. The axle load equivalency factors recommended in Annexure-2 of IRC:37 shall be used for converting different axle load repetitions into equivalent standard axle load repetitions. VDF values so determined shall be used for estimating design traffic in terms of standard axles. Provided that if the Concessionaire envisages the possibility of controlling the severity and incidence of overloading with better enforcement of legal load limits as also of increase in the proportion of Multi Axle Vehicles over the years; it may, at its own risk and cost adopt a lower VDF value than that determined on the basis of the Axle load spectrum survey.

5.5.6 Lane distribution factors given in IRC:37 shall be adopted.

5.5.7 For rigid pavement, Equivalent Damage Ratio (EDR) shall be adopted as given in IRC:58.

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5.6 Subgrade

The subgrade, whether in cut or fill, shall meet the following requirements:

(i) Subgrade material shall conform to the requirements laid down in Section 4. Expansive clays and other unsuitable soils shall not be used for subgrade construction. The material used in subgrade shall have maximum dry density of not less than 17.5 kN/cum.

(ii) The thickness of subgrade shall not be less than 500 mm.

(iii) The subgrade shall be compacted to at least 97% of the maximum dry density achieved with heavy compaction in accordance with IS:2720 (Part 8).

(iv) The soaked CBR value of remoulded subgrade soil samples at the specified dry density and moisture content shall not be less than 7% (average of at least 3 specimens), unless specified otherwise.

5.7 Pavement Components and Materials

(i) The pavement construction materials for sub-base, base and bituminous surfacing shall conform to the requirements prescribed herein and MOSRTH/ IRC Specifications, unless specified otherwise.

(ii) Where several materials will adequately serve as component within the pavement structure, such as a sub-base or a base course, the Concessionaire shall have the option of using any of the materials/specifications. It is important that good engineering practice and product quality requirements are not abandoned or compromised for the sake of effecting cost reduction.

(iii) If any material, which is not specified here or not included in the MOSRTH/ IRC/PWD Specifications, is proposed to be used, the proposal supported with authentic international standards and practice shall be communicated to the Independent Engineer for review and comments, if any.

5.7.1 *Sub-base*

(i) Sub-base shall be any of the following types conforming to MOSRTH/IRC Specifications.

(a) Granular sub-base conforming to Clause 401 of MOSRTH Specifications. The sub-base material shall have minimum soaked CBR value of 30%.

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(b) Cement treated soil sub-base conforming to Clause 403 of MOSRTH Specifications.

(c) Water Bound Macadam (WBM) conforming to IRC:19. This shall be restricted to service roads only, if so provided.

(d) Wet Mix Macadam (WMM) conforming to IRC:109.

(ii) Frost susceptible materials shall not be used in the sub-base.

(iii) From pavement drainage considerations, the granular sub-base should be extended over the entire formation width. The granular sub-base shall be of proper design and grading to perform satisfactorily as the drainage layer as per IRC:37. In cuttings, granular sub-base shall be at least 300 mm above the invert level of the drain.

(iv) Where modification of granular sub-base grading given in Clause 401 of MOSRTH Specifications is considered necessary to improve its drainage properties, the PI, compaction and strength criteria shall be fully satisfied besides drainage efficacy. Further where required, depending upon the gradation of the sub-base material and sub-grade soil, an appropriate filter layer of soil/ aggregate or geotextile shall be incorporated between the sub-base and the sub-grade to prevent clogging of sub-base. The proposal shall be communicated to the Independent Engineer for review and comments, if any.

5.7.2 *Base Course*

(i) Base course material and construction shall be any of the following types conforming to MOSRTH/IRC Specifications.

(a) Wet Mix Macadam Base

(b) Crusher Run Macadam Base conforming to Clause 410 of MOSRTH Specifications.

(c) Bituminous base materials like Bituminous Macadam (Clause 504), Dense Bituminous Macadam (DBM) (Clause 507) as per MOSRTH Specifications.

(ii) The granular base shall be primed with a prime coat of low viscosity liquid bituminous material of appropriate type and specification conforming to MOSRTH Specifications/BIS Specifications, preparatory to the superimposition of bituminous treatment.

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5.7.3 *Bituminous Surfacing (Binder Course and Wearing Course)*

(i) Bituminous surfacing materials and thicknesses shall satisfy the requirements of IRC:37 "Guidelines for the Design of Flexible Pavements". The suggested surfacing materials and thickness are desirable minimum to meet functional and structural requirements.

(ii) The specifications for the bituminous materials and mixes shall satisfy the specified minimum requirements as per the relevant MOSRTH Specifications. The design of mixes shall be done by Marshall method or Superpave design mix procedure.

(iii) For the design of mixes use of refusal density criterion can be adopted.

(iv) The grade of bitumen/modified bitumen shall be selected by the Concessionaire keeping in view the traffic, temperature, rainfall and other environmental conditions and site requirements.

(v) Use of high performance bitumen mixes for binder course / wearing course can be made by the Concessionaire. In case the proposed mixes are not covered by the MOSRTH / IRC Specifications, the proposal supported with authentic international standards and practice will be submitted to the Independent Engineer for review and comments, if any.

5.8 Performance Evaluation

(i) On completion, pavement performance evaluation shall be done by the Independent Engineer in accordance with the provisions of the Concession Agreement and tests based on good industry practice.

(ii) Roughness in each lane for full length shall be measured by calibrated BI periodically.

(iii) The structural evaluation of the pavement shall be made by taking deflection measurements every 5 years in accordance with the procedure given in IRC:81, unless needed earlier for stretches exhibiting severe distress during the operation and maintenance period.

5.9 Strengthening of Existing Pavements

5.9.1 A structural overlay shall be implemented to strengthen and extend the service life

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of the existing pavement. The overlay shall be implemented in combination with

(i) Pre-overlay repair, pothole filling, crack sealing, rectification of profile by providing a suitable profile correcting course and/or

(ii) Recycling.

5.9.2 Before strengthening treatment is prescribed, a detailed pavement condition survey and evaluation shall be carried out in accordance with IRC:81 to determine

(i) The extent of distress and nature of deficiency in the existing pavement structure, and

(ii) Whether any special treatments e.g. provision for remedying reflection cracking, pavement internal drainage, sub-grade improvement/reconstruction, or rectification of any other deficiencies are warranted.

5.9.3 Necessary corrective measures to treat the identified deficiency vide Para 5.9.2 above shall be taken along with strengthening of the pavement.

5.9.4 Any stretches in which the pavement is damaged/deteriorated to such an extent that the use of Benkelman Beam method may not result in a realistic assessment of the strengthening treatment, pavement in such stretches shall be designed using the design procedure for new pavements or employing any other pavement evaluation techniques like Falling Weight Deflectometer (FWD) etc.

5.9.5 Where an existing pavement is built over an untreated expansive/black cotton soil subgrade, its improvement/strengthening shall be treated separately. Such stretches shall require reconstruction with provision of necessary measures such as replacement/ treatment of expansive subgrade, drainage, etc. as per the prescribed specifications and IRC:37; and shall be designed as new pavement. Stretches to be reconstructed, whether due to expansive subgrade or due to having grossly deteriorated, etc. shall be specified in Schedule-B of the Concession Agreement.

5.9.6 No granular layer shall be provided over an existing bituminous surfacing. Situations may arise where it is envisaged to strengthen grossly deficient existing road with a granular layer in addition to the bituminous overlay, or where for camber and/or grade correction substantial thickness of profile corrective course is needed. In such cases, the existing bituminous surfacing shall be completely removed by scarifying / milling and then the pavement built up with the granular layer(s) and bituminous overlay. The thickness and composition of bituminous surfacing (Binder course and Wearing course) over the granular layer shall conform to IRC:37.

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5.9.7 *Design of Strengthening Treatment (Overlay)*

(i) The thickness of the bituminous overlay shall be determined on the basis of Benkelman Beam Deflection Technique and the design traffic as per the procedure outlined in IRC:81 "Guidelines for Strengthening of Flexible Road Pavement using Benkelman Beam Deflection Technique (First Revision)".

(ii) The design period will be the same as specified for the new pavement sections vide Para 5.4.1 of this Section. In case stage construction is adopted, the initial strengthening shall be done for a minimum design period of 8 years. Subsequent strengthening to extend the pavement to full operation period shall be implemented at the end of initial design period or earlier, in case of any structural distress in the pavement or if the surface roughness exceeds the value specified in Schedule K of the Concession Agreement.

(iii) The design traffic will be estimated as per the procedure described for new pavement.

(iv) The pavement shall be strengthened by providing a bituminous overlay of a dense graded bituminous mix.

(v) The thickness of bituminous overlay for pavement strengthening shall not be less than 50 mm.

5.9.8 *Bituminous Mix for Overlay*

(i) The specifications for the bituminous mixes for the overlay shall be as specified for bituminous surfacing for new pavement sections vide Para 5.7.3 of this Section.

(ii) Design of recycled mix where provided shall conform to the requirements of Clause 517 of MOSRTH Specifications.

5.9.9 *Pavement Performance Requirements and Evaluation*

(i) The strengthened pavement shall satisfy the minimum standard and maintenance requirements specified for new pavement sections in Para 5.4.3 of this Section and Schedule-K of the Concession Agreement.

(ii) The performance measurement and evaluation will be done as per Para 5.8 of this Section.

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5.9.10 *Paved Shoulders*

(i) Paved shoulders shall be constructed, where specified.

(ii) The width and composition of paved shoulders shall be as specified in Section 2 of this Manual.

(iii) If the thickness of the existing paved shoulder, if any, is less than the thickness of the existing pavement, the paved shoulders shall be reconstructed to the pavement thickness in the adjoining carriageway.

(iv) In case the existing pavement and paved shoulders have the same composition and thickness, the overlay in the main carriageway pavement and on the paved shoulders shall be uniform in thickness and composition.

5.9.11 *Construction Choice*

(i) The Concessionaire can use any or in combination the following construction methods for pavement strengthening.

(a) Pavement strengthening as required, after correcting surface profile by milling or by providing a suitable leveling course of bituminous material. The leveling course shall not form part of the overlay thickness.

(b) Pavement strengthening as required, along with an inlay of recycled distressed layer using hot process.

(c) Partial depth reconstruction through recycling and application of appropriate overlay of required thickness to extend the pavement structural capacity to carry the design traffic and meet the specified minimum performance standards.

(ii) The Concessionaire will be free to evaluate alternative treatment combinations and choose the preferred solution which fulfills the design and performance requirements.

5.10 Construction, Workmanship and Quality of Work

All materials, construction operations, workmanship, and the surface finish and quality of completed construction for all pavement works including sub-grade, sub-base, base course, bituminous surface courses for both new pavement and

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strengthening of existing pavements, shoulders etc. shall conform to the specified requirements and comply with the provisions of Section 900 of the MOSRTH Specifications.

5.11 Premature Distress

Notwithstanding the minimum design, specifications and standards specified in the preceding paras for new pavements and strengthening of existing pavements, if the pavement shows premature distress in the form of cracking, rutting, patching, loss of camber or any other structural or functional distress, necessary remedial measures by strengthening/resurfacing/recycling shall be undertaken for conforming to the minimum requirements prescribed in Schedule-K of the Concession Agreement.

5.12 Detailed Design Report

The new pavement design and strengthening proposals formulated on the basis of the detailed investigations and studies shall be submitted to the Independent Engineer for review and comments, if any. The proposal shall be accompanied by Data Collection, Data Evaluation and Design Reports.

5.12.1 Data Collection Report

The data collection report shall include:

(i) Soil investigation data for new pavements as per Table 13.2 of IRC:SP:19. Report shall include OMC-dry density relationship with heavy compaction and soaked CBR values in addition to other data and information as per the prescribed Proforma.

(ii) Test values of aggregate for pavement courses as per Tables 13.3 and 13.4 of IRC:SP:19. All tests as per requirements of MOSRTH Specifications shall be reported in addition to the tests and information included in the above mentioned Tables.

(iii) Classified traffic counts in Proforma 1 of IRC:SP:19.

(iv) Axle load surveys and VDF values for each category of commercial vehicles as per Proforma 4 of IRC:SP:19.

(v) Estimation of traffic growth and traffic projections for pavement design.

(vi) Pavement condition data in the Proforma given in Table 2 of IRC:81.

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(vii) Pavement roughness data measured by Calibrated Bump Integrator as per IRC:SP:16.

(viii) Pavement Deflection Data measured by Benkelman Beam as per the procedure detailed in IRC:81. Pavement deflection data shall be recorded in the prescribed Proforma vide Table 3 of IRC:81. The deflection data shall be accompanied with the characteristics of the sub-grade soil covering type of sub-grade soil, field moisture content (at the time of deflection survey), average annual rainfall in the area, and pavement temperature at the time of deflection survey.

(ix) Any other relevant information required by the Independent Engineer for review and comments, if any.

5.12.2 *Data Evaluation Report*

The report shall inter alia cover:

(i) Data evaluated - soil characteristics and subgrade strength, pavement distress, pavement deflection, riding quality, skid resistance, drainage aspects, etc.

(ii) Pavement deficiencies, drainage and constraints.

(iii) Any other relevant details.

5.12.3 *Design Report*

The Concessionaire shall furnish the detailed design of the preferred solution along with any special treatment proposed for adoption. Any departures from the specifications stated herein shall be supported with authentic standards and specifications and accepted practice.

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Section 6

Highway Drainage

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SECTION 6

HIGHWAY DRAINAGE

6.1 General

6.1.1 The design and construction of surface and subsurface drains for highway drainage shall be carried out in accordance with the requirements of this Section.

6.1.2 Efficient drainage system shall be provided for the entire Project Highway including structures and facilities.

6.1.3 For quick disposal of precipitation on the road surface, the carriageway, shoulders and median shall have the requisite camber/crossfall and longitudinal gradient as per the values specified in Section 2 of this Manual.

6.1.4 The natural drainage of the area shall not be disturbed.

6.1.5 The design of drains shall be carried out in accordance with IRC:SP:42-1994 and IRC:SP:50.

6.1.6 Construction of surface and subsurface drains shall be carried out in accordance with the requirements of Clause 309 of the MOSRTH Specifications.

6.1.7 Efficient drainage arrangement for road sections in cuttings and at underpasses shall be made. Where it is not possible to drain out the water using gravity flow, necessary arrangement for pumping shall be made.

6.2 Surface Drainage

6.2.1 The water from road and adjacent areas shall be intercepted and carried through road side drains to natural outfalls.

6.2.2 The drains shall have sufficient capacity to carry peak run-off without overflowing.

6.2.3 The selection of type of roadside drains shall be based on the magnitude and duration of flow. The roadside drains shall be designed on the principles of flow in open channel.

6.2.4 The estimation of design discharge (peak run off) and design of drain sections shall be made in accordance with the procedure given in IRC:SP:42.

6.2.5 The open drains shall be located sufficiently away from the toe of embankment. When

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the drain is unlined, it shall be beyond 4H:IV imaginary line drawn from the edge of the roadway.

6.2.6 The road side drains shall not pose any danger to traffic, slopes of cuttings, embankment, pavement or structures.

6.2.7 As far as possible, longitudinal slope shall not be less than 0.5 percent for lined drains and 1.0 percent for unlined drains.

6.2.8 The side slopes of the unlined drains shall be as flat as possible and shall not be steeper than 2H:IV.

6.2.9 The drains shall be provided with CC lining in the following situations:

(i) When due to space constraint, the drains are located near the toe of the embankment or near structures.

(ii) Drains located in paved areas.

(iii) Flow velocity is more than 0.3 m to 1 m/s in silt and sand; and more than 1.5 m/s in stiff clay.

6.2.10 In built-up areas, covered or piped drains, with manholes at suitable intervals to desilt the pipes, shall be provided.

6.3 Median Drainage

6.3.1 Proper arrangement for drainage of median shall be provided. The median drain should have adequate longitudinal slope to the nearest culvert to drain off transversely.

6.3.2 Earthen surface in the median shall not be sloped towards carriageway to drain on the pavement, to avoid washed away soil getting deposited on the pavement making it slippery and accident prone.

6.3.3 In case the carriageway is sloping towards unkerbed median (wider than 5 m), provision of a central swale shall be made for drainage of the median. The swale shall slope longitudinally for drainage and water is intercepted by inlets at intervals and discharged through transverse drains into outlet channel.

6.3.4 Turfed/paved median of upto 5 m width with kerbs could be crowned for drainage across the pavement.

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6.3.5 In superelevated sections, proper arrangement for drainage of raised carriageway and median shall be made without allowing water to drain on the other carriageway.

6.4 Drainage of High Embankment

6.4.1 In high embankment and approaches to bridges, proper arrangement for drainage of carriageway shall be made in order to ensure that no damage is caused to pavement, shoulders and embankment slopes.

6.4.2 Drainage arrangement may include provision of kerb channel at the edges of the roadway to channelise the water, and Cement Concrete (CC) lined chutes along the slopes at designed intervals to discharge the water into side channels at the bottom.

6.4.3 The chute drains and drains at toe of the embankment shall be of Plain Cement Concrete (M 15 grade), over proper bedding.

6.5 Catch Water Drains

6.5.1 Suitable catch water drains shall be provided on the hill slope above a cutting to collect and remove surface water run-off from upper reaches. These drains shall be of trapezoidal shape and stone lined and cement pointed.

6.5.2 The catch water drains shall be designed to carry the intercepted water to the nearest culvert or natural drainage channel.

6.5.3 It shall be ensured that the catch water drains are provided in stable hill slopes outside the periphery of slide/unstable areas.

6.5.4 Where required, lined chutes shall be provided to lead the discharge to the catch pit of culvert or to a natural drainage channel.

6.6 Sub-surface Drains

6.6.1 The sub-surface drainage shall be provided

(i) for lowering the level of water table for drainage of sub-grade

(ii) to intercept or drain out free water in cut slopes

(iii) for drainage of pervious subbase in situations where it may not be practicable to extend the subbase across the shoulder.

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6.6.2 Sub-surface drains shall not be used for surface drainage.

6.6.3 The sub-surface drains shall be:

(i) Close jointed perforated pipes or open jointed unperforated pipes in trenches with backfill material around pipes.

(ii) Aggregate drains consisting of free draining material in the trench without any pipe.

6.6.4 Perforated pipes and unperforated pipes shall meet the requirements of Clause 309.2 of the MOSRTH Specifications.

6.6.5 The internal diameter of the pipe shall not be less than 150 mm.

6.6.6 The sub-surface drains shall be located not less than 0.5 m below the sub grade.

6.6.7 *Backfill material*

(i) Backfill material shall be free draining sand, gravel or crushed stone designed on inverted filter criteria for filtration and permeability, or of an appropriate grading conforming to the requirements of Table 300.3 of the MOSRTH Specifications.

(ii) Thickness of backfill material around the pipe shall not be less than 150 mm. The minimum thickness of material above the top of the pipe shall be 300 mm.

6.6.8 Sub-surface drains not located below the road pavement shall be sealed at the top.

6.6.9 *Use of Geo-textile*

(i) The sub-surface drains may be designed using appropriate geotextile to serve the functions of filteration and separation.

(ii) The sub-surface drains can be provided with geotextile either along the trench or around the pipe or both.

(iii) The geotextile shall satisfy the requirements of Clause 702 of the MOSRTH Specifications.

6.6.10 Trench excavation, laying of pipe, backfilling, and use of geosynthetics shall conform to the requirements of Clause 309.3.3, 309.3.4 and 309.3.5 of the MOSRTH Specifications.

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6.6.11 The drain outlet shall be a free outlet and shall be prepared as per Clause 309.3.6 of the MOSRTH Specifications.

6.6.12 *Aggregate drains*

(i) The trench for aggregate drain shall be of minimum 300 mm width and cut to a depth to expose the granular pavement courses to be drained.

(ii) Aggregate for the drain shall be gravel, stone aggregate or slag of grading as per Table 8 of IRC:SP:42.

(iii) The aggregate drain shall be provided with a geo-textile wrap to act as filteration and separation layer.

6.6.13 Design of subsoil drainage shall be based on a rational basis. Reference may be made to IRC:SP:42

6.7 Internal Drainage of Pavement Structure

(i) Boxed type construction in which pavement is housed in earthen shoulders shall not be provided.

(ii) The sub-base shall be extended across the shoulders for efficient drainage of pavement.

(iii) The granular sub-base shall be of proper design and grading to perform satisfactorily as a drainage layer. The drainage layer shall not have material finer than 75 micron size.

(iv) A suitable filter of granular material or geotextile to act as filtration and separation layer shall be incorporated between the subgrade and sub-base to prevent clogging. Reference may be made to Section 5 of this Manual.

6.8 Surveys, Investigations and Design Report

The Concessionaire shall carry out proper surveys and investigations for detailed design of the drainage system. The proposal for drainage system supported with survey investigation report and detailed design report shall be submitted to the Independent Engineer for review and comments, if any.

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6.8.1 *Survey and Investigations - Drainage Studies*

The survey and investigation and drainage studies shall include:

(i) Alignment plan, longitudinal and cross sections, contour map.

(ii) Hydrological data

Drainage area, water shed delineation, direction of flow, location of outfalls, existing surface drains, ground surface condition, rainfall, flood frequency, etc.

(iii) Data for hydraulic design of drains.

(iv) Geo-technical investigations for sub surface strata, level of water table, seepage flow etc.

(v) Identification of areas requiring sub-base drainage.

(vi) Any other relevant information

IRC:SP:19, IRC:SP:42, IRC:SP:48 and IRC:SP:50 may be referred to.

6.8.2 *Design Report*

The design report shall include:

(i) Estimation of design discharge.

(ii) Design of surface drains.

(iii) Design of sub-surface drains

(iv) Drainage arrangement plan along with a strip chart

(v) Specifications of drains

(vi) Any additional information as required by the IE for review of the drainage system.

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Section 7

Design of Structures

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SECTION 7

DESIGN OF STRUCTURES

7.1 General

(i) All bridges shall have independent superstructure for each direction of travel. Culverts may have single or independent superstructure.

(ii) All bridges shall be high level bridges unless specified otherwise in the Concession Agreement.

(iii) All bridges shall be designed in accordance with the relevant Codes, Standards and Specifications of the IRC.

(iv) The width of median in the culvert and bridge portion shall, as far as possible, be kept same as that in the approaches. In case width of median is different from that of approach section due to site constraints, suitable transition shall be provided near approaches for guiding vehicular traffic.

(v) The median in the portion of structures shall be treated as below:

(a) The pipe culverts shall have the same median width as in the approaches. A suitably designed catch pit shall be provided to collect and carry discharge from median drain.

(b) For bridges the median shall be open to sky. The safety barrier on the median side shall be provided at a clear distance of 0.5 m from the edge of carriageway.

(vi) Suitable provision shall be made for retaining the earth in the median portion either by extending the abutment wall or constructing a new retaining wall. The abutment wall shall have provision for taking the discharge from the median. Care shall also be taken to merge the wing wall/return wall and flooring of the old bridge with those of the new bridge.

(vii) Any utility service to be carried by the structures shall be specified in Schedule B of the Concession Agreement.

7.2 Design Loads and Stresses

(i) The design loads and stresses shall be as per IRC:6 appropriate for the width of carriageway, velocity of stream, location, altitude, etc.

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(ii) All new structures shall be designed in such a way that the footpath portion can be used as carriageway when widening to 3 lanes is taken up. The structure shall be checked for the condition when footpath is used as carriageway. The footpath portion may be provided at the same level as the bridge carriageway and separated by crash barrier in non-urban areas. In built-up areas, raised footpaths shall be provided.

(iii) In Seismic Zones IV & V, necessary precautions against dislodgement of superstructure shall be taken as per Clause 222 of IRC:6.

(iv) All the components of structures shall be designed for a service life of 100 years except appurtenances like crash barriers, wearing surface and rubberized components in expansion joints and elastomeric bearings. All the requirements to achieve durability and serviceability shall be implemented.

(v) For bridges in marine environment, special precautions shall be taken as specified in Schedule-B of the Concession Agreement.

7.3 Width of Structures

Width of the culverts and bridges shall be adopted as below:

(i) New culverts

Overall width of all new culverts shall be equal to roadway width of the approaches. The outer most face of railing/parapet shall be in line with the outer most shoulder edge. Typical cross section of the new culverts for a 4-lane project highway is given in Fig. 7.1.

(ii) New Bridges

(a) The overall width of new bridges proposed to be of solid slab type superstructure with open foundation or box type structure shall be equal to roadway width of the approaches. The outer most face of railing/ parapet shall be in line with the outer most shoulder edge The median side inner edge of the safety barrier/kerb on the bridge and the approaches shall also be in the same line. Typical cross sections of such type of new bridges with and without footpaths for a 4-lane project highway are given in Fig 7.2 A and 7.2 B respectively.

(b) The overall width of new bridges proposed with T-beam/box type

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superstructure with well/pile foundation shall be 15 m to eventually cater for 3-lane traffic. The median side inner edge of the safety barrier/kerb on the bridge and the approaches shall also be in the same line. Typical cross sections of such type of new bridges for both sides traffic with and without footpaths for a 4-lane project highway are given in Fig 7.3 A and 7.3 B respectively.

(iii) Existing culverts

(a) All culverts which are structurally distressed shall be reconstructed as new structures of width as per Sub Para 7.3 (i) of this Section.

(b) All existing culverts which are not to be reconstructed shall be widened equal to the roadway width of the approaches.

(c) The culverts and Hume pipe structures shall be widened so as to make the deck width same as specified in Sub Para 7.3 (i) of this Section. If the width of additional widening is less than 1.0 m, the widening of the structure may be dispensed with and traffic shall be guided with the help of crash barriers in a transition of 1 in 20 on either side approaches.

(d) List of culverts to be reconstructed and/or widened shall be specified in Schedule-B of the Concession Agreement.

(iv) Existing bridges

(a) All bridges which are structurally distressed shall be reconstructed as new bridges of width as per Sub Para 7.3 (ii).

(b) The bridges having solid slab type superstructure with open foundation or box type structure shall be widened so as to make the deck width same as specified in Sub Para 7.3 (ii)(a) of this Section. If the width of additional widening is less than 1.0 m, the widening of the structure may be dispensed with and traffic shall be guided with the help of crash barriers in a transition of 1 in 20 on either side approaches.

(c) The bridges having 2-lane carriageway and T-beam/Box type superstructure with well/pile foundation may be retained and proper transition between approach and bridge shall be provided with the help of crash barriers. Typical cross sections at deck level for bridges with and without footpaths showing new bridge on one side and existing 2-lane bridge on the other side are given in Fig. 7.4 A and Fig. 7.4 B respectively.

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(d) The width of the new structures constructed on the other side of the existing bridge shall be as specified in Sub Para 7.3 (ii) of this Section.

(e) List of bridge structures to be reconstructed and/or widened shall be specified in Schedule-B of the Concession Agreement.

7.4 Structure Types

(i) Bridge superstructure may be of reinforced concrete, pre-stressed concrete or steel-concrete composite construction.

(ii) Wherever box girders are proposed for superstructure, the minimum clear depth inside the box shall be 1.50 m with suitable openings in the diaphragms and box to facilitate inspection. Haunches of minimum size of 300 mm (horizontal) and 150 mm (vertical) shall be provided at the extreme corners of the box section.

(iii) The bridge foundation and substructure shall be designed as per the relevant IRC Codes/MOSRTH Specifications.

(iv) Continuous bridges, precast, pre-tensioned girder bridges and segmental bridges may be adopted, where considered appropriate. The design of continuous bridges shall be governed by IRC:SP:66, that of segmental bridges by IRC:SP:65 and that of precast pre-tensioned girder bridges by IRC:SP:71.

(v) The following types of structures shall not be accepted.

(a) Drop in spans with halved joints (articulations)

(b) Trestle type frames for substructures

(vi) In case the Government wants construction of structures like cable stayed/ suspension bridge or with special techniques, it shall be specified in Schedule B of the Concession Agreement.

7.5 Hydrology

All the structures shall have adequate waterway, which shall in any case be not less than that of existing bridge. The design discharge shall be evaluated for flood of 100-year return period.

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7.6 Sub-Surface Investigations

(i) The Concessionaire shall carry out independent subsurface investigations to establish the soil parameters required for detailed design of each foundation separately, if necessary, in accordance with relevant provisions of IRC:78 and MOSRTH Specifications.

(ii) For single span structures (bridges, overpasses, ROBs etc), bores shall be taken at each of the abutment locations. For structures having more than one span at least one bore shall be taken at each of the foundation locations.

7.7 Culverts and bridges using pipes

(i) Reinforced concrete pipes for culverts and bridge structures shall be of Non Pressure (NP) 4 type conforming to the requirements of IS:458. Minimum diameter of pipes for new pipe culverts shall be 1200 mm.

(ii) Existing culverts of diameter 900 mm and above, which are in sound condition and functioning satisfactorily, may be extended, using pipes of same diameter. All culverts having pipe diameter less than 900 mm shall be replaced with pipes of minimum 1200 mm diameter under both the carriageways. Minimum depth of earth cushion over pipe including road crust shall not be less than 1000 mm for new / reconstructed culverts. In case of existing sound and safe culverts, a minimum cushion of 600 mm may be acceptable. Floor protection shall be as specified in the relevant IRC Codes and Specifications.

7.8 Prestressing

(i) The Concessionaire shall engage specialized agency in consultation with the Independent Engineer for rendering total service contract with regard to the type of prestressing system he proposes to adopt. The Concessionaire shall also obtain the necessary certificates from the specialized agency engaged that the work has been carried out in accordance with the prescribed standards and specifications.

(ii) The Concessionaire shall submit fabrication drawings, detailing of prestressing cables, anchorages, couplers, chairs and supports, templates or forms for holding anchorage assemblies, stressing schedule etc for review and comments, if any, of the Independent Engineer at least 45 days prior to the scheduled date of commencement of the prestressing work.

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(iii) The sheathings shall be either of mild steel as per sub- clause 3.6.1 or of High Density Polyethylene (HDPE) as per sub-clause 3.6.2 of IRC:18. They shall comply with the requirements specified in Appendix-1A/1B of IRC:18 and the Concessionaire shall obtain a test certificate of confirmation from the manufacturer and furnish for review and comments, if any, of the Independent Engineer before bringing the proposed type of sheathing to the site.

(iv) In order to keep the number of joints in a duct to the minimum possible, the sheathings shall be as long as practical from handling and transportation considerations without getting damaged. Sheathing damaged during handling or transportation shall not be made good and shall not be used in the works.

(v) The joints of the mild steel sheathings shall be water tight complying with the requirements given in Appendix 2 of IRC:18.

(vi) Pull-in or push-in of the prestressing strands shall be mechanized.

(vii) Temporary tendons shall be inserted in the sheathing or the sheathing shall be stiffened by other suitable method during concreting. Cables shall be threaded after the concreting. Tendons shall not be placed until immediately prior to stressing. Tendons shall be handled with care to avoid damage or contamination, to either tendon or the sheathing. Any tendon damaged or contaminated shall be cleaned or replaced.

(viii) Prestressing accessories like jacks, anchorages, wedges, block plates, couplers, etc., being patented items, shall be obtained from only authorized manufacturers with in-house testing facilities.

(ix) All prestressing components and accessories shall be subject to acceptance tests and reviewed prior to their actual use on the works. Testing of anchorage-cable assemblies shall be carried out in consultation with the Independent Engineer. Coupler which connect two tendons to form a continuous tendon shall be tested in the same way as anchorages formed by mechanical means.

(x) Jacks and pumps shall be got calibrated from any accredited laboratory prior to use and then at intervals not exceeding three months.

(xi) Grouting shall be carried out as early as possible but not later than 10 days after stressing of a tendon. Grouting of post-tensioned cables shall be carried out as per the recommended practice specified in Appendix 5 of IRC:18.

(xii) Jointing of pre-cast units by application of cement mortar shall not be permitted.

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The Concessionaire shall submit adequate data in support of the proposed method of jointing the precast units for the review and comments, if any, of the IE. Whatever may be the method of jointing, the holes of prestressing steel shall be accurately made to meet one another in true alignment at ends and to ensure even transfer of compression from one unit to another.

(xiii) Care shall be taken to ensure that the jointing material does not enter the duct or press the sheath against the prestressing steel.

(xiv) Guidelines for use of external and unbonded prestressing tendons in bridge structures may be adopted as per IRC:SP:67, wherever considered appropriate.

7.9 Form Work

The Concessionaire shall be responsible for the safe, workable design and methodology for all temporary or permanent forms, staging and centering required for supporting and forming the concrete of shape, dimensions and surface finish as shown on the drawings (Refer IRC:87). Adequate foundation for the staging shall be ensured. Redundancy in support system shall also be ensured by providing diagonals and additional members. The following guidelines shall be adopted:

(i) Formwork shall be of steel, marine ply or laminated plywood.

(ii) Only such shuttering oil (release agent) shall be used, which permits easy removal of shutters without leaving stains or other marks on the surface of the concrete. Requirements given under Clause 3.5 of IRC:87 shall also be complied with.

(iii) In case of tubular staging of heights more than 10 m, special attention shall be paid to the structural adequacy of the system, efficacy of the connections (clamps etc), and foundations. Foundation blocks of adequate thickness in M15 cement concrete shall be provided under the base plates to prevent unequal settlements. All bent tubular props shall be straightened before re-use and the member with deviation from straightness more than 1 in 600 of its length shall not be re-used. For re-used props, suitable reduction in the permissible loads shall be made depending upon their condition in accordance with recommendations of the manufacturer and as reviewed by the IE.

(iv) In case of prestressed concrete members, the side forms shall be removed as early as possible and the soffit forms shall permit movement of member without

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restraint, when prestress is applied. Form supports and forms for cast-in-situ members shall not be removed until sufficient prestress has been applied to carry all anticipated loads during construction stage.

(v) Adequate foundations for formwork shall be ensured.

7.10 Foundations and Sub-structures

7.10.1 The design of foundations and sub-structures shall conform to IRC:78.

7.10.2 *Open Foundations*

The design of open foundations shall conform to IRC:78. Floor protection shall be provided as per Section 2500 of MOSRTH Specifications.

7.10.3 *Pile Foundations*

(i) The design of pile foundations shall be done as per specialized literature and IRC:78. The Concessionaire shall submit a method statement to the Independent Engineer for review and comments, if any. The method statement shall be supported by the following:-

(a) Bore-log details for each foundation;

(b) Design assumptions;

(c) Design calculations both for new pile or group of piles and for pile type;

(d) Type of piles- Bored cast-in-situ piles, driven piles and girder piles;

(e) Procedure adopted for installation of piles;

(f) Arrangements for load testing of piles;

(g) Format for reporting of tests results.

(ii) The Concessionaire shall submit the following information to the Independent Engineer for review and comments, if any, regarding proposed proprietary system of piling:

(a) General features of the process/system alongwith specifications and standards.

(b) Authenticated copies of license/agreement, if any;

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(c) Details of plant and equipment to be used along with the names of manufacturers and name of process/system;

(d) Details of projects where the process/system has been successfully used;

(e) Limitations, if any;

(f) Acceptance tests and criteria;

(g) Installation and maintenance procedure and schedule; and

(h) Performance warranty.

7.10.4 *Well Foundations*

(i) For conventional method of well sinking, the Concessionaire shall submit a method statement to the Independent Engineer for review and comments, if any, including the following:-

(a) Design calculations and drawings,

(b) Procedure for sinking and plugging of well,

(c) Format for reporting of test results

(ii) If proprietary system of well sinking like jack down method is proposed to be used, the Concessionaire shall submit relevant information to the Independent Engineer for review and comments, if any, covering inter-alia the following:

(a) General features of the system along with specifications and standards and justification for the thickness of steining proposed to be adopted;

(b) Authenticated copies of license/agreement, if any;

(c) Details of plant and equipment to be used along with the names of manufacturers and name of process/system;

(d) Details of projects where the process/system has been successfully used;

(e) Limitations, if any;

(f) Acceptance tests and criteria;

(g) Installation and maintenance procedure and schedule; and

(h) Performance warranty.

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(iii) The Concessionaire in his Methods Statement shall include the procedure for sinking by special methods, carrying out tests, if any, of wells including design criteria/calculations, drawings and formats for reporting test results.

7.11 Approach Slabs

Approach slabs shall be provided as per Clause 217 of IRC:6 and Section 2700 of MOSRTH Specifications.

7.12 Superstructures

7.12.1 The design of reinforced and pre-stressed concrete superstructures shall be as per IRC:21 and IRC:18 respectively. The design of steel and steel-concrete composite super structures shall conform to IRC:24 and IRC:22 respectively.

7.12.2 The Concessionaire shall submit Method Statement to the IE for review and comments, if any, indicating inter-alia the following:

(i) Sources of materials,

(ii) Design, erection and removal of formwork,

(iii) Layout of casting yard together with necessary details,

(iv) Production, transportation, laying, compacting and curing of concrete,

(v) Sequence of concreting in cast-in-situ construction, side shifting of girders, if applicable and placing of girders on the bearings,

(vi) Details of construction joints,

(vii) Prestressing system, if required,

(viii) Methodology and equipment for side shifting and launching of pre-cast girders,

(ix) Key personnel for execution and supervision,

(x) Testing and sampling procedure,

(xi) Equipment details.

7.13 Bearings

7.13.1 All bearings shall be easily accessible for inspection, maintenance and replacement.

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Design and specifications of bearings shall be as per IRC:83 (Part I, II & III). Spherical bearings shall conform to the requirements of BS:5400. The materials of bearings may however conform to the relevant BIS codes nearest to the specifications given in BS:5400. The drawing of bearings shall include the layout plan showing exact location on top of pier and abutment cap and the type of bearings i.e. fixed/free/ rotational) at each location along with notes for proper installation.

7.13.2 The Concessionaire shall procure bearings only from the manufacturers approved by MOSRTH.

7.13.3 The Concessionaire, shall submit detailed specifications, designs and drawings including installation drawings and maintenance manual incorporating the replacement procedure for review and comments, if any, by IE.

7.13.4 The Concessionaire shall obtain a complete Quality Assurance Programme (QAP) from the manufacturer for review and comments, if any, by the IE. The QAP shall give the full details of the process of quality control, raw material testing, various stages of manufacture, testing of bearing components as well as testing of complete bearing in conformity with relevant part of IRC:83, prior to the commencement of manufacture of the bearings.

7.13.5 In addition to the routine testing of the materials and bearings at the manufacturer's premises, the Concessionaire shall arrange testing of random samples of one per cent (minimum one number of each type) of bearings from independent agency approved by the IE. The bearings shall be selected by the IE and duly sealed in his presence for dispatch to the approved independent agency.

7.13.6 The Concessionaire shall submit a certificate of confirmation regarding quality control measures taken during manufacture of the bearings and the material conforming to the prescribed standards and specifications. Full lot of bearings of the sample found to have inferior specifications to those certified by the manufacturer or to have major discrepancy in material specifications or which fail to meet the acceptance criteria, shall be rejected.

7.14 Expansion Joints

(i) Structures shall have minimum number of expansion joints. This may be achieved by adopting longer spans, making the superstructure continuous or by adopting integrated structures. Expansion joints shall conform to IRC:SP:69. The Concessionaire shall furnish guarantee/proprietary indemnity bonds from

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the manufacturers/suppliers of expansion joints for a period of 10 years.

(ii) For existing bridges all expansion joints, which are older than 15 years shall be replaced.

7.15 Wearing Coat

(i) The wearing coat may be either bituminous concrete or cement concrete. For new bridges and culverts, the wearing coat shall have unidirectional camber and shall be in conformity with Section 2700 of MOSRTH Specifications. For existing bridges, the camber as existing may be retained.

(ii) Wearing coat older than 15 years or in damaged / distressed condition shall be replaced.

7.16 Reinforced Earth Retaining Structures

7.16.1 Reinforced earth retaining structures shall not be provided for height more than 6 m unless otherwise specified, and near water bodies. Such structures should be given special attention in design construction, ground improvement where necessary, maintenance and selection of System/System design. Local and global stability of the structure shall be ensured.

7.16.2 A qualified and experienced technical representative of the approved supplier/ manufacturer shall be present on site throughout during the casting and erection phases to ensure that the quality of the works executed by the Concessionaire is in accordance with good industry practice.

7.17 River Training and Protective Works

River training and protective works shall be provided wherever required for ensuring the safety of bridges and their approaches on either side. The special features and design of various types of river training and protective works shall be in accordance with IRC:89.

7.18 Safety Barriers

For bridges without foot paths, concrete crash barriers shall be provided at the edge of the carriageway on all new bridges.

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(ii) The type design for the crash barriers may be adopted as per IRC:5. The design loading for the crash barriers shall be as per Clause 209.7 of IRC:6.

(iii) For bridges with foot paths, pedestrian railing shall be provided on the outer side of footpath.

(iv) The railings of existing bridges shall be replaced by crash barriers, where specified in Schedule-B of Concession Agreement.

(v) Parapets/Railings of the existing bridges/culverts to be repaired/replaced shall be specified in Schedule-B of the Concession Agreement.

7.19 Rail-Road Bridges

7.19.1 Unless otherwise specified in Schedule B of the Concession Agreement, ROB/RUB to be provided shall be as specified in this Manual, with particular reference to the provision of Para 7.3 of this Section.

7.19.2 *Road Over Bridge (Road over Rail)*

(i) In case a two-lane bridge exists over the railway tracks, another two-lane bridge shall be constructed for one side traffic. The treatment to existing structure shall be given as in Sub-Para 7.3 (iv) of this Section.

(ii) In case the bridge is to be provided over an existing level crossing, twin 2-lane bridges shall be constructed with overall width as given in Sub-Para 7.3 (ii) of this Section. If the alignment of road at the existing railway crossing has skew angle more than 45 degrees, the alignment of road or of pier/abutment shall be suitably designed to reduce skew angle up to 45 degrees.

(iii) The horizontal and vertical clearances to be provided shall be as per requirement of the Railway authorities.

(iv) In general, the Railways require that in the railway boundary there is no solid embankment; provision is made for future expansion of railway line; provision of vertical clearances as per requirement of electric traction; and excavation for foundations sufficiently away so as not to endanger the safety of the running tracks.

(v) The Concessionaire shall be required to obtain approvals of all designs and drawings from the concerned Railway authorities. The design of structure shall be in accordance with relevant IRC Codes.

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(vi) The construction of ROB within the railway boundary shall be under the supervision of Railway authorities.

(vii) The approach gradient shall not be steeper than 1 in 40.

7.19.3 *Road under Bridges (Road under Railway line)*

(i) Full roadway width as in the approaches shall pass below the bridge structure allowing for widening of Project Highway to 6-lane at a later date. The service roads where provided shall be continued in the bridge portion also.

(ii) The vertical and lateral clearances shall be as per guidelines given in Section 2 of this Manual.

(iii) These structures shall be designed to carry railway loads. The Concessionaire shall be required to obtain approvals of all designs and drawings from the concerned Railway authorities. The design of structure shall be in accordance with relevant Railway codes.

(iv) The construction of RUB and its approaches shall be carried out in conformity with the terms specified in the approval granted by the Railway authorities.

7.20 Grade Separated Road Structures

(i) The location and type of grade separated structures to be provided on the Project Highway shall be as specified in Schedule B of the Concession Agreement.

(ii) The vertical and lateral clearances shall be as per requirements given in Section 2 of this Manual. Design of structures shall conform to requirements specified in this Manual.

7.21 Drainage

An effective drainage system for the bridge deck structure shall be planned, designed and installed so as to ensure that water from the deck is taken down to ground level/ drainage courses by adequate size of drainage spouts and pipes.

7.22 Structures in Marine Environment

Necessary measures/treatments for protecting structures in marine environment shall be as specified in Schedule B of the Concession Agreement.

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7.23 Repairs and Strengthening

(i) Structures requiring repairs and strengthening shall be specified in Schedule-B of the Concession Agreement. This shall be based on detailed condition survey of existing structures and shall bring out the nature and extent of repairs to be carried out, covering the following in addition to other specific requirements:-

(a) Repair/replacement of damaged railings and parapets, provision of crash barriers,

(b) Replacement of wearing coat (old wearing coat shall be removed and replaced by bituminous wearing coat),

(c) Replacement of expansion joints,

(d) Replacement of bearings,

(e) Structural repairs to substructure/super structure,

(f) Repair to flooring and protection works.

(ii) The Concessionaire shall submit repairs and strengthening plan for structures in para (i) above to the Independent Engineer for review and comments, if any. For all other structures with minor deficiencies, not affecting structural inadequacies, appropriate repair measures may be proposed and submitted to the Independent Engineer for review and comments, if any.

(iii) Strengthening/rehabilitation work shall be carried out in accordance with IRC:SP:40 - "Guidelines on Techniques for Strengthening & Rehabilitation of Bridges".

(iv) The Concessionaire shall take up repair and widening of existing bridge at a particular site only after the new bridge at that site is constructed and the same can be used by the traffic. Before taking up the works of repair and widening of the existing bridge, the Concessionaire shall make all arrangements to ensure that both way traffic can use the new bridge and a smooth flow of traffic is maintained. The Concessionaire shall take all precautions to guard against any traffic accident due to such diversion and shall use all necessary road signs, etc. for the purpose. After completion of repair and widening of the existing bridge, all arrangements shall be made so that both the old and the new bridges at the site can be used by the traffic. Repair works for substructure, foundation, and abutment etc., which will not affect or disturb the flow of traffic over the

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existing bridges, may, however, be taken up before completion of the new bridge. In such cases where new 2-lane bridge is not required to be constructed before COD, the existing bridge shall be repaired/strengthened by suitably regulating the traffic on the bridge or by temporary diversion.

7.24 Design Report

The Concessionaire shall furnish the design report including the following to the Independent Engineer for his review and comments, if any.

(i) Sub surface exploration report as per IRC:78 as specified in para 7.6 above.

(ii) Hydrological Investigation report including design discharge calculation for the bridges, in case of any change in the proposed waterway of any bridge as specified in para 7.5 above.

(iii) Design and drawings of foundations, substructures and superstructure of structures.

(iv) Detailed report regarding the bridges whose width is less than the roadway width and the proposal for their improvement.

(v) Any other relevant information relevant to the design report.

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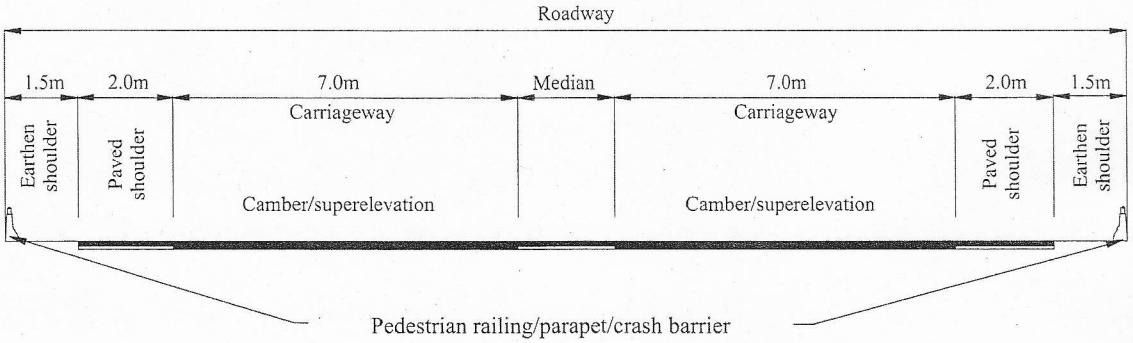
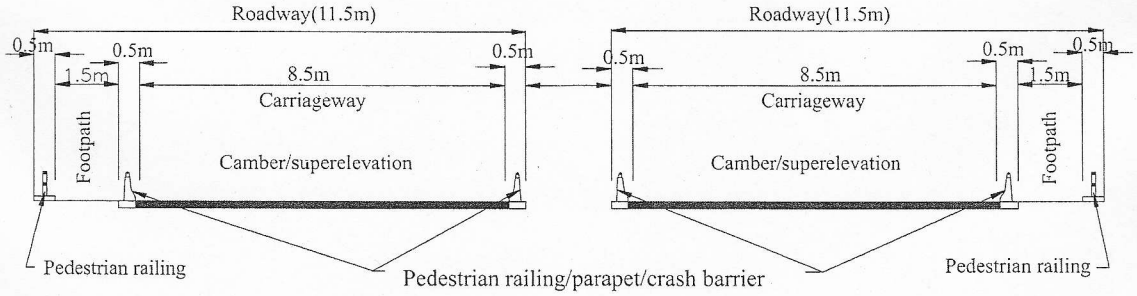


Cross section of pipe culvert at road level
4-lane divided highway

Fig. 7.1



Cross section of bridge at deck level - with footpath
(Slab/box type with open foundations)
4-lane divided highway

Fig. 7.2A

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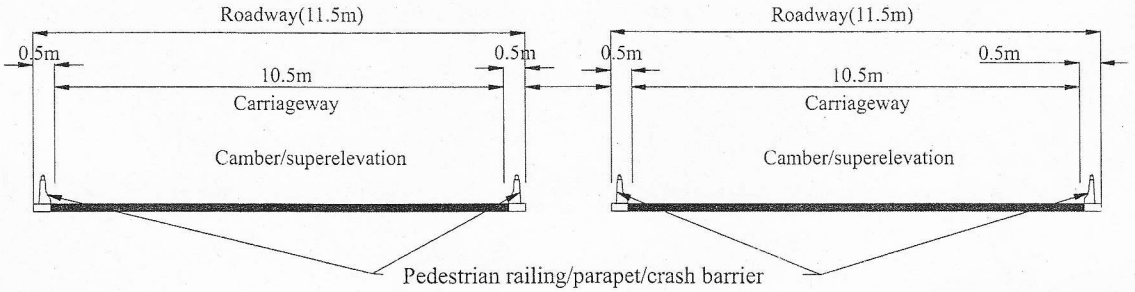
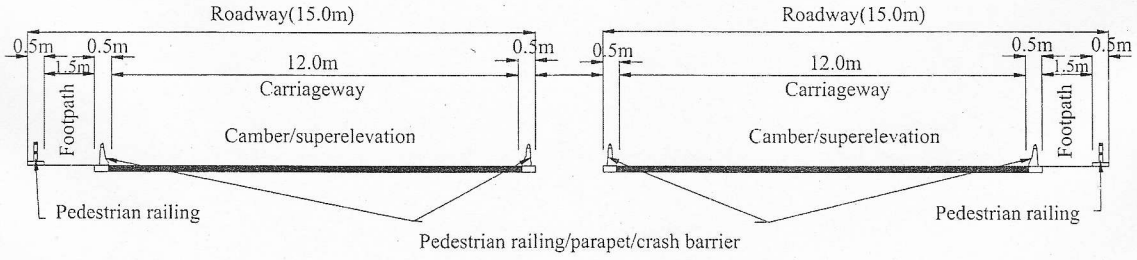


Cross section of bridge at deck level - without footpath
(Slab/box type with open foundations)
4-lane divided highway

Fig. 7.2B



Cross section of bridge at deck level - with footpath
(T-beam/box girder type/well/pile foundation)
4-lane divided highway (both side new bridges)

Fig. 7.3A

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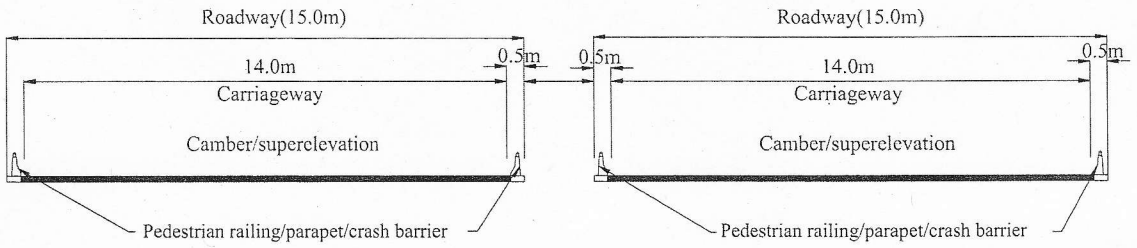
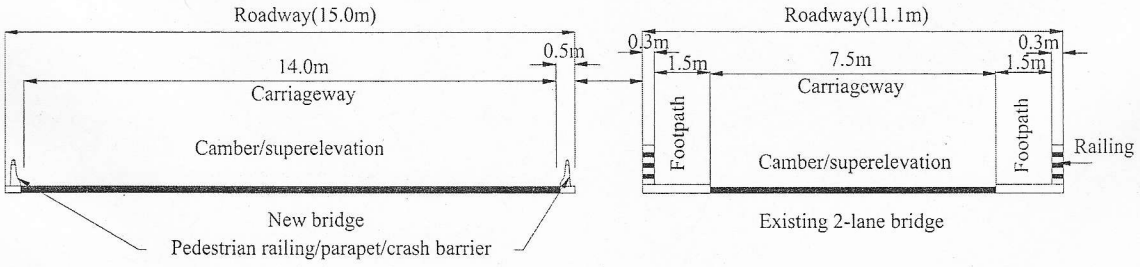


Cross section of bridge at deck level - without footpath

(T-beam/box girder type/well/pile foundation)

4-lane divided highway (both side new bridges)

Fig. 7.3B

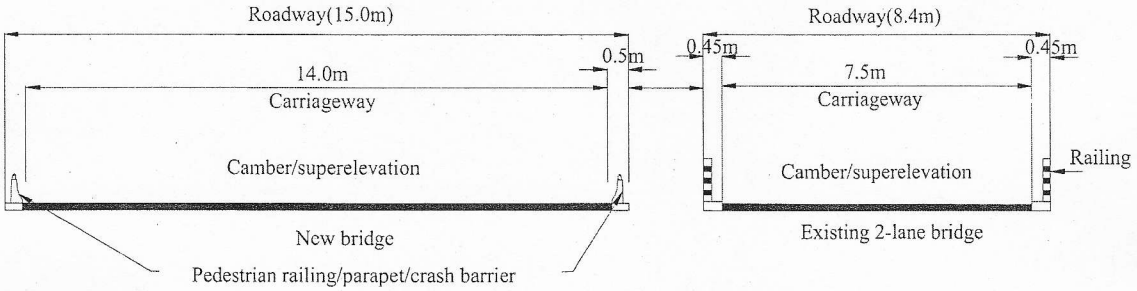


Cross section of bridge at deck level - without footpath

(T-beam/box girder type/well/pile foundation)

4-lane divided highway (one side new bridge and other side existing 2-lane bridge)

Fig. 7.4A



Cross section of bridge at deck level - without footpath

(T-beam/box girder type/well/pile foundation)

4-lane divided highway (one side new bridge and other side existing 2-lane bridge)

Fig. 7.4B

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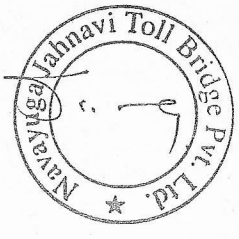
Section 8

Materials and Specifications for Structures





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SECTION 8

MATERIALS AND SPECIFICATIONS FOR STRUCTURES

8.1 General

(i) All materials to be used in structures shall be in conformity with the IRC/ MOSRTH Specifications unless otherwise specified in this Section. If the Concessionaire proposes to use any material, which is not covered in IRC/ MOSRTH Specifications, it shall conform to relevant Indian Standards, if there are any, or to the requirements specified in this Manual. Proprietary products proposed to be used shall be proven by use in comparable international bridge projects, and shall be supported with authenticated licensing arrangement with the manufacturer.

(ii) The Concessionaire shall identify the proposed sources of materials and submit the proposal to the IE for review and comments, if any, prior to delivery. If it is found that proposed sources of supply do not produce uniform and satisfactory products at any time during execution, the Concessionaire shall procure acceptable materials conforming to the specifications from other sources.

(iii) The samples required for review shall be supplied well in advance, at least 48 hours or minimum time required for carrying out the relevant tests, whichever is more. Delay in submission of samples shall not be acceptable as a reason for delay in completion of the works/extension of time for completion.

(iv) In case of manufactured items, the Concessionaire shall submit to the IE for review and comments, if any, the details pertaining to the product/process/ system covering inter-alia:

(a) Name of manufacturer and name of product/process/system;

(b) General features of the product/process/system along with specifications and standards adopted for the product/process/system.

(c) Authenticated copies of license/agreement;

(d) Details of projects where the product/process/system has been successfully used;

(e) Limitations, if any;

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(f) Acceptance tests and criteria;

(g) Installation and maintenance procedure and schedule; and

(h) Performance warranty

(v) The Concessionaire shall set up a full fledged laboratory at site, as per the agreement, for testing of all materials and finished products. It shall make arrangements for additional/confirmatory testing of any material including imported materials/products for which facilities at site laboratory are not available.

8.2 Structural Concrete

8.2.1 The Concrete for use in structures shall conform to the provisions in Clauses 302.6 to 302.9 of IRC:21 and Section 1700 of MOSRTH Specifications. Wherever High Performance Concrete (HPC) is proposed to be used, the same shall conform to the provisions of IRC:SP:70. Sampling and testing of concrete shall be as per Clause 302.10 of IRC:21. Acceptance criteria for concrete shall conform to Clause 302.11 of IRC:21. Concrete to be produced shall conform to the requirements as specified below.

8.2.2 A dense and well compacted concrete provides effective protection against corrosion of steel in reinforced/prestressed concrete members. To achieve this, the Concessionaire shall pay special attention to the following elements, which have a bearing on the production of a durable concrete:-

(i) Quality of materials - cement, aggregate, water and admixtures, both mineral and chemical,

(ii) Mix design,

(iii) Mixing and placing of concrete - Concrete shall be produced in a mixing and batching plant,

(iv) Vibration and compaction,

(v) Curing,

(vi) Cover to reinforcement/tendons, and

(vii) Detailing.

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8.2.3 The following points are also important in production of durable concrete, which shall be duly considered and adopted:-

(i) Chloride content in concrete to be in accordance with IRC:21,

(ii) Regular testing of water used for making concrete as per IRC:21,

(iii) Compatibility testing of admixtures with type of cement,

(iv) Permeability test for concrete,

(v) Testing of aggregates for alkali-silica reaction.

8.2.4 The mix designs for concrete shall be got reviewed by the Independent Engineer prior to construction.

8.3 Cement

Any type of cement specified in IRC:21 may be used for the works subject to limitations, if any, specified therein.

8.4 Coarse Aggregates

(i) Before commencement of the works, at least three samples, in accordance with the procedure laid down in IS:2430, shall be taken for each quarry source to ascertain the quality, suitability and fitness of the available material for use in the works. Fresh tests shall be conducted in case there is any change in the source or the type of rock being quarried. The proposal, along with a copy of test reports, shall be submitted to the IE for review and comments, if any.

(ii) Aggregate having more than 0.5% of sulphate as SO_3 with water absorption more than 2% of its own weight shall not be used.

(iii) In case of doubt, the alkali-aggregate reactivity shall be tested in accordance with IS:2386 (Part 6). Coarse aggregate having positive alkali-silica reaction (ASR) shall not be used.

(iv) The maximum value for combined flakiness and elongation index for coarse aggregates shall not exceed 35 percent.

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8.5 Sand/Fine Aggregates

(i) All fine aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS:2386 (Part I to VIII). The fineness modulus of fine aggregates shall be between 2.0 and 3.5.

(ii) Before the commencement of the works, at least three samples as per IS:2430 shall be taken for each quarry source to ascertain the quality, suitability and fitness of the available material for use in the works and the proposal along with a copy of test reports shall be submitted to the IE for review and comments, if any.

(iii) Fine aggregates having positive alkali-silica reaction shall not be used.

8.6 Water

(i) Water for use in the works for mixing and curing of concrete shall be in conformity with Clause 302.4 of IRC:21.

(ii) Water from each source shall be tested before the start of works and thereafter every three months and after each monsoon till the completion of the works and the proposal along with a copy of test reports shall be submitted to the IE for review and comments, if any.

8.7 Chemical Admixtures

8.7.1 Chemical admixtures are proprietary items and shall be obtained only from reputed manufactures with proven track record, quality assurance and full-fledged laboratory facilities for manufacture and testing.

8.7.2 The following guidelines shall apply in selection and use of admixtures:

(i) Chemical admixtures shall comply with IS:9103 and meet the requirements stipulated in clause 5.5 of IS:456.

(ii) Admixtures generating hydrogen or nitrogen or containing nitrates, sulphides, sulphates, or any other material liable to affect the reinforcement/embedments or concrete shall not be used.

(iii) Compatibility of admixture with the cement being used shall be tested before actual use in the works. The test shall be repeated in case of change of type or grade or source of cement.

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(iv) Admixtures shall not impair the durability of concrete. They shall not combine with the ingredients to form harmful compounds or endanger the protection of reinforcement against corrosion.

(v) The packaging of admixtures shall clearly indicate the name of the manufacturer/ supplier, brand name (name of the product), date of production and expiry, batch/identification number.

8.7.3 The Concessionaire shall obtain a certificate from manufacturer/supplier and submit to the IE for review and comments, if any. The certificate shall include the following information concerning the proposed admixture:

(i) Normal dosage with permissible range as a percentage of weight of cement and adverse effects, if any, of over and under dosage.

(ii) Chemical names of main ingredients.

(iii) Chloride content, if any, expressed as a percentage by weight of the admixture.

(iv) Values of dry material content with relative density of the admixture, which can be used for Uniformity Tests.

(v) pH value and colour.

(vi) Whether or not the proposed admixture leads to the entrainment of air when used as per the manufacturer's recommended dosage, and if so, to what extent.

(vii) Where two or more admixtures are proposed to be used in any one mix, confirmation as to their compatibility.

(viii) Confirmation that there is no risk of corrosion of reinforcement or other embedments.

(ix) Latest date of test and name of the laboratory.

(x) Shelf life, maximum and minimum temperature for storage, precautions to be taken while mixing and any other instructions for use.

8.7.4 In addition to conforming to the requirements of IS: 9103, the proposed admixture shall also satisfy the following conditions:

(i) Plasticisers and super-plasticisers shall meet the requirements indicated for water reducing admixtures.

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(ii) The chloride content of the admixture shall not exceed 0.2 per cent by weight of admixture when tested in accordance with IS:6925.

(iii) Except where resistance to freezing and thawing and to disruptive action of de-icing salts is necessary, the air content of freshly mixed concrete, in accordance with the pressure method given in IS:1199, shall not be more than 2 percent higher than that of the corresponding control mix and in any case not higher than 3 per cent of the test mix.

(iv) Uniformity tests on the admixtures are essential to compare qualitatively the composition of different samples taken from batch to batch or from same batch at different times. The tests that shall be performed along with permissible variations over the values stated by the manufacturer are given below:

(a) Dry Material Content: within 3 percent and 5 percent of liquid and solid admixture respectively.

(b) Ash Content: within 1 percent of the value stated by the manufacturer.

(c) Relative Density: within 2 percent (for liquid admixtures).

(v) All tests of concrete admixtures shall be conducted periodically at an independent laboratory and compared with the data furnished by the manufacturer.

8.8 Steel

8.8.1 *Steel for Prestressing*

(i) Prestressing steel shall be of any of the following types:

(a) Plain hard drawn steel wire conforming to IS:1785 (Part-I) and IS:1785 (Part- II),

(b) Cold drawn indented wire conforming to IS:6003

(c) High tensile steel bar conforming to IS:2090

(d) Uncoated stress relieved strand conforming to IS:6006, and

(e) Uncoated stress relieved low relaxation steel conforming to IS:14268.

(ii) Data in respect of modulus of elasticity, relaxation loss at 1000 hrs, minimum ultimate tensile strength, stress-strain curve etc. shall be obtained from the manufacturers. Prestressing steel shall be subjected to acceptance tests prior to actual use on works. Guidance may be taken from BS:4447. The modulus of

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elasticity value, as per acceptance tests, shall conform to the design value, which shall be within a range not more than 5 per cent between the maximum and the minimum.

8.8.2 *Reinforcement/Untensioned Steel*

(i) All reinforcing steel for use in works shall be procured from original producers or their authorized agents and shall conform to Clause 302.5 of IRC:21.

(ii) Only fresh steel shall be brought to the site. Every bar shall be inspected before assembling on the work; and defective, brittle or burnt bars shall be discarded. Cracked ends of bars shall be cut before use.

(iii) Only Thermo Mechanically Treated (TMT) bars conforming to IS:1786 shall be used as reinforcing steel except for bars of diameter less than 10 mm.

(iv) All reinforcement shall be free from loose rust and coats of paints, oil, mud or any other substance, which may destroy or reduce bond. The reinforcement bars bent and fixed in position shall be free from loose rust or scales, coats of paints, oil, mud or chloride contamination and other corrosion products. Where cleaning of corroded portions is required, proposal for effective method of cleaning such as sand blasting shall be submitted to the IE for prior review and comments.

(v) Proprietary steel products will be permissible provided they conform to the minimum requirements.

8.8.3 *Steel for Bearings*

Mild steel, high tensile steel, cast steel, steel forgings, and stainless steel shall conform to the provisions contained in clause 925.1 of IRC:83 (Part III).

8.8.4 *Structural Steel*

All structural steel, castings and forgings, fasteners (bolts, nuts, washers and rivets), welding consumables and wire ropes and cables shall conform to the provisions of clause 505.1.2, 505.2, 505.3, 505.4 and 505.6 respectively of IRC:24.

8.9 Storage of Materials

All materials shall be stored at proper places so as to prevent their deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness

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for the work. Any material, which has deteriorated or has been damaged or is otherwise considered defective after review by the Independent Engineer shall not be used in the works and shall be removed from site by the Concessionaire at his cost. Such materials shall not be made acceptable by any modifications.

8.10 Report to be submitted

The Concessionaire shall submit test results of all materials and finished products proposed to be used in the Project Highway, as specified in the QC document, to the Independent Engineer for review and comments, if any.

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Section 9

Traffic Control Devices and Road Safety Works

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SECTION 9

TRAFFIC CONTROL DEVICES AND ROAD SAFETY WORKS

9.1 General

(i) Traffic control devices shall comprise of traffic signs, road markings, safety barriers, pedestrian railings, etc. Guidelines given in IRC:35, IRC:67 and Section 800 of MOSRTH Specifications shall be used in adopting appropriate road markings and traffic signage unless otherwise specified in this Section. International practices in this connection may be referred such as:

a) Traffic Signs Manual - Department of Transport, UK.

b) Manual On Uniform Traffic Control Devices - Federal Highway Administration, USA.

(ii) The Concessionaire shall also follow the guidelines and suggestions stipulated in the MOSRTH "Manual for Safety in Road Design", while designing constructing, operating and maintaining the four-lane highway.

9.2 Road Markings

All road markings shall conform to IRC:35. Road markings shall comprise of carriageway markings such as longitudinal markings on intersections, hazardous locations, parking, etc., and object markings such as object within the carriageway adjacent to carriageway and marking on kerbs. Where service roads are provided, proper layout and road markings shall be ensured so that merging with traffic is safe.

9.2.1 *Material*

(i) Hot applied thermoplastic paint with glass beads shall be used as carriageway marking materials.

(ii) Pavement markings may also be in the form of prefabricated sheet materials, e.g. plastic sheets, which may be set into the pavement with upper surface flush with the pavement surface.

(iii) Road marking paint conforming to IS:164 shall be used for object markings.

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9.2.2 *Raised pavement markers (Cat's Eyes)*

The cat's eyes or road studs are used to form a semi-permanent marking and provide improved visibility in night-time and wet-weather conditions. These shall be either reflex lens type or solid white beads. These shall be provided at hazardous locations and while approaching important intersections to supplement the paint or thermoplastic line markings and road stretches passing through municipal areas or village settlements.

9.3 Road Signs

There are three types of road signs viz., mandatory / regulatory signs, cautionary / warning signs and informatory signs. Location of signs shall conform to IRC:67 and section 802 of MOSRTH Specifications. Proper signs shall be provided for left in and left out for service roads (if so provided) for safe guidance of traffic. Clustering and proliferation of road signs shall be avoided for enhancing their effectiveness.

9.3.1 *Sheeting*

The retro-reflective sheeting shall be used on the signs. The sheeting shall be weather-resistant and show colour fastness. It shall be new and unused and shall show no evidence of cracking, scaling, pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having tested the sheeting for these properties in an unprotected outdoor exposure facing the sun for two years and its having passed these tests shall be obtained from a reputed laboratory, by the manufacturer of the sheeting and shall be provided for review of the Independent Engineer. The reflective sheeting shall be of High Intensity Grade with encapsulated lens or with micro prismatic retro-reflective element material as specified by the Government. The retro-reflective surface after cleaning with soap and water and in dry condition shall have the minimum co-efficient of retro-reflection (determined in accordance with ASTM Standard E:810) as indicated in Tables 9.1 and 9.2.

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Table 9.1 : Acceptance Minimum Coefficient of Retro-Reflection for High Intensity Grade Sheeting (Encapsulated Lens Type) (Candelas Per Lux Per Square Metre)

Observation Angle	Entrance Angle	White[A]	Yellow[A]	Green[A]	Red[A]	Blue[A]
0.1°[B]	-4°	300	200	54	54	24
0.1°[B]	+30°	180	120	32	32	14
0.2°	-4°	250	170	45	45	20
0.2°	+30°	150	100	25	25	11
0.5°	-4°	95	62	15	15	7.5
0.5°	+30°	65	45	10	10	5.0

[A] *Minimum Coefficient of Retro-reflection (R_A) ($cd\text{-}lx^{-1}m^{-2}$)*

[B] *Value for 0.1° observation angles are supplementary requirements that shall apply only when specified by the purchaser in the contract or order.*

Table 9.2 : Acceptance Minimum Coefficient of Retro-Reflection for High Intensity Micro-Prismatic Grade Sheeting (Candelas Per Lux Per Square Metre)

Observation Angle	Entrance Angle	White[A]	Yellow[A]	Green[A]	Red[A]	Blue[A]	Fluorescent Yellow-Green[A]	Fluorescent Yellow[A]	Fluorescent Orange[A]
0.1°[B]	-4°	500	380	70	90	42	400	300	150
0.1°[B]	+30°	240	175	32	42	20	185	140	70
0.2°	-4°	360	270	50	65	30	290	220	105
0.2°	+30°	170	135	25	30	14	135	100	50
0.5°	-4°	150	110	21	27	13	120	90	45
0.5°	+30°	72	54	10	13	6	55	40	22

[A] *Minimum Coefficient of Retro-reflection (R_A) ($cd\text{-}lx^{-1}m^{-2}$)*

[B] *Value for 0.1° observation angles are supplementary requirements that shall apply only when specified by the purchaser in the contract or order.*

9.3.2 *Messages/Borders*

The messages (legends, letters, numerals etc.) and borders shall either be screen-printed or of cut-outs. Screen printing shall be processed and finished with materials and in a manner specified by the sheeting manufacturers.

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For screen printed transparent coloured areas on white sheeting, the co-efficient of retro-reflection shall not be less than 50% of the values of corresponding colour in Tables 9.1 and 9.2.

Cut out messages and borders, wherever used, shall be made out of retro-reflective sheeting (as per Para 9.3.1), except those in black, which shall be non-reflective as specified by the manufacturer. The cutouts shall be bonded properly with the base sheeting in the manner specified by the manufacturer.

9.3.3 *Colour scheme*

(i) Unless specified otherwise, the general colour scheme shall be in accordance with IRC:67, the colours shall be as stipulated in IS:5 "Colour for Ready Mixed Paints".

(ii) The colours shall be durable and uniform when seen in daylight or under normal headlights at night.

(iii) Direction, destination and plate identification signs shall have green background and white messages (legends, letters, numerals, etc.) and borders.

(iv) Colour scheme for facility information signs, other useful information signs and parking signs shall conform to the provision contained in IRC:67. In respect of informatory signs, the messages/borders shall either be screen-printed or of cutouts, while for warning and regulatory signs, these shall be screen-printed.

9.3.4 *Adhesives*

The sheeting shall either have a pressure-sensitive adhesive of the aggressive tack requiring no heat, solvent or other preparation for adhesion to a smooth clean surface, or a tack free adhesive activated by heat applied in a heat-vacuum applicator, in a manner recommended by the sheeting manufacturer. The adhesive shall be protected by an easily removable liner (removable by peeling without soaking in water or other solvent) and shall be suitable for the type of material of the base plate used for the sign. The adhesive shall form a durable bond to smooth, corrosion and weather resistant surface of the base plate such that it shall not be possible to remove the sheeting from the sign base in one piece by use of sharp instrument. In case of pressure sensitive adhesive sheeting, the sheeting shall be applied in accordance with the manufacturer's specifications. Sheeting with adhesives requiring use of solvents or other preparation for adhesive shall be applied strictly in accordance with the manufacturer's instructions.

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9.3.5 *Installation*

The sign posts, their foundations and sign mountings shall be so constructed as to hold these in a proper and permanent position against the normal storm wind loads or displacement by vandalism. Normally, signs with an area upto 0.9 sq. m. shall be mounted on a single post, and for greater area two or more supports shall be provided. Sign supports may be of mild steel, reinforced concrete or galvanized iron (G.I.). Post end(s) shall be firmly fixed to the ground by means of property designed foundation. The work of foundation shall conform to relevant IRC/CPWD Specifications.

All components of signs and supports, other than the reflective portion and G.I. posts shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. Any part of Mild Steel (MS) post below ground shall be painted with three coats of red lead paint.

The signs shall be fixed to the posts by welding in the case of steel posts and by bolts and washers of suitable size in the case of reinforced concrete or G.I. posts. After the nuts have been tightened, the tails of the bolts shall be furred over with a hammer to prevent removal.

Important informatory signs such as approaching important locations like toll plaza, major town, intersection shall be mounted on gantries in the form of overhead signs. (Also refer Section 11.5 of this Manual)

9.3.6 *Warranty and durability*

The Concessionaire shall obtain from the manufacturer a seven year warranty for satisfactory field performance including stipulated retro-reflectance of the retro-reflective sheeting of high intensity grade and submit the same to the Independent Engineer for review and comments.

9.4 Road Side Safety Barriers

There are two types of safety barriers viz., longitudinal roadside safety barriers, and median safety barriers.

9.4.1 Warrants: The longitudinal roadside barriers are basically meant to shield two types of roadside hazards i.e. embankments and roadside obstacles and also for preventing the vehicles veering off the sharp curves. The warrants for a fill section in terms of the height and slope needing protection with roadside barriers are shown in Fig.9.1. The barrier is not warranted for embankment having a fill slope of 3:1 or flatter. The

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warrants for roadside objects are mainly dependent upon the type of obstacle and the probability of their being hit. A barrier shall be installed only if the result of vehicle striking the barrier is likely to be less severe than the severity of accident resulting from the vehicle impacting the unshielded obstacle. Some of the commonly encountered roadside obstacles are bridge piers, abutments and railing ends, roadside rock mass, culverts, pipes and headwalls cut slopes, retaining walls, lighting supports, traffic signs and signal supports, trees and utility poles.

9.4.2 *Types of Roadside Safety Barriers*

There are three types of longitudinal roadside safety barriers viz.:

(i) Flexible type (like wire rope fencing)

(ii) Semi-rigid type like
  (a) "W' beam type steel barrier
  (b) Thrie beam type steel barrier

These steel barriers are of strong post type and usually remain functional after moderate collisions thereby eliminating the need for immediate repair.

(iii) Rigid type (like concrete crash barriers)

9.4.3 *Roadside steel barriers*

(i) Design Aspects: The "W" beam type safety barrier consists of steel posts and a 3 mm thick "W" beam rail element which is spaced away from the posts. The spacer minimizes vehicular snagging and reduces the likelihood of a vehicle vaulting over the barrier. The steel posts and the blocking out spacer shall both be channel section of 75 mm x 150 mm size and 5 mm thick. The rail shall be 700 mm above ground level and posts shall be spaced 2m center to center. Typical details are shown in Fig.9.2.

The thrie beam safety barrier shall have posts and spacers similar to the ones mentioned above for "W" beam type. The rail shall be placed at 850 mm above the ground level. This barrier has higher initial cost than the "W" beam type but is less prone to damages to vehicle collisions especially for shallow angle impacts. Typical details of Thrie beam barrier are shown in Fig. 9.3.

The "W" beam, the Thrie beam and the posts spacers and fasteners for steel barriers shall be galvanized by hot dip process.

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(ii) End treatment for steel barrier: An untreated end of the roadside barrier can be hazardous, if hit, because the barrier beam can penetrate the passenger compartment and cause the impact vehicle to stop abruptly. End treatments should, therefore, form an integral part of safety barriers and the end treatment not spear vault or roll a vehicle for head on or angled impacts. The two end treatments recommended for steel barriers are "Turned down guardrail and Anchored in back slope".

Turned down guardrails have the "W" or Thrie sections reduced from full height to ground level with a gentle slope over a distance of 8 to 9 meters. The turned down rail is intended to collapse on impact allowing the vehicle to pass over it without becoming airborne or unstable. In order to locate the barrier terminal away from the traveled way and to minimize drivers' reaction to a hazard near the road by gradually introducing a parallel barrier installation or to transition a roadside barrier nearer the roadway such as a bridge parapet or a railing, the turned down shall be flared away from the roadway. Suggested flare rates depending upon the design speed and type of barrier are given in Table 9.3.

Table 9.3 : Flare Rates

Design speed in km per hour	Flare Rates	
	Rigid barriers	Semi-rigid barriers
100	17:1	13:1
80	14:1	11:1
65	11:1	9:1
50	8:1	7:1
40	8:1	7:1
30	8:1	7:1

The posts in the end treatment should have the same cross sections as provided in the main barrier.

At road cross sections in cutting or if the road transitions from cut to fill, the safety barriers can be anchored in back slopes. The back slope covering the anchored portion of the barrier should be graded flat with side slopes preferably not steeper than 10:1. The anchored portion should develop a tensile strength in the rail element to prevent the rail from pulling out of the anchorage. The

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barrier can also be anchored in an earth berm specially constructed for this purpose provided the new berm itself is not a hazard to the traffic. The earth berm should be made impervious to erosion.

(iii) Placement: Placement recommendations determine the exact layout of the barrier and shall be made by the design engineer keeping in view the lateral offset of the barrier and flare rate. The final layout shall be a site-specific combination of these factors. The barriers shall be as far away from the traffic as possible and shall preferably have uniform clearance between the traffic and the hazard.

As far as possible the safety barrier shall be placed beyond 2.5 m of the traveled way. For long and continuous stretches, this offset is not critical. The distance between the barrier and the hazard shall not be less than the deflection of the barrier by an impact of a full sized vehicle. In case of embankments, a minimum distance of 600 mm shall be maintained between the barrier and the start of embankment slope of a hazard to prevent the wheels from dropping over the edge. Typical details are shown in Fig. 9.4.

Flatter flare rates may be used particularly where extensive grading would be required to ensure a flat approach from the traveled way subject to the availability of right of way.

9.4.4 *Roadside Concrete Barriers*

(i) Design Aspects: Roadside Concrete safety barriers are rigid barriers having a sloped front face and a vertical back face. The recommended designs of the cast in situ and precast barriers are shown in Figs. 9.5 and 9.6 respectively. Based on evaluation of vehicle direction, sight distance, structural stability and the psychological effect of barrier height on driver reaction, the most desirable height of the median barrier is 800 mm. Variations upto 50 mm in height of barrier can be made in the total height of the barrier to meet the site requirements. It is however, important to maintain the height of lower slope between 200 mm and 350 mm so as to reduce the chances of overturning of the vehicles.

The concrete barrier may be precast in lengths of upto 6m depending upon the feasibility of transport and lifting arrangements. Concrete grade for the barriers should not be leaner than M 30. The minimum thickness of foundations shall be 25 cm thick cement concrete or hot mix asphalt placed at the base of barrier

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to provide lateral restraint. Where more than 75 mm thick overlay on the road pavement is anticipated, the foundation step may be increased to 125 mm. However, longitudinal roadside concrete barrier should have elaborate footing design which is structurally safe unless sufficient earth support is available.

(ii) End Treatment: Safety barrier shall be provided with an end treatment, which shall be obtained by tapering the height of terminating end of the median barrier within a length of 8 m to 9 m.

(iii) Placement: Placement recommendations for roadside steel barriers, mentioned in para 9.4.3 above are applicable to concrete barriers as well.

9.4.5 *Median Barriers*

(i) General: Head-on-collisions, especially on highways with narrow medians, caused by out-of-control vehicles jumping across the medians are a major source of accidents. Fixed objects on medians also require shielding from the traffic flow. Provision of median safety barrier in such conditions is an important requirement.

(ii) Warrants: The requirement of a median barrier is a function of the width of the median and the traffic volume on the road. Fig.9.7 indicates the warrants for provision of median barriers in terms of the combination of median width and Average Daily Traffic (ADT) in PCUs. At ADT less than 20,000 PCUs and with medians wider than 9 m, the probability of a vehicle crossing across the median is relatively low and median barriers in such cases are optional. Medians with width between 9 m and 15 m do not warrant a barrier unless there is an adverse history of median crossovers.

Median barriers may be impractical where a road has a large number of closely spaced median openings since the barrier needs to be terminated with an end treatment at these points.

An evaluation of the number of median openings, accident history, alignment, sight distance, design speed, traffic volume and median width shall be made prior to taking a decision to install a median barrier.

Median barriers shall also be provided to shield fixed objects in a narrow median. If necessary, median barriers shall be flared to encompass a fixed object, which may be a lamp post, foundation of overhead signs, bridge pier etc.

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9.4.5.1 *Types of Median Barriers*

There are three types of median safety barrier viz., "W' beam type steel barrier, (Strong post type), Thrie beam type steel barrier, (Strong post type) and Concrete barriers

(i) Steel Median Barriers

(a) Design Aspects: The "W' beam barrier shall be similar to the roadside barrier described in para 9.4.3 above except that the "W' beam shall be provided on both sides of the post with similar spacers. Typical details are indicated in Fig.9.8.

The Thrie beam barrier shall be similar to the roadside barrier described in para 9.4.3 above except that the Thrie beam shall be provided on both sides of the post with similar spacers. Typical details are shown in Fig.9.9.

(b) End Treatment: Steel median barriers shall be provided with a "Turned-down-guardrail" end treatment as described in para 9.4.3 above except that no flaring is to be provided.

(c) Placement: At locations, where the two adjacent carriageways are at the same level, the barrier shall be placed in the center of the median, duly taking into consideration, the drainage requirements. The placement of median barriers in cases where the two carriageways are at different levels is a function of the slopes between the two medians. Recommended placement for various combinations is indicated in Fig.9.10. In case the median barriers need to be flared e.g. for the protection of supports to overhead signs, the flare rates mentioned in para 9.4.3 above shall be followed.

(ii) Concrete Median Barriers

(a) Design Aspects: The design of cast-in-situ and precast median barriers is indicated in Figs.9.11 & 9.12.

Median barrier shall be terminated sufficiently away from the median opening with the twin objectives of preventing impact by the turning traffic and providing adequate sight distance to the turning traffic. The terminating end of the median barrier shall be tapered in a length of 8 to 9 meters.

(b) Placement: Placement recommendations for steel median barriers mentioned in para 9.4.5.1 (i) (c) above apply to concrete median barriers also.

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9.4.6 *General*

Raised kerbs or drains shall not be provided between the traveled way and the barriers. These destabilize the vehicle balance and disturb its equilibrium before it strikes the barrier, thus defeating the essential purpose of safety and redirection of the impacting vehicle.

In rural situations both the roadside and the median barriers shall preferably be steel barriers. Concrete barriers shall be preferred in urban situations.

9.5 Safety during Construction

Widening of an operational two-lane highway into four-lanes is rife with problems of traffic diversion, management and road safety of workers and road users. A proper Traffic Management Plan during Construction shall be formulated by the Concessionaire as per guidelines given in IRC:SP:55 "Guidelines for Safety in Construction Zones" and other international practices and submitted to the IE for review and comments, if any. The Traffic Management Plan during construction shall be put in place before the start of any construction activity.

The execution of work shall be so planned that the inconvenience to traffic is minimal. The temporary diversion, where constructed, shall conform to the following standards:

(i) Width of diversion shall be minimum 7.0 m paved

(ii) The crust composition shall be minimum 150 mm GSB + 150 mm WBM + 20 mm Mix Seal Surfacing

9.6 Design Report

The Concessionaire shall submit proposals for traffic control devices and road safety works together with drawings and details to the Independent Engineer for review and comments, if any. The proposals shall include:

(i) Details covering type, location, material specifications, installation details and the requisite warranties for satisfactory field performance (as applicable) in respect of road signs, road markings and roadside safety barriers;

(ii) Traffic Management Plan during construction in accordance with the requirement specified in para 9.5 above.

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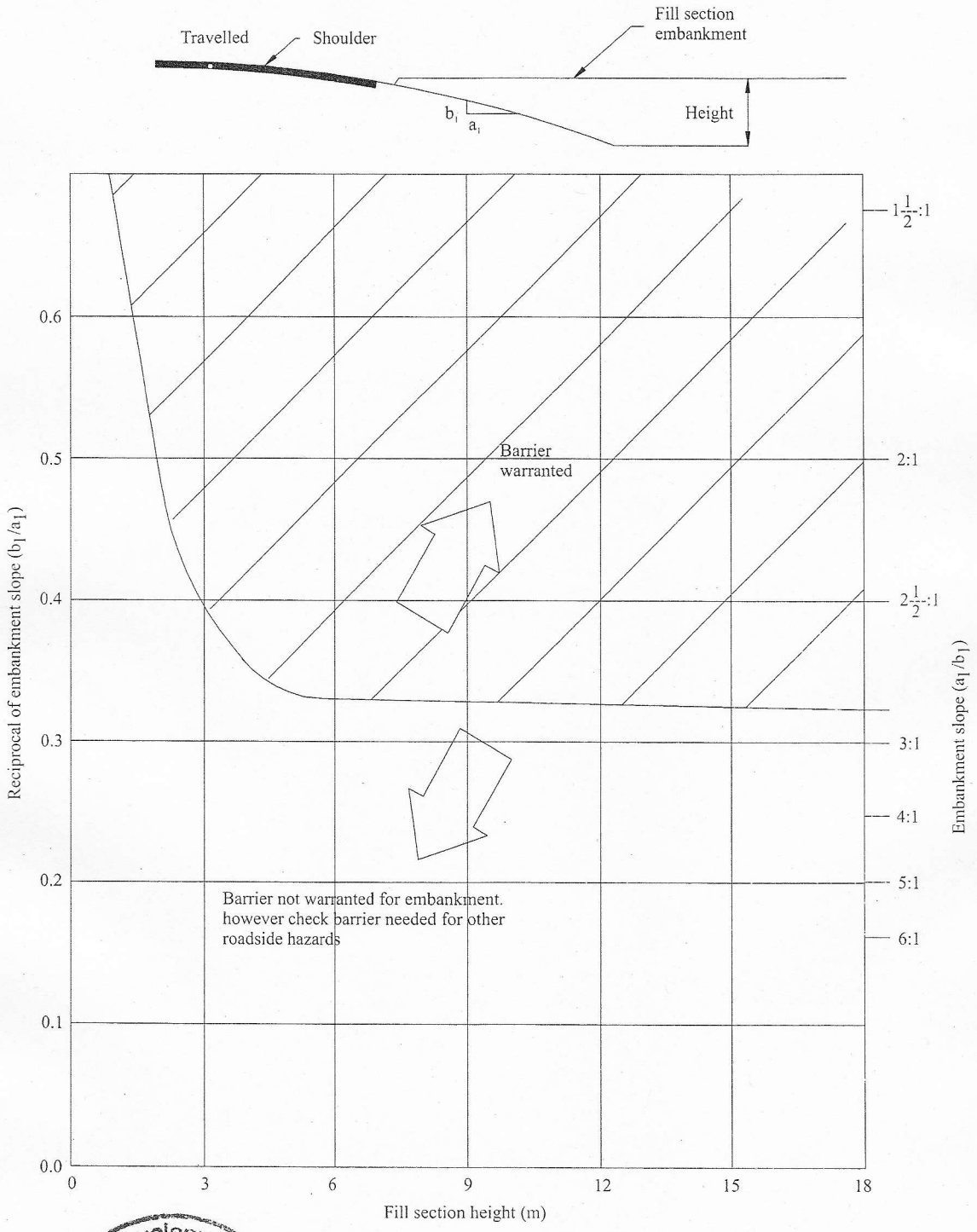
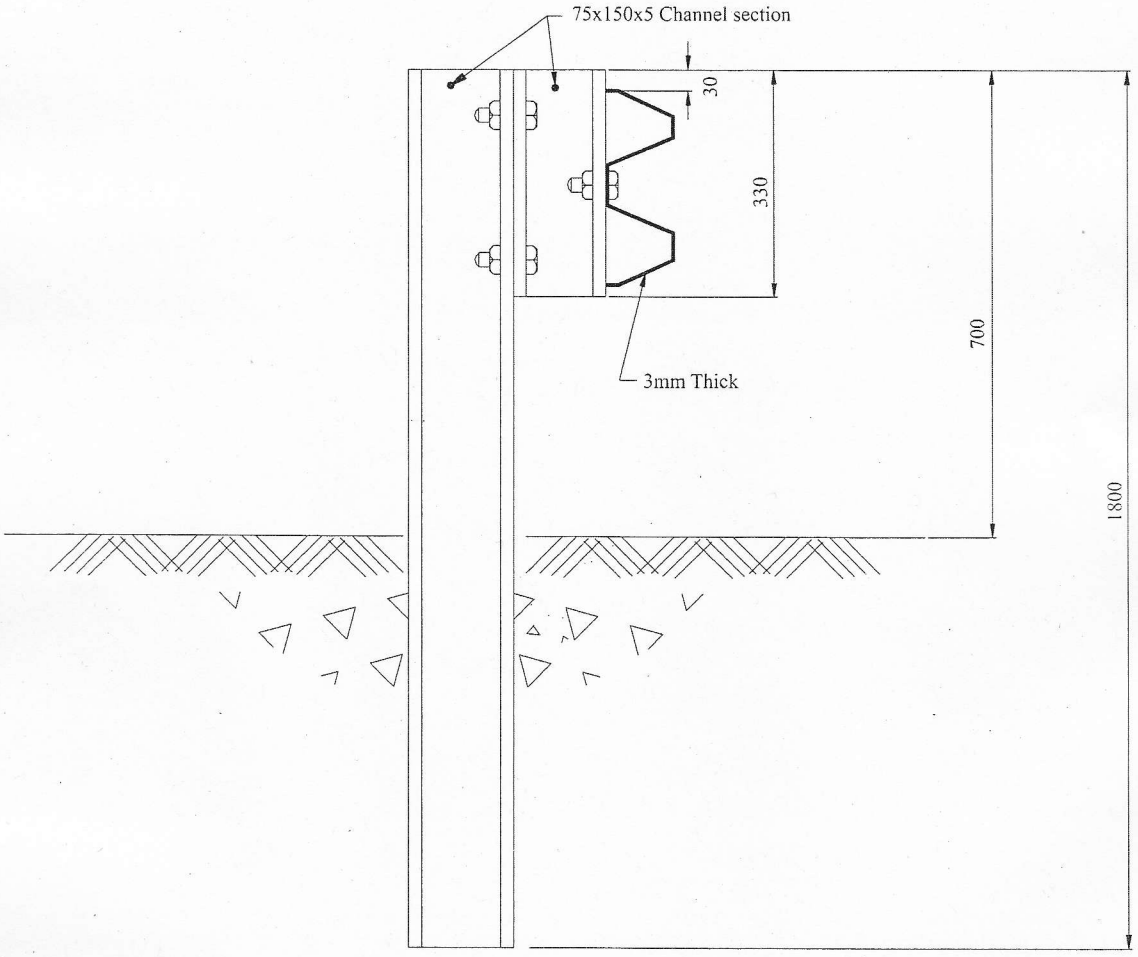


Fig. 9.1 Warrants for roadside barriers on embankments



Note:
All dimensions are in mm.

Fig. 9.2 : Typical details of "W" beam section

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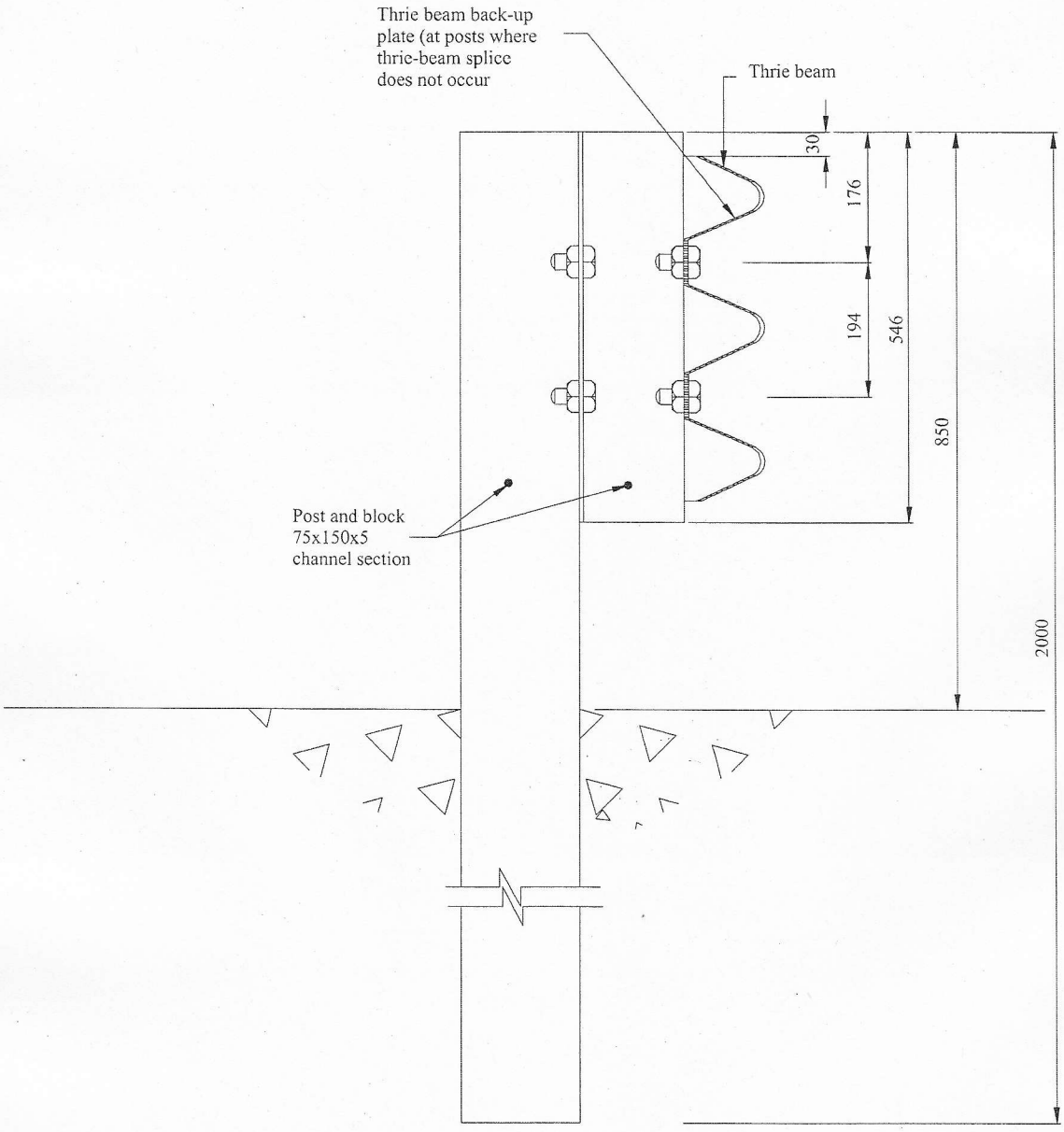

Note:
All dimensions are in mm.

Fig. 9.3 : Typical details of thrie beam section

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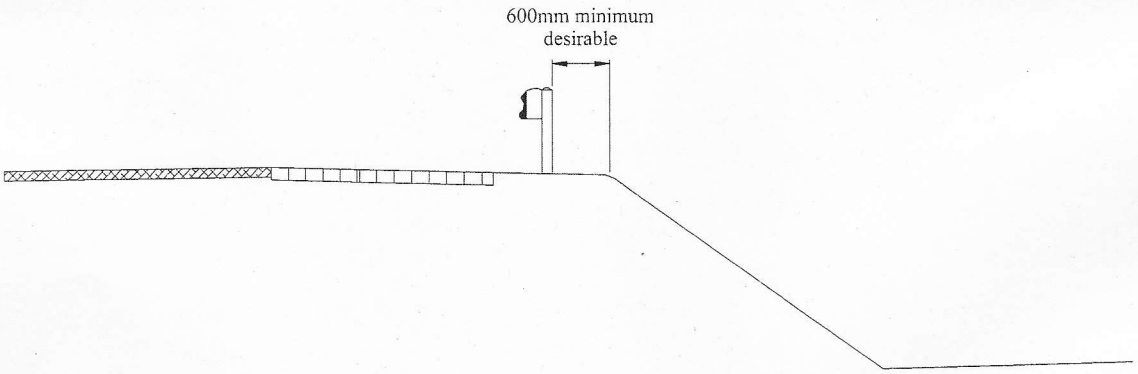

Fig. 9.4 : Recommended barrier placement

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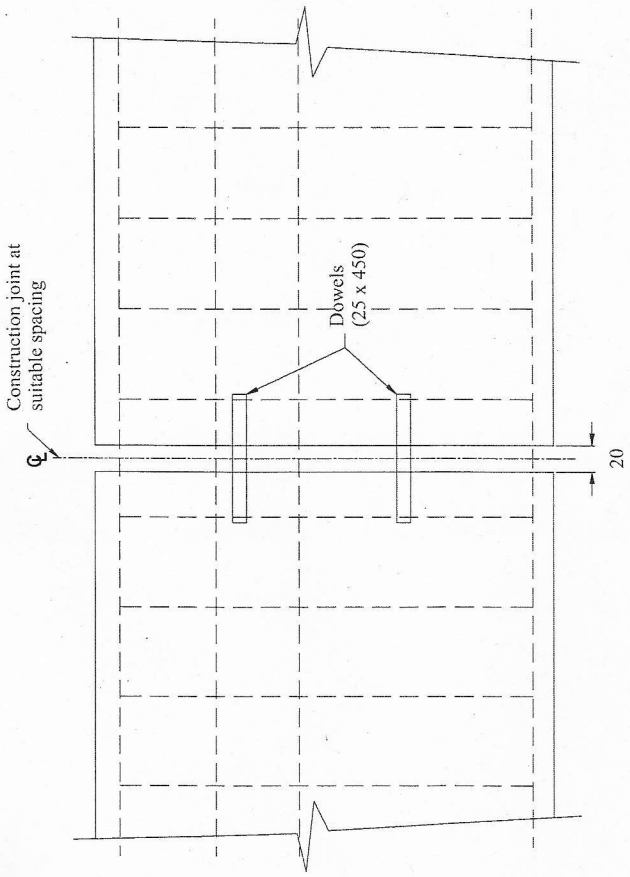

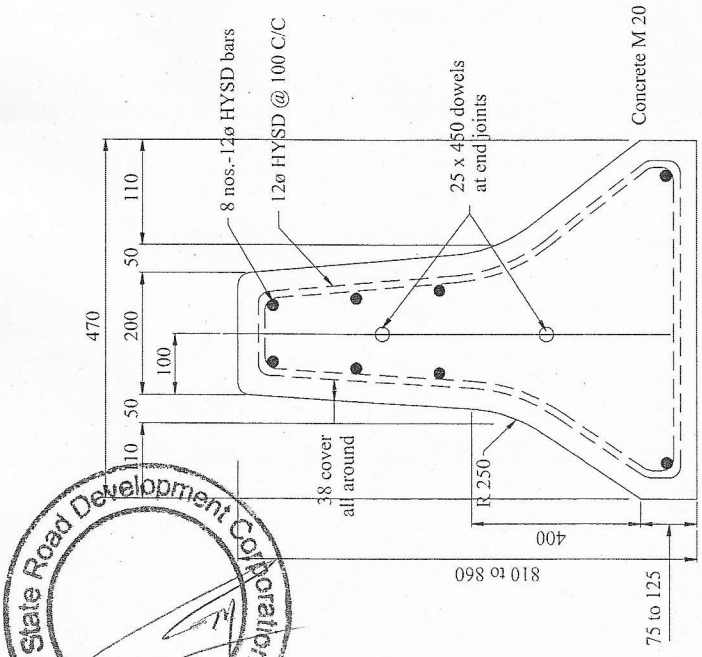

Note:
1. HYSD-High yield strength deformed reinforcement.
2. All dimensions are in mm.

Fig. 9.5 : Road side barrier cast-in-situ design

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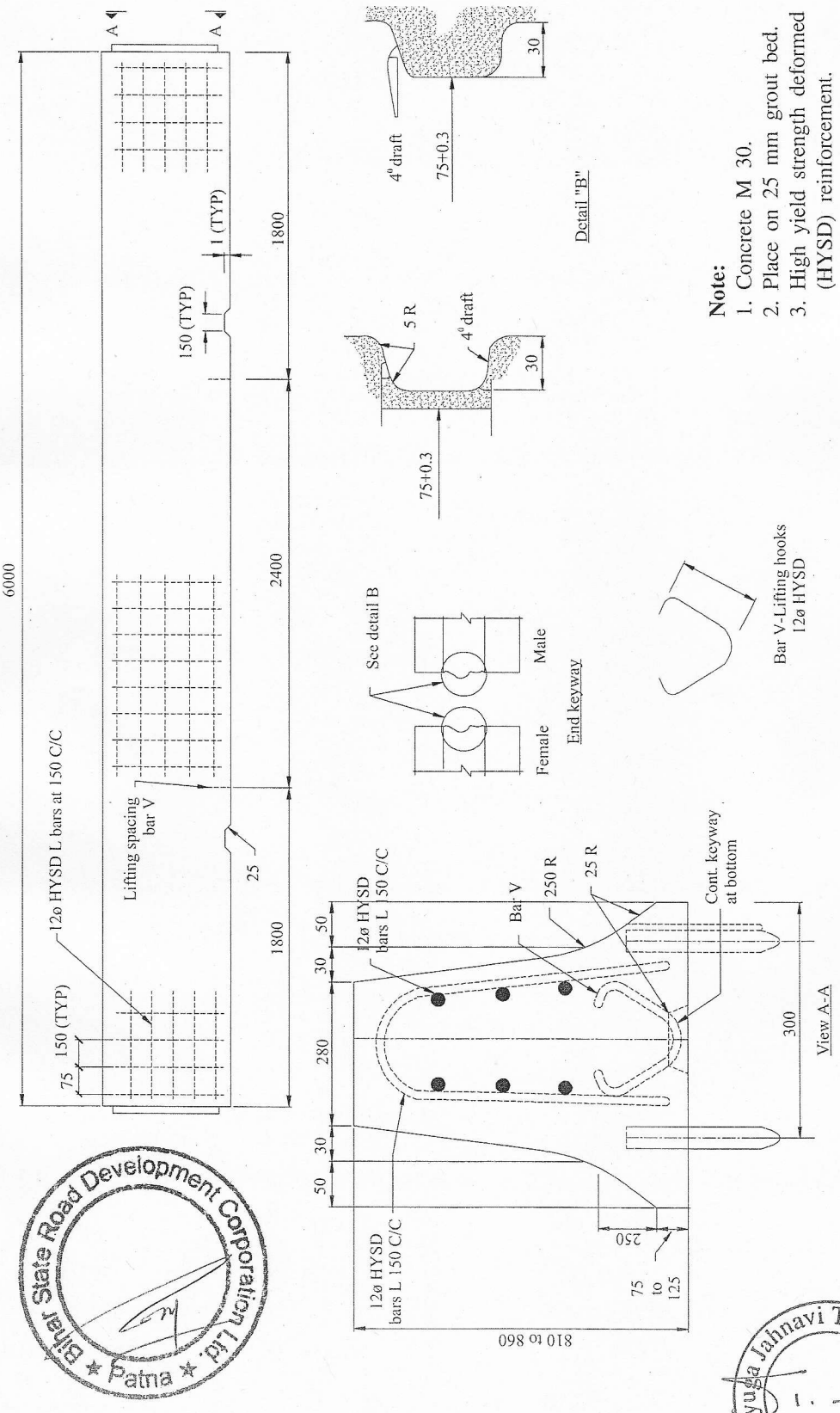

Fig. 9.6 : Road side barrier precast design

Note:

1. Concrete M 30.
2. Place on 25 mm grout bed.
3. High yield strength deformed (HYSD) reinforcement.
4. All dimensions are in mm.

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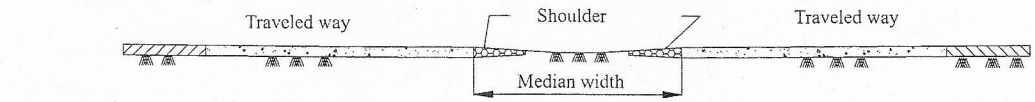

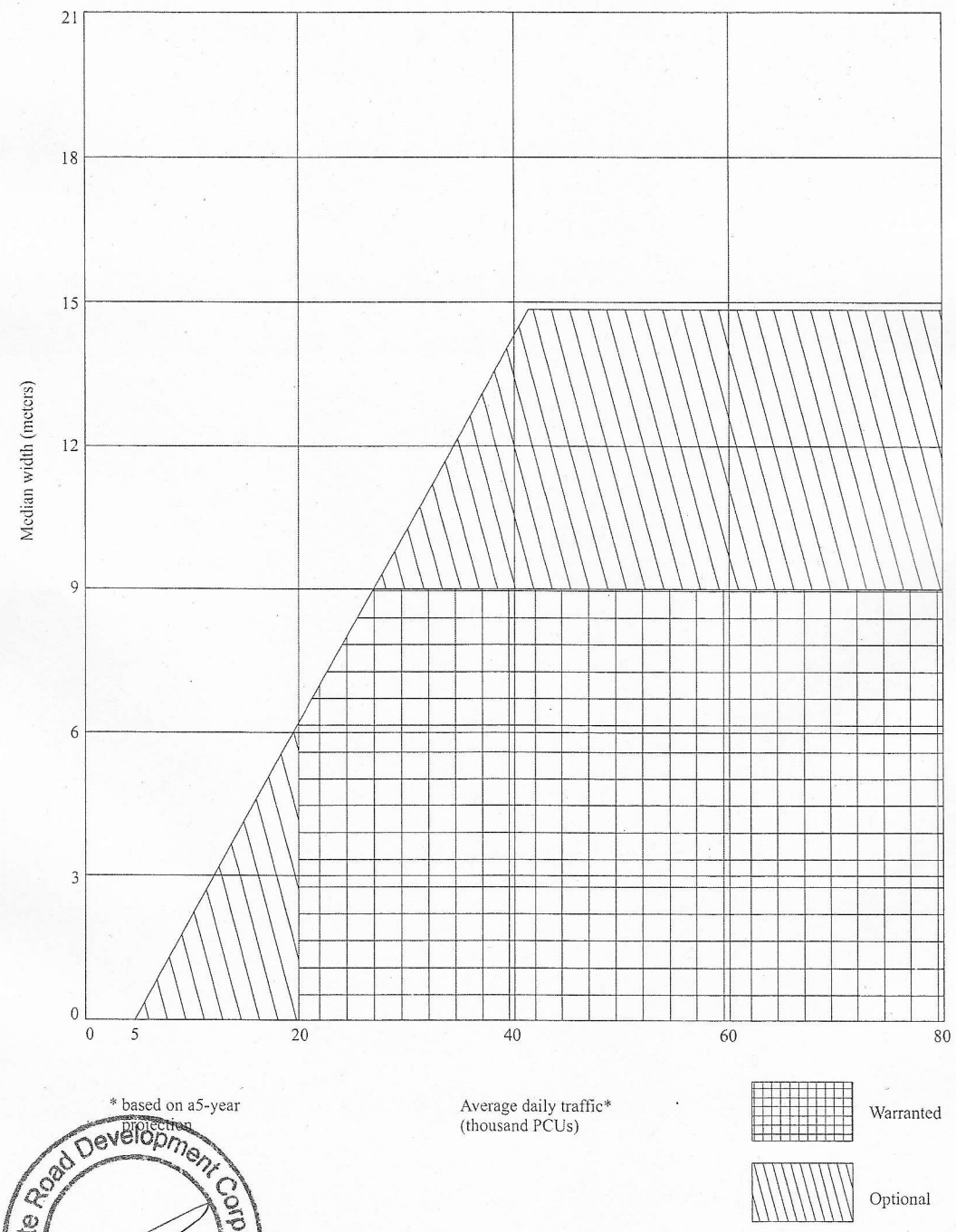

Fig. 9.7 : Median barrier warrants

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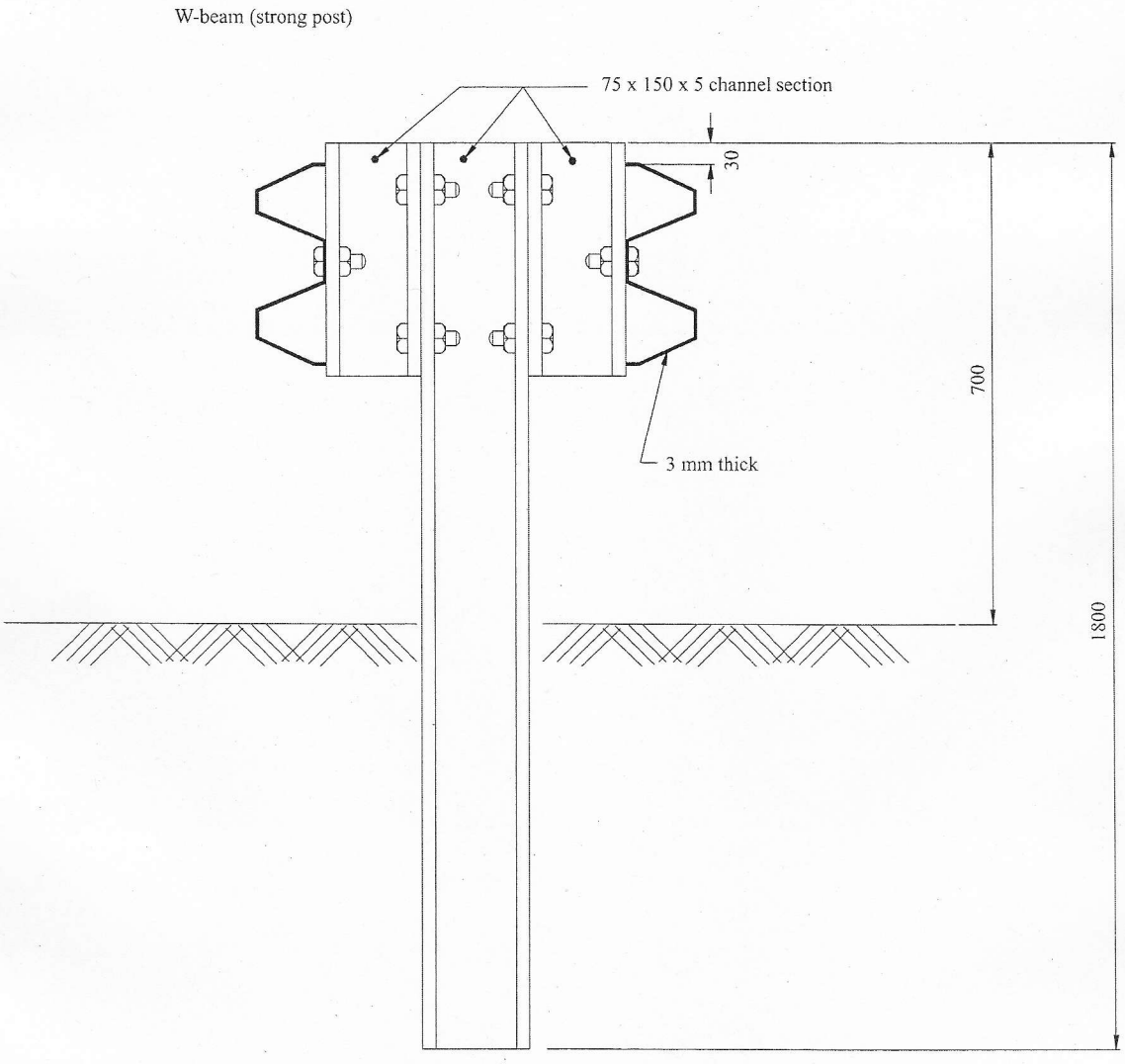

Note:
All dimensions are in mm.

Fig. 9.8 : Typical details of "W" beam median barrier

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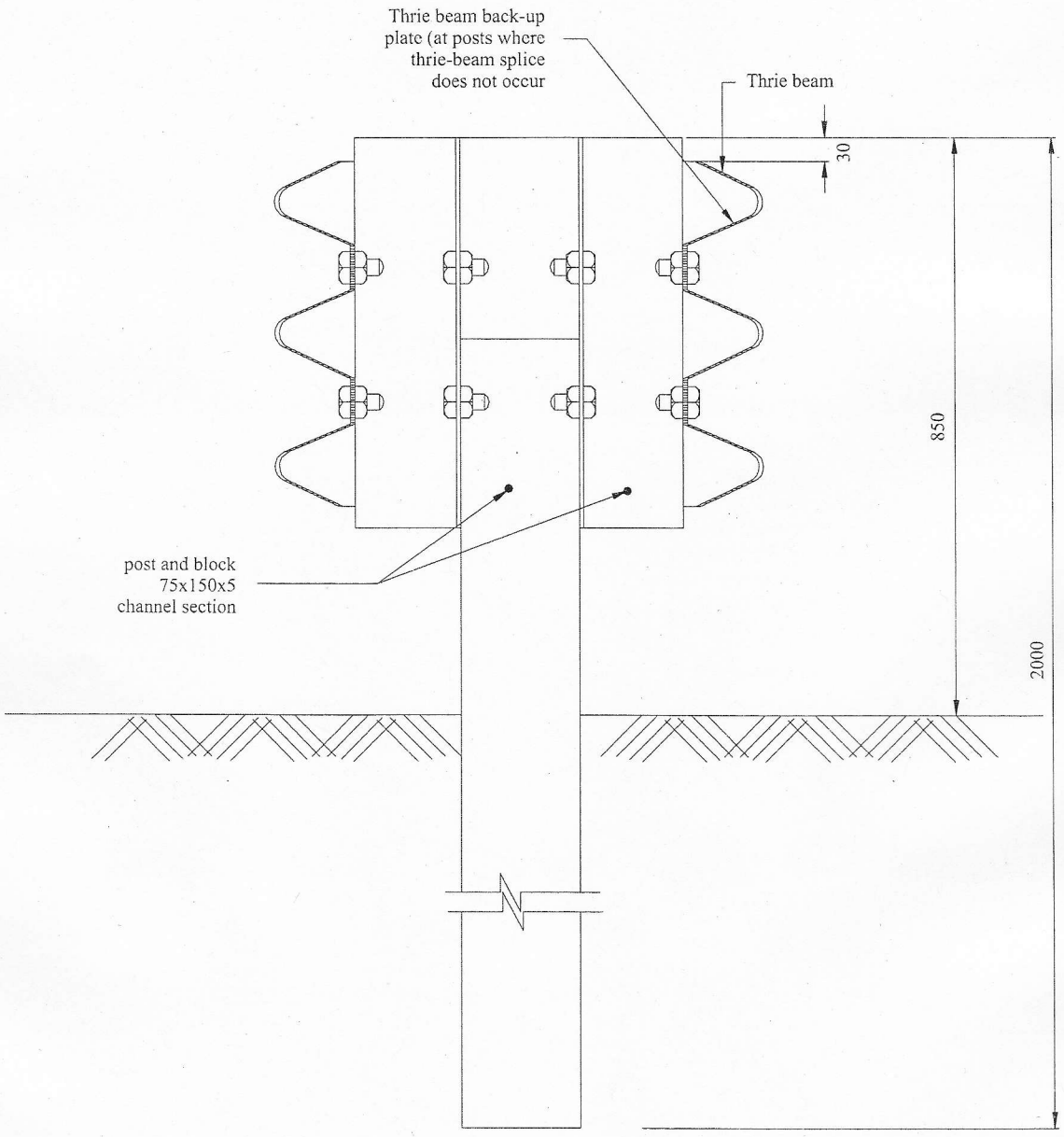

Note:
All dimensions are in mm.

Fig. 2.9 : Typical details of thrie beam median barrier

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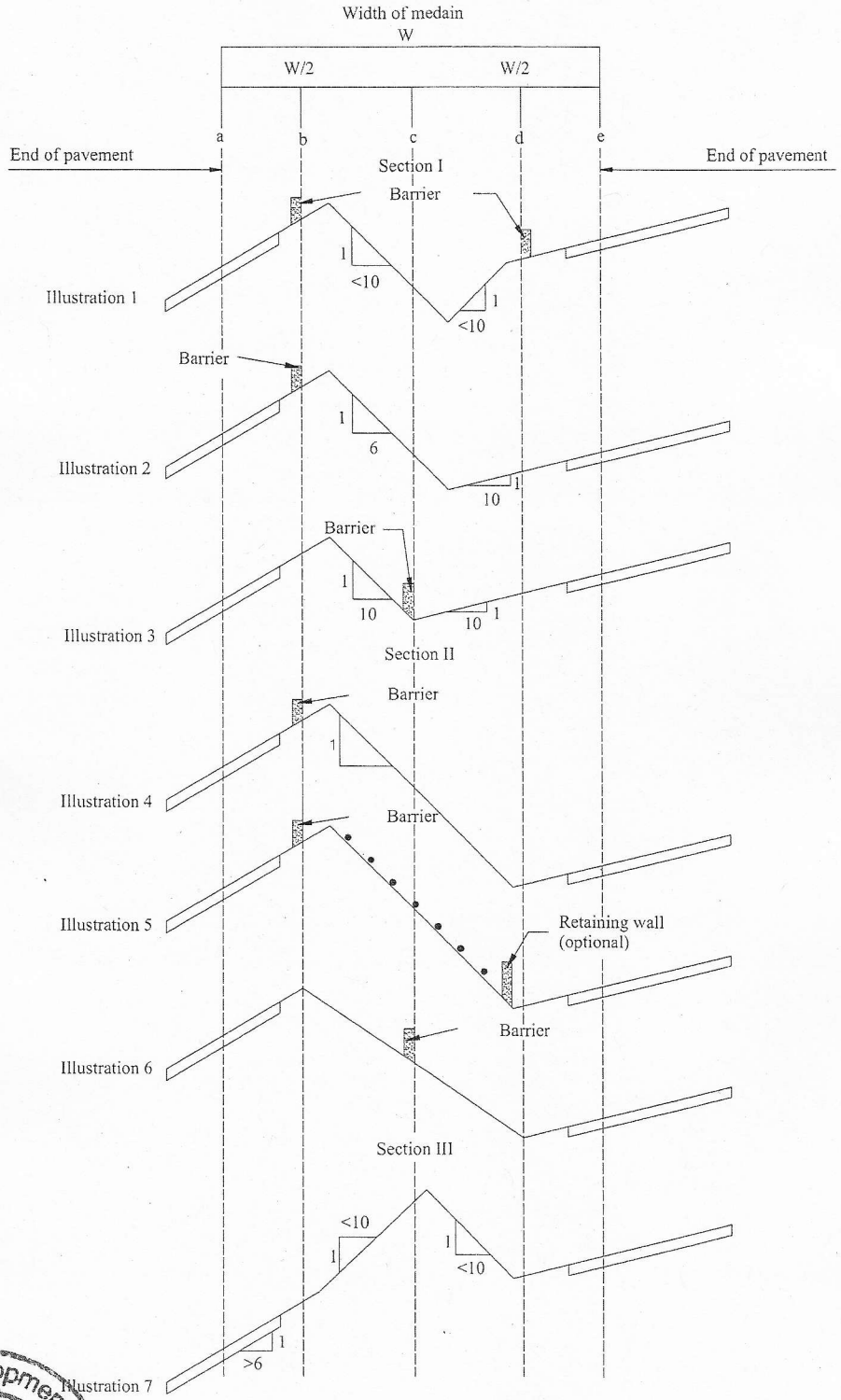
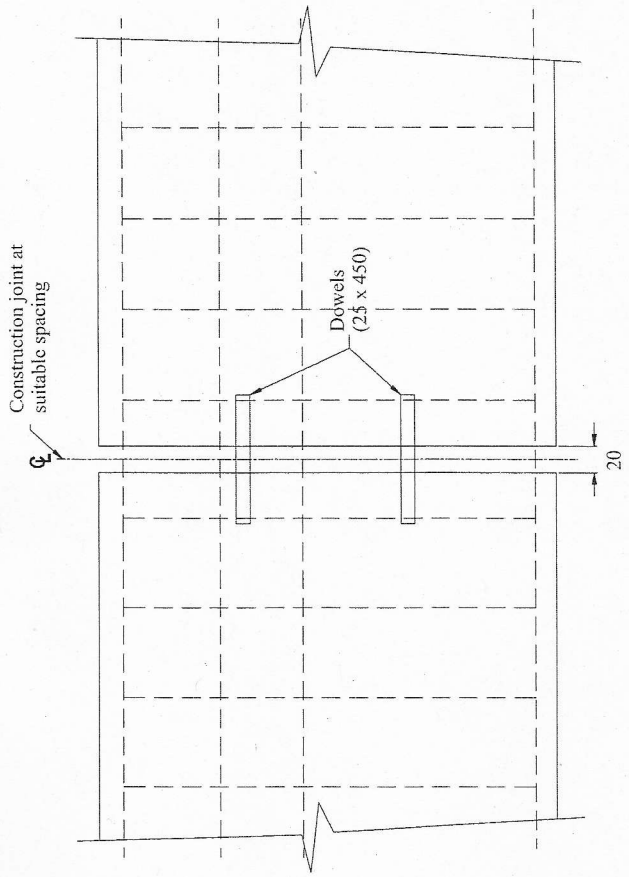
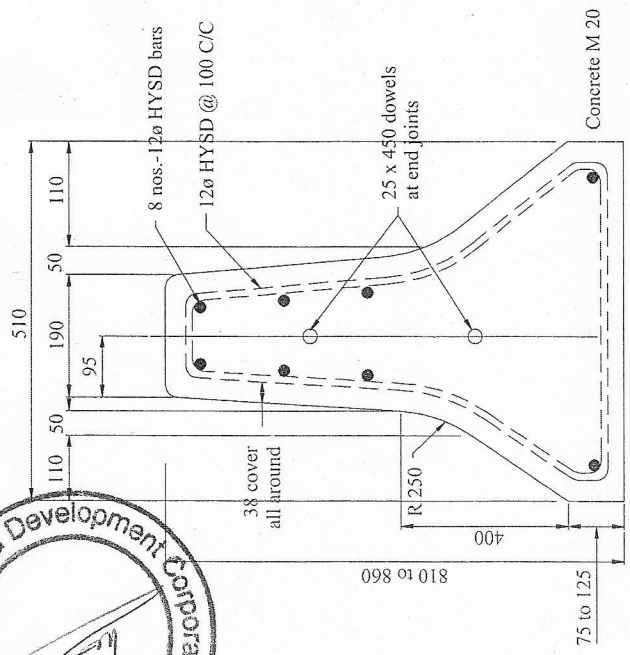


Fig. 9.10 : Recommended median barrier placement in non-level median





Note:
1. HYSD-High yield strength deformed reinforcement.
2. All dimensions are in mm.

Fig. 9.11 : Median barrier cast-in-situ design

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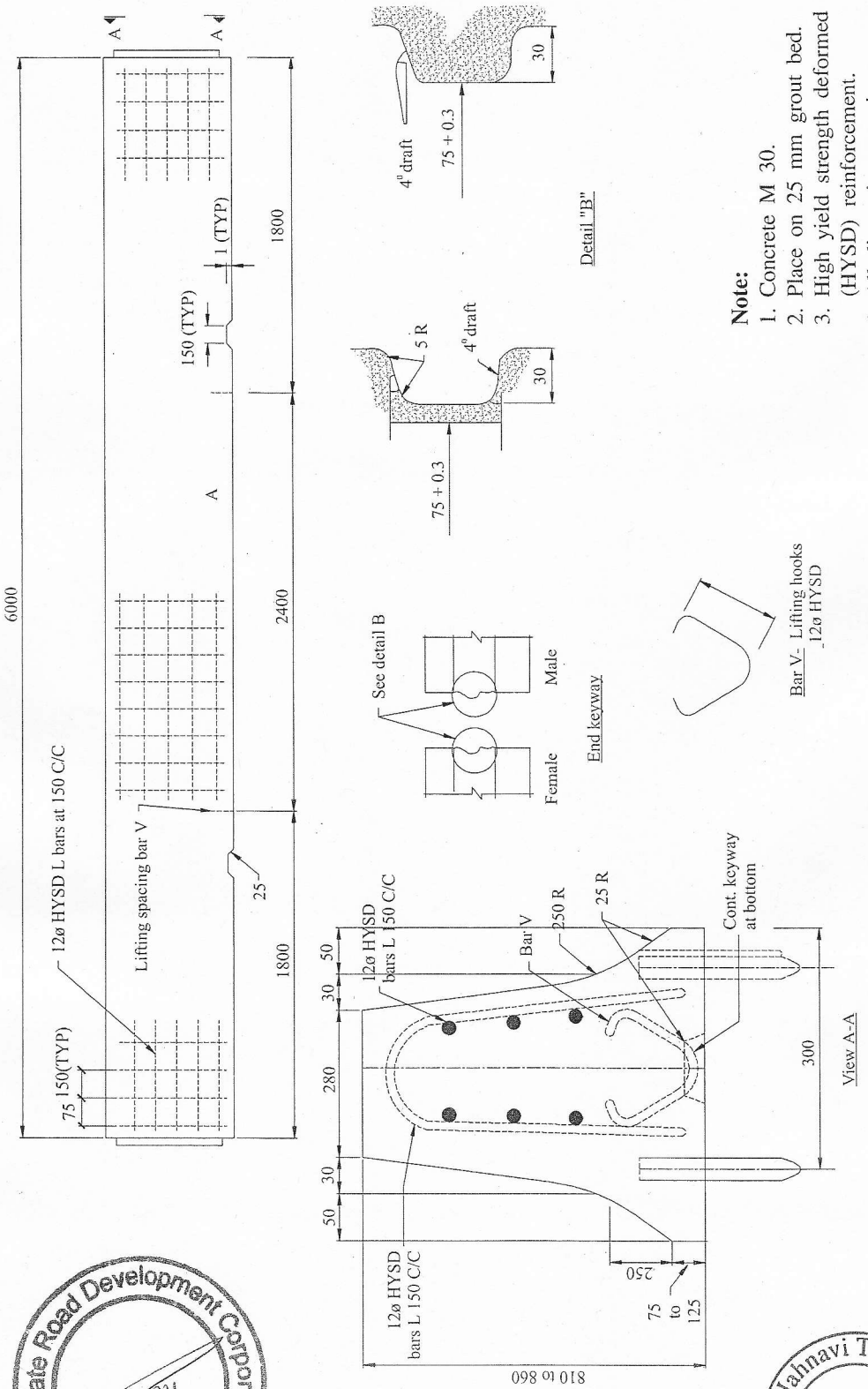

Fig. 9.12 : Median barrier precast design

Note:

1. Concrete M 30.
2. Place on 25 mm grout bed.
3. High yield strength deformed (HYSD) reinforcement.
4. All dimensions are in mm.

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Section 10

Toll Plazas

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SECTION 10

TOLL PLAZAS

10.1 General

The Concessionaire shall provide required number of Toll Plazas for collection of toll/ fee as per the Concession Agreement. The fee collection system shall be speedy, efficient and user friendly. The design of the Toll Plazas should be such that they are aesthetically pleasing and efficient and the fee collection staff should be quick, courteous and adequately trained before deployment.

10.2 Location of Toll Plaza

The location of toll plaza shall be indicated in Schedule C of the Concession Agreement. Their locations shall be decided keeping in view the following factors:

(i) Land availability

(ii) Stream of traffic on Toll Plaza

(iii) Visibility for the approaching traffic

(iv) Reasonably away from road intersections and/or rail crossings

(v) Free from risk of flooding and submergence, etc.

(vi) Preferably on flat land and away from congested urban locations.

10.3 Land for Toll Plaza

Adequate land for Toll Plaza shall be acquired to permit the provision of a minimum number of 16 toll lanes including all other buildings and structures to be accommodated at the Toll Plaza location. Land shall be acquired by the Government at its own cost. However, the Government may, if so decided, require the Concessionaire to procure the same on behalf of the Government.

10.4 Lay out and Design of Toll Plaza

10.4.1 Stage construction of Toll Plaza in respect of number of toll lanes shall be allowed. However, other structures as envisaged in the Concession Agreement shall be provided at the initial stage itself.

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10.4.2 *General Lay Out*

(i) Lane width = 3.2 m in general and 4.1 m for oversize vehicles.

(ii) Median (a) Width = 1.8 m; (b) Length = 25 m

(iii) Transition - A transition of 1 in 20 to 1 in 10 may be provided from four-lane section to the widened width at Toll Plaza on either side.

(iv) Provision for future expansion: The office building shall be located taking into consideration of future expansion.

Typical layout plan of 5+5 Toll plaza is given in Fig 10.1

10.4.3 *Number of lanes at Toll Plaza*

The number of lanes at the Toll Plaza in the initial stage should be corresponding to the forecast traffic for atleast 10 years. The forecast traffic should be converted in to peak hour peak direction (PHPD) traffic to derive the number of toll lanes.

PHPD	—	Forecast traffic x Peak hour factor x peak direction split
Forecast traffic	—	Design year forecast in terms of vehicles/day for the vehicles classified under tollable category. Non-tollable vehicles need not be considered for calculation of number of toll lanes, as they would be allowed to pass through a separate lane.
Peak hour factor	—	Percentage of traffic traveling during peak hour to Average Daily Traffic.
Peak Direction Split	—	Percentage of traffic traveling in peak direction during peak hour. (In case of rural highways this is generally close to 50%, however in case of urban/sub-urban sections this may be derived from the traffic counts.)

The number of toll lanes should be calculated as:

Number of toll lanes	—	PHPD/Service rate (rounded up to whole number) (A service rate of 180 vehicles/hour may be used for semi-automatic toll gate with manual cash collection)

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The number of toll lanes for the Toll Plaza may be derived using Table 10.1

Table 10.1 : Number of toll lanes in each direction (Semi Automatic toll gates)

Design year Forecast Traffic (in vehicles/day), total of both directions	Peak Hour Factor				
	5%	6%	7%	8%	9%
Less than 20,000	4	4	4	5	5
20,000	4	4	4	5	5
22,500	4	4	5	5	6
25,000	4	5	5	6	7
27,500	4	5	6	7	7
30,000	5	5	6	7	8
32,500	5	6	7	8	9
35,000	5	6	7	8	9
37,500	6	7	8	9	10
40,000	6	7	8	9	10

Note:

1. *The above assessment assumes 50% direction split*
2. *On deriving the number of toll lanes based on traffic as above, one additional toll lane should be added in each direction as a spare lane for maintenance purposes.*
3. *With fully automatic toll collection, a service rate of upto 360 vehicles per hour may be used.*

10.4.4 If at any time, the queue of vehicles becomes so large that the waiting time of the user exceeds three minutes, the number of toll lanes shall be increased so that the maximum waiting time is brought down to less than three minutes.

10.4.5 *Toll Collection System:*

A minimum semi-automatic system for toll collection shall be adopted. In this system, the collection of tolls and recording data would be made through electronic equipment.

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Within a period of 3 years from COD at least two booths for either side traffic shall be upgraded to automatic toll collection with the help of smart card / censor.

For smooth and efficient functioning of toll collection, the following arrangements / facilities shall be provided:

(i) The staff posted at the counters shall be provided with sufficient equipment and small denomination notes / coins at the start of each shift.

(ii) Intercom facility shall be provided between booths and the office of the supervisors.

(iii) If the booth is closed for any reason, incoming traffic shall be guided into the adjoining working booth with the help of appropriate signs.

(iv) The entire fee collection complex shall be adequately guarded.

10.4.6 *Vehicle Counting Classifier (VCS) Unit:*

Each lane shall be equipped with micro controller based vehicle counting and classifier and battery back up to collect data in case of power failure.

10.5 Toll Booths

Toll booths may be provided of prefabricated materials or of masonry. The toll booths shall have adequate space for seating of toll collector, computer, printer, cash box, etc. It should have provision for light, fan and air conditioning. The typical details of traffic island with toll booth are given in Fig. 10.2.

10.6 Road Works

10.6.1 Vehicles are required to decelerate while entering the toll lane, stop for payment and then accelerate and merge in the main line traffic of the highway. All these operations of vehicles at toll plaza are prone to oil/POL spillage on the surface, which may have cut back action on bituminous surface.

10.6.2 Therefore concrete pavement would be preferred in the Toll Plaza area including tapering zone, from durability and long time serviceability consideration. The rigid pavement shall be designed as per IRC:58. For this work, use of paver shall not be insisted. The use of cement concrete paver blocks would also be permissible.

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10.6.3 The Concessionaire may also adopt flexible pavement. The design of flexible pavement shall be as per IRC:37. Suitable provision shall be made to overcome the problem of rutting which is usually observed at the toll plaza sections because of acceleration, deceleration and static movement of vehicles.

10.7 Traffic Signs

10.7.1 A well thought out strategy should be evolved for providing traffic signs and road markings in and around the Toll Plaza in accordance with IRC:67 and IRC:35.

10.7.2 Signs should be placed along the Project Highway, roadway of Toll Plaza to guide and render assistance to the drivers approaching the Toll Plaza. It is necessary to remind the driver about the existence of Toll Plaza one km ahead with a repeater sign 500 m ahead. Stop sign shall always be used in combination with certain road markings such as stop line and the word 'STOP' marked on the pavement.

10.7.3 The Toll Plaza sign should be supplemented by the sign advising the users of the notified toll rates (fees) for various types of vehicles.

10.8 Road Markings

10.8.1 The road markings shall be used in accordance with Section 9 of this Manual. The road markings for the Toll Plaza area shall consist of lane markings, diagonals, chevron markings. Single centre line is provided at the centre of carriageway at toll gate to demarcate each service lane. Diagonal markings for central traffic island and chevron markings at side traffic island shall be provided to guide the approaching and separating traffic.

10.8.2 The road markings shall be in accordance with IRC:35 "Code of Practice for Road Markings". Thermoplastic paint with reflective glass beads shall be used as road marking material. Typical details of markings at toll plaza are given in Fig. 10.3.

10.9 Toll Plaza Complex

The size of the office complex depends on the minimum requirement of facilities such as toilet, bathroom, store, rest room, traffic aid post, medical aid post etc. All these depend on the size of Toll Plaza and may vary as per the need of a particular location/ area.

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The following facilities shall be provided at Toll Plaza complex:

(i) Office complex with toilet, bathroom and rest room.

(ii) Traffic aid post

(iii) Medical aid post

(iv) Vehicle rescue post

(v) Telecom rescue post

(vi) Traffic census post

10.10 Check/Barrier Gate

A boom barrier is generally placed at the exit of each lane to avoid passing of any vehicle without payment of toll (fee). These barriers normally remain closed and on payment of toll (fee) by the passing vehicle, the barrier will be opened by the toll collector through his key-board command. Generally, electrically operated barrier gates shall be used.

10.11 Lighting

10.11.1 The Toll Plaza complex shall have continuous and reliable electric supply system for efficient functioning.

10.11.2 *Interior Lighting:*

The toll booths and facility building office shall be illuminated adequately. Indoor lighting shall be with fluorescent lamps. Lighting should be provided in such a manner that glare is avoided or minimised. The level of illumination shall be 200 to 300 Lux as per IS:3646 part II.

10.11.3 *Exterior Lighting:*

Lighting of the Toll Plaza is important for enhancing the night visibility. The lighting system shall consist of the following major components.

(i) High Mast lighting

(ii) Lighting on both side approaches to the Toll Plaza

(iii) Canopy lighting of complex

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(iv) Back up arrangement in case of power failure

(v) Highway lighting around Toll Plaza

10.11.4 *High Mast Lighting:*

The 'Code of Practice for Lighting of Public Thoroughfare' IS:1944 (Part I & II) - 1970 recommends 30 Lux of average illumination on road surface and ratio of minimum to average illumination as 0.4. Normal low light poles are not able to give the required lighting conditions. It is, therefore, necessary to install high mast. A height of 30 m for the mast is considered suitable to have uniform spread of desired level of illumination in the Toll Plaza area for frequent and safe movement of vehicles.

10.11.5 *Highway Lighting:*

Lighting in 300 m length on both side approaches of toll plaza shall be provided to enhance the safety on highway and to make the drivers conscious of their approaching the toll gate. These shall be provided on the mild steel welded tubular pole of 10 m height from road surface and with 2 m overhead on both sides. Sodium Vapour lamp of 200-250 watts should be provided for these poles on both sides at 50 m staggered spacing. There should be provision for flashing signals for foggy weather conditions.

10.11.6 *Canopy Lighting:*

A higher level of illumination upto 100 Lux by providing 150 watt metal halide lamps shall be provided at the toll gate and at toll booth locations. 1000-watt halogen lamps shall be provided at the selected nodes of space frame of the canopy to ensure uniform illumination of the area.

10.12 Water Supply

Adequate water supply shall be provided. For working out water requirement and internal drainage system, reference may be made to IS:1172, IS:5339 and IS:1742.

10.13 Fire Fighting System

For protection of the Toll Plaza complex against fire hazards, adequate fire protection arrangement shall be made.

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10.14 Report to be submitted

The design and layout of Toll Plaza complex including all facilities shall be submitted to the Independent Engineer for review and comments, if any.

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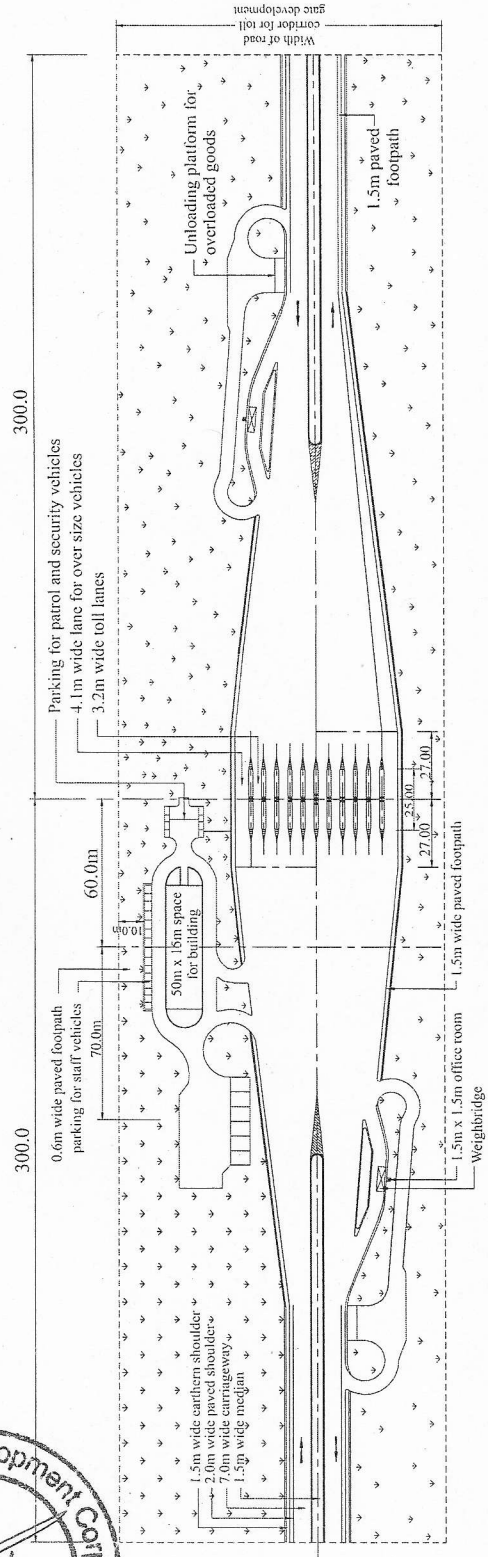

Note:

1. Detailed system of road marking as per IRC:35.
2. Building location should be such that plaza can accomodate 16 toll-lanes.

Fig. 10.1 : Typical layout for a toll plaza

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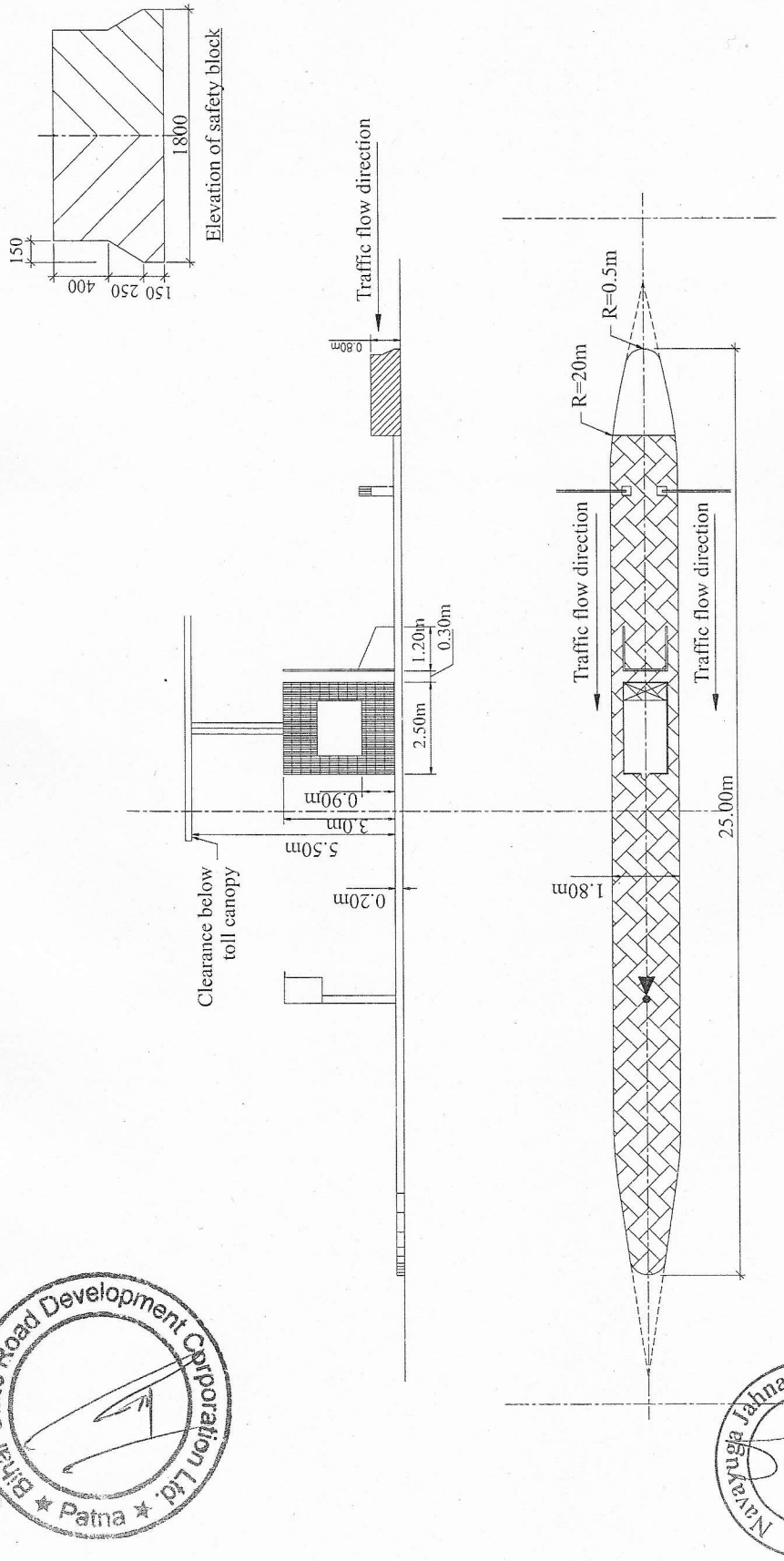

Fig. 10.2 : Typical layout for traffic island with toll booth

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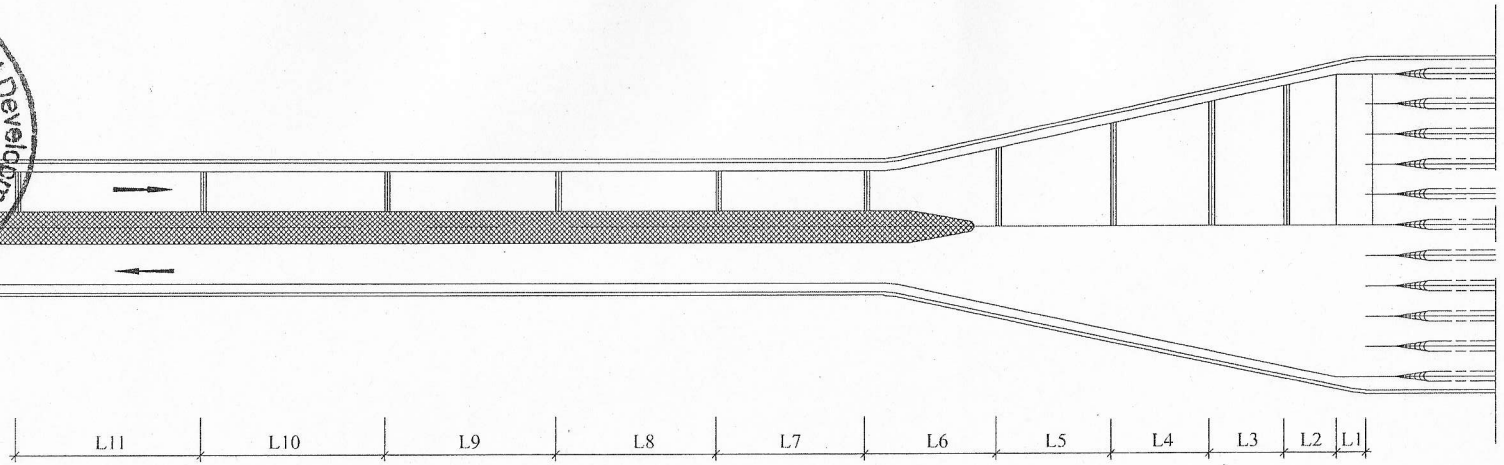
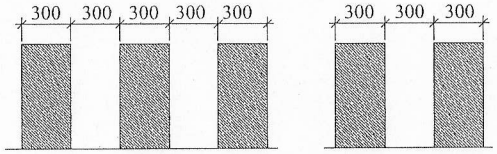


Distance form previous bar marking (m)	No. of bar markngs
L1 = 5	1
L2 = 9	1
L3 = 13	2
L4 = 17	2
L5 = 20	2
L6 = 23	2
L7 = 26	3
L8 = 28	3
L9 = 30	3
L10 = 32	3
L11 = 32	3



White transverse bar marking

Note:
Detailed system of road marking as per IRC:35.

Fig. 10.3 : Details of suggestive transverse bar marking for speed control at toll plaza

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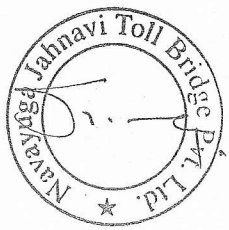
Section 11

Roadside Furniture





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SECTION 11

ROADSIDE FURNITURE

11.1 General

Roadside furniture shall be provided as per details given in this Section.

11.2 Road Boundary Stones (RBS)

Road boundary stones shall be provided at the boundary on both sides of the Right of Way available under the control of the Government. These shall be spaced at 200 m. The boundary stones shall be of cement concrete as per Type Design given in IRC:25. The boundary stones shall be painted with cement primer and enamel paint and marked 'RBS' by paint.

11.3 Kilometre and 200 m Stones

(i) The kilometre stones shall be provided at each kilometre on both sides of the Project Highway. The design and specification of kilometre stones shall conform to IRC:8. The matter to be written on the kilometre stones and the pattern thereof shall be as specified in IRC:8.

(ii) Two hundred metre stones shall be provided at every 200 m distance on both sides of the Project Highway. The design and specification of 200 m stones shall conform to IRC:26. The matter to be written on the 200 m stones shall be as specified in IRC:26.

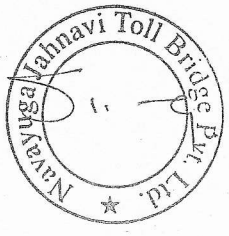
11.4 Roadside Railings / Pedestrian Guard Rails

11.4.1 *Pedestrian Guard Rails*

(i) Pedestrian guardrails are an important design element to prevent indiscriminate crossing and spilling over of pedestrians on to the carriageway. Their judicious use can help in ensuring that pedestrians cross the highway at predetermined and safe locations.

As the guardrails would confine the movement of pedestrians to the footpath, it is obligatory that sufficient width of footpath be made available for the use of pedestrians.





(ii) Design: The design shall be such that the guardrails are neat and simple in appearance. The height of guardrail shall be 1.2 m from footpath level. The visibility of the approaching vehicles by the pedestrians as well as the visibility of the pedestrians by the drivers of the approaching vehicles shall be adequate. The railings shall not have any thick horizontal member, other than the baluster to achieve the desired objective.

Pedestrian guardrails may be of reinforced cement concrete, iron tubes, steel channeled sections and pipes, or steel sections appropriate for the environment. Refer to IRC:103.

(iii) Application: Pedestrian guardrails shall be provided at the following locations/ situations:

(a) Hazardous locations on straight stretches: In particularly busy reaches, where the road is congested and vehicles move at a fast pace, guardrails shall be provided on both sides of the carriageway so as to channelize the pedestrians on to the planned crossing locations.

(b) At Junctions/Intersections: Railing barriers shall be provided to prevent people from crossing the junctions diagonally at signalized intersections. The barrier shall open only at planned crossing facility (at the Zebra Crossing). At unsignalized junctions they shall be provided for sufficient length to guide the pedestrians to the nearest planned pedestrian crossing.

(c) Schools: Provision of guardrails near schools, where children would otherwise run straight into the road, is essential. If there is a pedestrian crossing or a school crossing patrol nearby, the guardrails shall be extended up to it.

(d) Bus stops, Railway stations, etc.: Guardrails shall be provided along sidewalks with suitable access at bus stops, railway stations and other areas of heavy pedestrian activity such as cinema houses, stadia, etc. for guiding pedestrians safely in such areas.

(e) Overpasses, Subways, etc.: Guardrails shall be provided at these locations in order to induce the pedestrians to use the facilities provided for them.

(f) Central reserves: Where there is a central reserve or a median, guardrails shall be erected within it to deter the pedestrians from attempting a crossing.

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(iv) Gaps/Setback Distance: The guardrails shall be set back from edge of the carriageway by at least 150 mm.

11.5 Overhead Traffic Signs

11.5.1 Overhead road signs shall be provided, in lieu of, or as an adjunct to, ground sign where the situation so warrants for providing warning of hazardous situations, help in regulating traffic, for proper information and guidance of the road user. The following conditions may be considered while deciding about the provision of overhead signs:

(i) Traffic volume at or near capacity,

(ii) Restricted sight distance,

(iii) Built up stretches,

(iv) Insufficient space for ground mounted signs,

(v) Distances of important places and route highways at suitable intervals.

11.5.2 The overhead signs shall be reflectorised with high intensity retro-reflective sheeting preferably of encapsulated lens type, unless specified otherwise.

11.5.3 Design, location, application, height, vertical and lateral clearances of overhead road signs shall be as specified in Section 800 of MOSRTH Specifications.

11.5.4 Materials for overhead signs support structure and installation shall be in accordance with Section 802 of MOSRTH Specifications.

11.5.5 Locations and size of overhead traffic signs shall be specified in Schedule B of the Concession Agreement.

11.6 Traffic Impact Attenuators

11.6.1 These are protective systems which prevent errant vehicles from impacting fixed objects like the following:

(i) Bridge abutments

(ii) Structural columns of large direction signs

(iii) Illumination lamp posts

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Necessary safety devices like an assembly of old tyres or steel drums filled with sand can be adopted at suitable location.

11.7 Road Delineators

11.7.1 They provide visual assistance to drivers about the road ahead especially at night. These include pavement markings and post type delineators.

11.7.2 Delineators shall include:

(i) Roadway indicators - They shall be provided to delineate the edges of the roadway so as to guide drivers about the alignment and particularly where it might be confusing to drivers.

(ii) Hazard Markers - They shall be used to define obstructions like guardrails and abutments adjacent to the carriageway, particularly at culverts and bridges, which are narrower than the roadway width.

(iii) Object Markers - They shall be provided to indicate hazards and obstructions within the vehicle flow path like channelizing islands close to the intersections.

11.7.3 Delineator by pavement markings shall be provided as per IRC:35; guidepost side delineators shall be provided as per IRC:79 and Section-800 of MOSRTH Specifications.

11.8 Report to be submitted

The Concessionaire shall submit report containing the proposals for provision of roadside furniture on the Project Highway to the IE for review and comments, if any.

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Section 12

Landscaping and Tree Plantation

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SECTION 12

LANDSCAPING AND TREE PLANTATION

12.1 General

The Concessionaire shall plant trees and shrubs of required number and type at the appropriate locations within the Right of Way and in the land earmarked by the Government for afforestation. The Government shall specify the number of trees which are required to be planted by the Concessionaire as compensatory afforestation or otherwise. The Concessionaire shall also maintain the trees and shrubs in good condition during the Concession Period as per the maintenance schedule. The guidelines given in this Section shall be followed in plantation of trees and shrubs.

12.2 Design considerations in various locations

12.2.1 *Set-back distance of trees and other plantation:*

Trees on the roadside shall be sufficiently away from the roadway so that they are not a hazard to road traffic or restrict the visibility. Most vulnerable locations in this regard are the inside of curves, medians, junction corners and cut slopes. Trees shall be placed at a minimum distance of 14 metres from the centre line of the extreme traffic lane to provide recovery area for the vehicle that runs off the road. A second row of trees 6m further away will also be desirable and planted wherever possible. Preferably the first row of trees shall consist of species with thick shade and other rows of vertical type providing thin shade. Expansion of the Project Highway to 6-lanes shall be taken into consideration while locating the trees so that land is free of trees when further widening takes place. The distances for alternative rows of trees shall be reckoned from the nearest edge of the unidirectional carriageway. No plantation shall be allowed on the embankment slopes.

12.2.2 *Set-back of Trees on Curves:*

Experience has been that growth of thick vegetation close to the formation on inside of horizontal curve leads to serious reduction of sight distance and causes avoidable accidents with cattle/children suddenly emerging from the side. Uncontrolled trees/ vegetation, may also affect visibility of traffic control devices and road signs. Therefore, in plain terrain a stopping sight distance of 180 m corresponding to the design speed of 100 km per hour may be ensured on all curved sections of the Project Highway along the innermost lane. However, where there are site restrictions their

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requirement may be reduced to 120 m corresponding to the design speed of 80 km per hour as a special case. The existing trees and vegetation on the sides have to be suitably thinned/ trimmed, or even removed if necessary and a regular programme of pruning of the offending trees shall be undertaken as part of the maintenance operations.

In the urban section of the Project Highway, trees can be planted on the raised footpaths, provided the distance between the edge of kerb and the nearest edge of tree is not less than 2 metres.

In all cases, location of trees shall be checked to ensure that to the motorists clear vision of all highway signs/signals is available at all times. Also, the foliage or trees shall not come in the way of roadway lighting.

12.2.3 *Vertical clearance of trees and other plantations:*

For safe traffic operation, the vertical clearance available across the roadway shall be minimum 5 m. From this angle, the probable size of all plants shall be anticipated in advance, at the time of initial planting.

To allow for the effects of growth, wind and rain, trees shall be trimmed to 6 m and 6.5 m above the pavement in rural and urban areas respectively.

12.2.4 *Plantation in medians:*

In the sections of the Project Highway where median width is more than 3 metres, shrubs shall be planted and maintained to cut off headlight glare from traffic in the opposite direction. Flowering plants and shrubs are eminently suited for the purpose. These shall be planted either in continuous rows or in the form of baffles. The height of shrubs shall be maintained at 1.5m to cut off the effect of traffic lights coming from the opposite direction.

In the sections, where the width of median is less than 3 metres, shrubs or flowery plants may be planted in between crash barriers or other means like metal/plastic strips to cut off glare shall be provided.

The shape of shrubs and plants shall be suitably regulated so that there is no overgrowth either vertically or horizontally beyond the edge of the paved median.

In the vicinity of road intersections and median openings, median planting shall be avoided or restricted to low-growing varieties to ensure adequate visibility.

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12.2.5 *Spacing of Avenue Trees:*

The spacing of avenue trees will depend on the type and growth characteristics of trees, requirement of maintenance, penetration of distant views, etc. A range of 10-15 m would meet the requirement for most varieties.

12.2.6 *Choice of Trees:*

The following guidelines shall be kept in view while selecting the species of trees to be planted:

(i) Trees shall be selected with due regard to soil, rainfall, temperature and water level.

(ii) Trees which become very wide shall be avoided as their maintenance would cause interference with traffic flow.

(iii) The species must be capable of developing a straight and clean bole upto a height of 2.5 to 3.5 m from the ground level.

(iv) The selected trees shall, preferably, be fast growing and wind-firm. These shall not be thorny or drop too many leaves.

(v) The trees shall be deep rooted, as shallow roots injure pavements.

(vi) In urban areas, the species selected shall be of less spreading type, so that these do not interfere with overhead services, clear views of signs/signals, and efficiency of roadway lighting.

12.3 Report to be submitted

The Concessionaire shall submit scheme for plantation and maintenance of plants and trees to the Independent Engineer for review and comments, if any.

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Section 13

Project Facilities

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SECTION 13

PROJECT FACILITIES

13.1 General

The requirement of the project facilities to be provided shall be indicated in Schedule-C of the Concession Agreement. This shall include information regarding location and size of the facilities. Land required for provision of facilities shall be acquired by the Government and the date of handing over of the land to the Concessionaire shall be indicated in the Concession Agreement.

13.2 Pedestrian Facilities

13.2.1 *General*

Pedestrians are vulnerable to being involved in accidents. Therefore, adequate consideration shall be given to their safety through provision of facilities. The facilities for pedestrians given in this Section shall be provided on the Project Highway.

13.2.2 *Footpaths (Sidewalks)*

(i) The sidewalks shall be provided in the built-up sections, on both sides, by barrier type (non-mountable) kerbs of height 200 mm above the adjacent road surface.

(ii) The width of sidewalks depends upon the expected pedestrian flow and shall be fixed subject to land availability, but shall not be less than 1.5 m.

13.2.3 *Pedestrian Guard Rails*

Pedestrian guardrails shall be as specified in Section 11 of this Manual.

13.2.4 *Pedestrian Crossings*

Where complete segregation of pedestrians from vehicular traffic is not provided, some form of planned road sharing principle shall be applied. Pedestrian crossings shall be provided where they will be well used. Pedestrian crossings shall be suitably integrated with the overall design of the intersection.

The following criteria shall be followed regarding selection of pedestrian crossings:

(i) At Grade Pedestrian Crossing (Pedestrian Crosswalk): Pedestrian crosswalks

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shall be provided at all important intersections and such other locations where substantial conflict exists between vehicular and pedestrian movements. Wherever possible, the crosswalks shall be at right angles to the carriageway and properly marked so that the pedestrians are subjected to minimum inconvenience. Crosswalks shall not substantially increase the walk distance of pedestrians. Adequate visibility, freedom from obstructions and sufficient space for waiting are the other important requirements for location of crosswalks.

At-grade pedestrian crossings shall be controlled. Controlled form of crossing shall be achieved through provision of Zebra Crossings, whether at signalized intersection or pedestrian actuated signal.

(ii) Zebra Crossing: A Zebra Crossing shall not be sited within 150 m of another such crossing. The Zebra Crossing shall be somewhat set back from the carriageway line. However, the set back distance shall not be so much as to cause an appreciable increase in walking distance for the pedestrians. Pedestrian guardrails may be necessary where the setback distance is appreciable or at the skew crossings.

The width of the Zebra Crossing shall be adequate and shall generally lie within a range of 2.0 m to 4.0 m. The crossing shall, as far as possible, proceed uninterrupted through the median strip. In the event of the median strip being used as pedestrian refuge, adequate width of median shall be provided. In case of raised medians, such portion could be suitably depressed with kerb height not exceeding 150 mm.

In the vicinity of Zebra crossing, guardrails of sufficient length shall be provided to deter pedestrians from crossing the road at any arbitrary point along the road.

(iii) Pedestrian Underpasses/Overpasses: The pedestrian underpasses/overpasses shall be provided as specified in Para 2.15.3 of this Manual.

13.3 Street Lighting

13.3.1 *General*

(i) The Concessionaire shall provide lighting at specified locations of the Project Highway using appropriate system and source of electric power as per the requirements of this Section.

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(ii) The Concessionaire shall make suitable arrangements for procuring power supply to ensure uninterrupted lighting during night and when visibility is low, including provision of DG sets as standby arrangements.

(iii) The Concessionaire shall bear all costs of procurement, installation, running and operation cost of all lighting, including cost of energy consumption specified in this Section.

13.3.2 *Specifications*

(i) Unless stated otherwise elsewhere in this Manual, the minimum average level of illumination on the stretches of the Project Highway including Toll Plazas, truck lay-byes, interchanges etc. shall be 30 Lux.

(ii) The layout of the lighting system together with type of luminaries for different locations shall be prepared by the Concessionaire in such a manner that the minimum illumination level prescribed in Para 13.3.2(i) can be achieved and shall be submitted to the Independent Engineer for review and comments, if any, for compliance by the Concessionaire.

(iii) Overhead electrical power and telecommunication lines erected within the ROW by the Concessionaire shall be provided with adequate clearance so that safe use of the highway is not affected.

(iv) Vertical and horizontal clearances for electrical installations shall conform to IRC:32.

(v) All the fixtures, wires/cables, lights shall conform to relevant BIS specifications as a minimum. The Concessionaire with the prior review and comments of the Independent Engineer can use fixtures with better specifications.

13.3.3 Locations where lighting is to be provided: Unless specified otherwise in Schedule-C of the Concession Agreement and elsewhere in this Manual, the Concessionaire shall provide lighting at the following locations of the Project Highway:

(i) Toll Plaza Area: The lighting in and around Toll Plaza, toll booths, office building, on the approach road, etc. shall be as per Section 10 of this Manual.

(ii) Truck lay byes: Lighting at the truck lay byes shall be as per para 13.4 of this Manual.

(iii) At interchanges: Lighting at the interchanges shall be as per para 3.4.7 of this Manual.

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13.4 Truck Lay-byes

13.4.1 *General*

The Concessionaire shall construct and maintain adequate number and size of truck lay-byes for parking of trucks by the side of the Project Highway as indicated by the Government. The guidelines, as given here, shall be followed in regard to location, size and facilities to be provided at the truck lay-byes.

13.4.2 *Location and size*

Truck lay-byes shall, in general, be located near check barriers, interstate borders, places of conventional stops of the truck operators, etc. The places be identified on the basis of field survey and shall have adequate space for facilities as specified in subsequent para 13.4.3 and future growth.

13.4.3 *Facilities*

The truck lay-byes shall have the following facilities:

(i) Paved parking,

(ii) Rest areas with toilets, drinking water,

(iii) Telephone.

13.4.4 *Lighting*

The truck lay-byes and 50 m length of the Project Highway on its either side shall be illuminated at night to provide an average illumination of 30 Lux. Suitably designed electric poles having aesthetic appeal and energy saving bulbs may be used to provide required illumination. Alternatively, photo voltaic lamps may be used.

13.5 Bus Bays and Bus Shelters

13.5.1 *General*

The buses shall be allowed to stop for dropping and picking up passengers only at the bus bays. The Government shall indicate in Schedule-C of the Concession Agreement the number and broad location of bus bays to be provided by the Concessionaire. The bus bays shall conform to the specifications and standards given in this Section. In cases where bus stands are provided by the concerned State

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Government Transport Authorities, the Concessionaire shall provide only access road within the right of way.

13.5.2 *Location*

The location of the bus bays shall be fixed on the basis of following principles:

(i) The bus stops shall be sited away from bridges and other important structures and embankment sections more than 3 m high.

(ii) As far as possible, bus bays shall not be located on horizontal curves or at the summit of vertical curves.

(iii) The location shall have good visibility, not less than the safe stopping sight distance.

(iv) The bus bays shall not be located too close to the road intersections. A gap of 300 m from the tangent point of intersections to start/end of the bus bay shall be desirable. At minor intersections (e.g. junctions with village roads), distance of 60 m may be adopted. However, if a substantial volume of buses is to turn right at the intersection, it is necessary that the bus bay shall be located sufficiently ahead of the intersection so that the buses can be manoeuvred easily from the pick-up stop on the left hand side to the extreme right lane for turning. The location of the bus bays may be fixed after due consultation with the local communities expected to use such facilities.

(v) At major four-way intersections involving transfer of a substantial number of passengers from one pick-up stop to the other, it might be desirable to construct a single, composite bus stop of suitable design to cater to all the bus routes collectively.

(vi) In hilly areas, the bus bays shall be located, preferably, where the road is straight on both sides, gradients are flat and the visibility is reasonably good (usually not less than 50 m). Subject to these requirements, it will be advisable to choose locations where it is possible to widen the roadway economically for accommodating bus bays.

(vii) Where grade separator is provided, the location of bus bays shall be as under:

(a) Sufficiently away from the ground intersection.

(b) Sufficiently away from the longitudinal slope of the approaches.

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13.5.3 *Layout and Design*

(i) For plain area, typical layouts of bus bays given in Fig. 13.1 shall be adopted. The length "L" shown in Fig. 13.1 shall be 15 m, which shall be increased in multiples of 15 m if more than one bus is likely to halt at the bus bay at one time.

(ii) For hilly areas, where there is a general constraint on space, the layout indicated in Fig. 13.2 may be adopted.

(iii) Bus bays shall be provided on both carriageways of the Project Highway for each direction of travel independently. At intersections, the bus bays for up and down direction shall be located on farther sides of the intersection.

(iv) The bus bay shall be provided with a shelter for passengers. The shelter shall be structurally safe and aesthetic in appearance, while also being functional so as to protect the waiting passengers adequately from sun, wind and rain. If the shelter is constructed on the hillside, slopes shall be properly dressed and suitably protected to avoid slips. The shelter shall be set back from the kerb line by at least 500 mm.

13.5.4 *Pavement*

The pavement in the bus bays shall have adequate crust with respect to the wheel loads expected. Also, the surfacing shall be strong enough to withstand forces due to frequent braking and acceleration by the buses. The colour and texture of the bus bay surfacing shall be preferably distinctive from that of the main carriageway.

13.5.5 *Drainage*

(i) The bus bays shall have proper cross slope to drain off the excess water. No water, which is likely to splash on the waiting passengers, shall be allowed to collect near the bus shelters.

(ii) Suitable kerb gutter section with requisite longitudinal slope and outlets at intervals to ensure quick disposal of water shall be provided.

13.5.6 *Road Markings*

Pavement markings with thermoplastic paint having glass beads shall be provided at the bus stops as shown in Figs. 13.1 and 13.2 with the word 'BUS' written prominently on the pavement. Pedestrian crossings shall be marked slightly behind the standing

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position of the buses in order to reduce pedestrian conflicts. The kerbs shall be marked with continuous yellow line to indicate "No Parking".

13.6 Cattle Crossings

Facility for cattle crossings shall be provided as specified in para 2.15.3 of this Manual.

13.7 Traffic Aid Posts

Traffic Aid Posts shall be established at Toll Plaza locations in accordance with the provisions of the Concession Agreement.

13.8 Medical Aid Posts

Medical Posts shall be established at Toll Plaza locations in accordance with the provisions of the Concession Agreement.

13.9 Vehicle Rescue Posts

The Concessionaire shall provide a vehicle rescue post at Toll plaza location with all necessary equipment as specified in the Concession Agreement.

13.10 Telecom Posts

The Concessionaire shall provide a Telecom Post at Toll plaza location with all necessary equipment as specified in the Concession Agreement.

13.11 Noise Barriers

The Concessionaire shall carry out noise impact studies of the Project Highway and submit proposal for provision of noise barriers for review and comments, if any, of the Independent Engineer and undertake implementation of the proposal in consultation with the Independent Engineer.

13.12 Report to be submitted

The Concessionaire shall submit report containing the proposals for provision of project facilities on the Project Highway to the IE for review and comments, if any.

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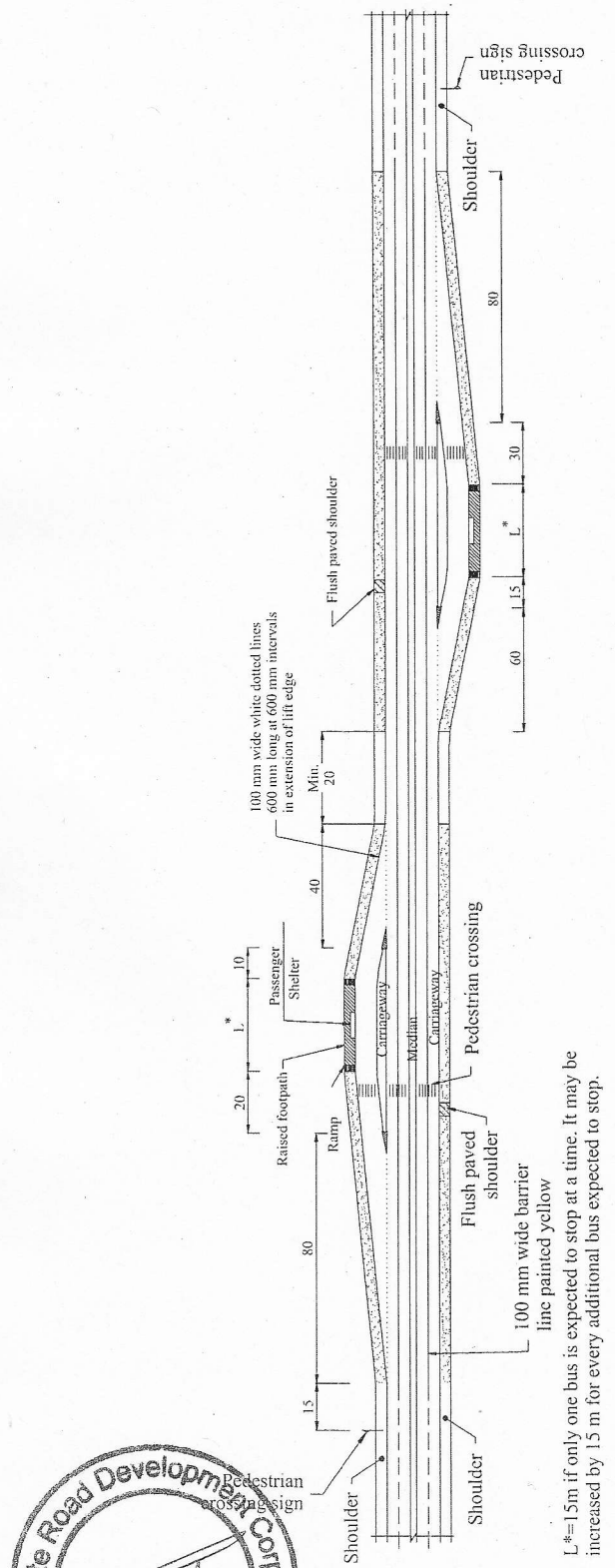

Note:
All dimensions are in metres except as shown otherwise.

Fig. 13.1 : Layout of staggered pick-up bus stop

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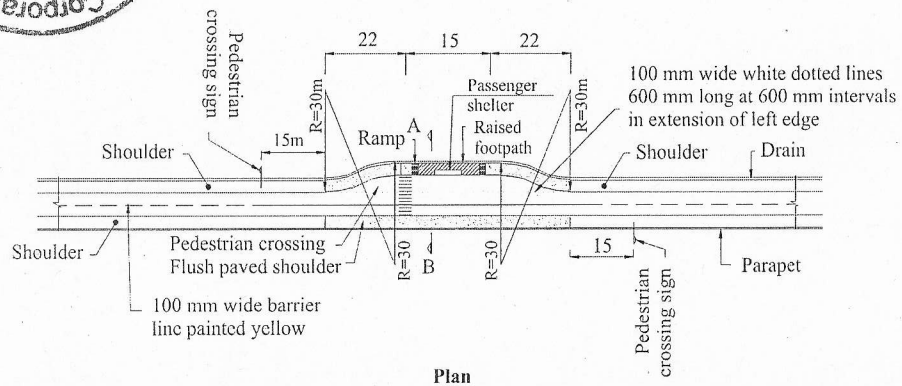
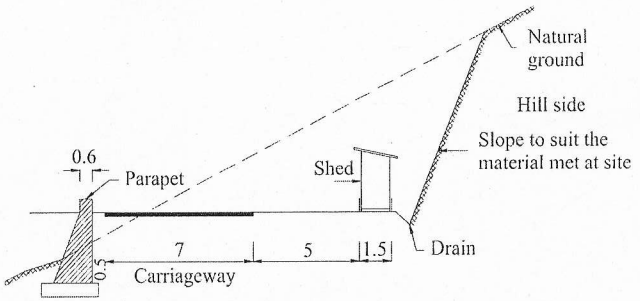


Plan



Section through road on A-B

Note:
All dimensions are in metres except as shown otherwise.

Fig. 13.2 : Layout of pick-up bus stop in hilly area

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Section 14

Special Requirements for Hill Roads

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SECTION 14

SPECIAL REQUIREMENTS FOR HILL ROADS

14.1 General

14.1.1 The Concessionaire shall pay due attention to geo-technical, environmental and social aspects of hill roads and take appropriate measures to ensure the following: (The guidelines given in IRC:SP:48 may be referred to, for details).

(i) Stability against geological disturbances.

(ii) Prevention of soil erosion.

(iii) Provision of efficient drainage and preservation of natural drainage system.

14.1.2 If there are any landslide prone areas along the road alignment, adequate investigation shall be undertaken and appropriate remedial measures shall be provided as per guidelines given in IRC:SP:48.

14.1.3 Where any new construction/realignment is involved, the alignment shall avoid large scale cuttings and fillings and follow the profile of land, as far as possible.

Areas having potential landslide or settlement problems shall be avoided. Adverse impact on the environment shall be reduced by adopting proper mitigation measures. Refer to guidelines given in IRC:SP:48.

14.1.4 Unstable hill slopes shall be adequately addressed by providing appropriate bio-engineering and stabilization measures.

14.1.5 Necessary safeguard shall be taken to protect ecology sensitive areas like wild life and bird sanctuaries, reserve forests, national parks, etc.

14.1.6 Protective structures for traffic such as parapets, railings, roadside safety barriers, boulder nets, etc. shall be provided, where necessary.

14.1.7 In mountainous and steep terrain, the scope of work defined by the Government may be two-lane carriageways on different alignments (contours). In that case, the Manual of Specifications and Standards for two-laning of Highways shall apply to the two-lane carriageways on different alignments (contours).

14.2 Set back distance at Horizontal Curves

Requisite sight distance should be available across the inside of horizontal curves.

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Lack of visibility in the lateral direction may arise due to obstructions like walls, cut-slopes, wooded areas, etc. Set back distance from the central line of the carriageway, within which the offending obstructions should be cleared to ensure the needed visibility, can be determined using the Equation given in IRC:52.

14.3 Grade Compensation at Curves

At horizontal curves, the gradient shall be eased by applying the grade compensation correction for gradients steeper than 4 per cent in accordance with IRC:52.

14.4 Hairpin Bends

Hairpin bends, where unavoidable, may be designed either as a circular curve with transition curves at each end or as a compound circular curve.

Design criteria given in IRC:52 shall be adopted for the design of hairpin bends. At hairpin bends, the full roadway width shall be surfaced.

14.5 Climbing Lane

Climbing lane shall be provided, where specified in Schedule-B of the Concession Agreement, in order to address the necessity of making available separate lane for safe overtaking for vehicle travelling uphill.

Proper signing of road markings shall be provided to ensure that the absolute right of way for climbing vehicles is available.

14.6 Rock Blasting

Heavy rock blasting should be avoided. Controlled blasting shall be resorted to. Blasting shall be supervised by experienced personnel. Blasting and related operations shall be carried out in accordance with Clause 302 of MOSRTH Specifications.

14.7 Cut Slopes

Cut slopes shall be rendered stable in the construction stage itself, by cutting at the correct angle and benching etc. including slope stabilizing structures like drains, breast walls, pitching etc.

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14.8 Tunnels

Where it is necessary to cross hills or high ridges, the various alternatives including construction of tunnel to avoid deep cuts shall be considered and the most preferred alternative shall be chosen. The alternative to be followed shall be indicated by the Government in Schedule-B of the Concession Agreement. Where road is to be taken through tunnel, its salient details shall be indicated in Schedule-B of the Concession Agreement.

14.9 Drainage

For drainage of water from roadside, an effective system of drainage shall be constructed to lead the run-off to natural water courses. In particular, catch water drains (Refer to para 6.5 of this Manual) shall be provided above the cut slopes. It shall be ensured that water is not drained into villages and cultivated land. Location of cross drains and culverts should be so chosen as to avoid erosion of the outlet. Erosion control works like drop walls, apron at out-fall points along with pitching/ paving of the channel shall be provided where required.

14.10 Retaining Walls

14.10.1 Retaining walls shall be provided:

(i) To support the down hill side unstable strata or fills,

(ii) To achieve width of roadway, where cutting into hill is restricted,

(iii) To arrest damage caused to the valley side and the road, by under cutting by a stream or other water course,

(iv) At valley points, where water flows over the road,

(v) At places where the valley side gets saturated in the monsoons and is likely to result in slips and damage to the road,

(vi) At any other locations warranting provision of retaining walls.

14.10.2 The retaining walls on the existing roads shall be inspected to check and assess the requirements of repairs and/or strengthening or reconstruction. If so required, the repair, strengthening or reconstruction work shall be carried out as per the assessment.

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14.10.3 For general features, arrangement and design, guidelines given in IRC:SP:48 may be referred to.

14.11 Aprons etc.

Construction of apron, pitching, flooring shall conform to Clauses 2503 to 2507 of MOSRTH Specifications.

14.12 Disposal of debris

Disposal sites shall be identified for disposal of waste, debris, etc. Tipping of waste into valley sides, stream channels, water bodies, and forest areas shall not be resorted to.

14.13 Report to be submitted

The Concessionaire shall submit report containing proposal for special requirements in hill areas to the IE for review and comments, if any.

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Appendices

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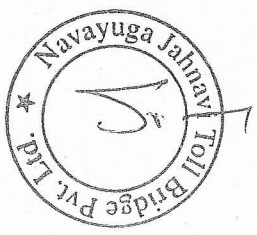
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APPENDIX-1

(Reference Para 1.11)

List of paras for preparing Schedules of the Concession Agreement

Section	Para	Particulars to be specified
Section 1	1.13	Utilities to be constructed/shifted
Section 2	2.1 (ii) (a)	Requirement of 6 laning in stretches passing through built up areas, and such stretches.
	2.1 (ii) (b)	Construction of bypass, alignment and land for the bypass.
	2.1 (v)	Land for geometric improvements, and such stretches
	2.2.3	Land for geometric improvements and such stretches for ruling design speed
	2.3	Right of way
	2.5.2 (i)	Provision of foot paths in built up sections
	2.6.2	Width of raised median if flush or depressed median cannot be provided
	2.14.2	Provision of Service Roads and Stretches and treatment at bridge locations
	2.14.2.4	Design Traffic for Service Road with justification if more than 2 msa is specified
	2.15.1	Location and other features of grade separated structures
	2.15.2	Type of Structures for Vehicular under/over passes
	2.15.3 (i)	Location of Cattle and Pedestrian Underpasses/overpasses
	2.20	List of stretches that are not required to be constructed as 6-lanes when traffic exceeds specified design service volume
Section 3	3.1 and 3.2	Type of Intersection and land for intersection
	3.3.1 (ii)	Location and other features of grade separated intersections without ramps.
	3.3.3	Length of viaduct at grade separated structures
	3.4.1 (iii)	Location and other features of interchanges
	3.4.5	Length of viaduct at grade separated structures (Inter changes with ramps)
Section 4	4.2.2 (ii)	Sections of existing road to be raised
Section 5	5.2.1	Type of pavement for new construction, if not flexible pavement

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Section	Para	Particulars to be specified
	5.2.2	Type of strengthening of existing flexible pavement, if not flexible pavement
	5.2.3	Requirement of CC Pavement, and design, performance, construction and maintenance requirements
	5.9.5	Stretches to be reconstructed
Section 7	7.1 (ii)	Bridges which are not required to be high level bridges
	7.1 (viii)	Utility services to be carried over the structures
	7.3 (ii) (d)	List of culverts to be reconstructed and/or widened.
	7.3 (iii) (e)	List of bridge structures to be reconstructed and/or widened.
	7.4 (vi)	Requirement of special structures like cable stayed/ superstructure bridge etc.
	7.16.1	Requirement of RE walls when height more than 6 m.
	7.18 (iv)	Requirement of Crash barriers for existing bridges
	7.18 (v)	Parapets/Railings of existing bridges to be repaired/replaced.
	7.19	Locations where railway level crossings not to be replaced with ROBs/RUBs
	7.22	Measures for protecting structures in marine environment
	7.23 (i)	Structures to be repaired/strengthened, nature and extent of repairs
Section 9	9.3.1	Specifications of reflecting sheeting
Section 10	10.2 & 10.3	Location of Toll Plaza and land for Toll Plaza
Section 11	11.5.2	Specifications of reflecting sheeting
Section 11	11.5.5	Location and size of overhead traffic signs
Section 12	12.1	Number of trees to be planted
Section 13	13.1	Project facilities and land for providing project facilities
	13.3.3	Situations/locations where lighting to be provided
	13.4.1	Location and number of truck lay-byes to be provided.
	13.5.1	Location and number of bus bays to be provided
Section 14	14.5	Requirement of Climbing lane
	14.8	Alignment/Construction of tunnel and its salient details
	14.10.1	Requirement of repairs, strengthening or reconstruction of existing retaining walls.

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APPENDIX-2

(Reference Para 1.4)

List of IRC Publications

S. No.	Code/ Document No.	Title of the Publication
1. ROADS		
1 (A) Transport Planning, Traffic Assessment & Policies		
1.	IRC:3-1983	Dimensions & Weights of Road Design Vehicles (First Revision)
2.	IRC:9-1972	Traffic Census on Non-Urban Roads (First Revision)
3.	IRC:71-1977	Recommended Practice for Preparation of Notations
4.	IRC:SP:24-1984	Guidelines on the Choice and Planning of Appropriate Technology in Road Construction
1 (B) Road Geometric & Design Features		
1.	IRC:12-1983	Recommended Practice for Location and Layout of Roadside Motor-Fuel Filling and Motor-Fuel Filling-cum-Service Stations (Second Revision)
2.	IRC:32-1969	Standard for Vertical and Horizontal Clearances of Overhead Electric Power and Telecommunication Lines as Related to Roads
3.	IRC:38-1988	Guidelines for Design of Horizontal Curves for Highways and Design Tables (First Revision)
4.	IRC:39-1986	Standards for Road-Rail Level Crossings (First Revision)
5.	IRC: 54-1974	Lateral and Vertical Clearances at Underpasses for Vehicular Traffic
6.	IRC:64-1990	Guidelines for Capacity of Roads in Rural Areas (First Revision)
7.	IRC:66-1976	Recommended Practice for Sight Distance on Rural Highways
8.	IRC:70-1977	Guidelines on Regulation and Control of Mixed Traffic in Urban Areas

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S. No.	Code/ Document No.	Title of the Publication
9.	IRC:73-1980	Geometric Design Standards for Rural (Non-Urban Highways)
10.	IRC:80-1981	Type Designs for Pick-up Bus Stops on Rural (i.e. Non-Urban) Highways
11.	IRC:86-1983	Geometric Design Standards for Urban Roads in Plains
12.	IRC:98-1997	Guidelines on Accommodation of Underground Utility Services Along and Across Roads in Urban Areas (First Revision)
13.	IRC:99-1988	Tentative Guidelines on the Provision of Speed Breakers for Control of Vehicular Speeds on Minor Roads
14.	IRC:103-1988	Guidelines for Pedestrian Facilities
15.	IRC:106-1990	Guidelines for Capacity of Urban Roads in Plain Areas
16.	IRC:SP:23-1983	Vertical Curves for Highways
17.	IRC:SP:41-1994	Guidelines on Design of At-Grade Intersections in Rural & Urban Areas
1 (C) Road Markings		
1.	IRC:30-1968	Standard Letters and Numerals of Different Heights for Use on Highway Signs
2.	IRC:35-1997	Code of Practice for Road Markings (With Paints) (First Revision)
1 (D) Road Furniture & Signage		
1.	IRC:8-1980	Type Designs for Highway Kilometer Stones (Second Revision)
2.	IRC:25-1967	Type Designs for Boundary Stones
3.	IRC:26-1967	Type Design for 200-Metre Stones
4.	IRC:31-1969	Route Marker Signs for State Routes
5.	IRC:67-2001	Code of Practice for Road Signs (First Revision)
6.	IRC:79-1981	Recommended Practice for Road Delineators
7.	IRC:SP:31-1992	New Traffic Signs

S. No.	Code/ Document No.	Title of the Publication
1 (E) Road Safety & Traffic Management		
1.	IRC:53-1982	Road Accident Forms A-1 and 4 (First Revision)
2.	IRC:SP:27-1984	Report Containing Recommendations of IRC Regional Workshops on Highway Safety
3.	IRC:SP:32-1988	Road Safety for Children (5-12 Years old)
4.	IRC:SP:44-1994	Highway Safety Code
5.	IRC:SP:55-2001	Guidelines for Safety in Construction Zones
1 (F) Embankment Construction & Erosion Control		
1.	IRC:10-1961	Recommended Practice for Borrow pits for Road Embankments Constructed by Manual Operation
2.	IRC:28-1967	Tentative Specifications for the Construction of Stabilised Soil Roads with Soft Aggregate in Areas of Moderate and High Rainfall
3.	IRC:33-1969	Standard Procedure for Evaluation and Condition Surveys of Stabilised Soil Roads
4.	IRC:36-1970	Recommended Practice for Construction of Earth Embankments for Road Works
5.	IRC:56-1974	Recommended Practice for Treatment of Embankment Slopes for Erosion Control
6.	IRC:75-1979	Guidelines for the Design of High Embankments
7.	IRC:SP:58-2001	Guidelines for Use of Flyash in Road Embankments
1 (G) Non-Bituminous Base and Sub-Base		
1.	IRC:19-1977	Standard Specification and Code of Practice for Water Bound Macadam (Second Revision)
2.	IRC:49-1973	Recommended Practice for the Pulverization of Black Cotton Soils for Lime Stabilisation
3.	IRC:50-1973	Recommended Design Criteria for the Use of Cement Modified Soil in Road Construction

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S. No.	Code/ Document No.	Title of the Publication
4.	IRC:51-1992	Guidelines for the Use of Soil Lime Mixes in Road Construction (First Revision)
5.	IRC:60-1976	Tentative Guidelines for the Use of Lime-Flyash Concrete as Pavement Base or Sub-Base
6.	IRC:63-1976	Tentative Guidelines for the Use of Low Grade Aggregates and Soil Aggregates Mixtures in Road Pavement Construction
7.	IRC:74-1979	Tentative Guidelines for Lean-Cement Concrete and Lean-Cement Flyash Concrete as a Pavement Base or Sub-Base
8.	IRC:88-1984	Recommended Practice for Lime Flyash Stabilised Soil Base/ Sub-Base in Pavement Construction
9.	IRC:109-1997	Guidelines for Wet Mix Macadam
10.	IRC:SP:59-2002	Guidelines for Use of Geotextiles in Road Pavements and Associated Works
1 (H) Design, Construction and Maintenance of Flexible Pavements		
1.	IRC:14-2004	Recommended Practice for 2 cm Thick Bitumen and Tar Carpets (Third Revision)
2.	IRC:16-1989	Specification for Priming of Base Course with Bituminous Primers (First Revision)
3.	IRC:17-1965	Tentative Specification for Single Coat Bituminous Surface Dressing
4.	IRC:19-2005	Standard Specifications and Code of Practice of Water Bound Macadam (Third Revision)
5.	IRC:20-1966	Recommended Practice for Bituminous Penetration Macadam (Full Grout)
6.	IRC:23-1966	Tentative Specification for Two Coat Bituminous Surface Dressing
7.	IRC:cm-1967	Tentative Specifications for Bituminous Macadam (Base & Binder Course)

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S. No.	Code/ Document No.	Title of the Publication
8.	IRC:34-1970	Recommendations for Road Construction in Waterlogged Areas
9.	IRC:37-2001	Guidelines for the Design of Flexible Pavements (Second Revision)
10.	IRC:47-1972	Tentative Specification for Built-up Spray Grout
11.	IRC:55-1974	Recommended Practice for Sand-Bitumen Base Courses
12.	IRC:82-1982	Code of Practice for Maintenance of Bituminous Surfaces of Highways
13.	IRC:95-1987	Specification for Semi-Dense Bituminous Concrete
14.	IRC:110-2005	Standard Specifications and Code of Practice for Design and Construction of Surface Dressing
15.	IRC:SP:53-2002	Guidelines on Use of Polymer and Rubber Modified Bitumen in Road Construction (First Revision)
1 (I)	**Design, Construction and Maintenance of Cement Concrete Pavements**	
1.	IRC:15-2002	Standard Specifications and Code of Practice for Construction of Concrete Roads (Third Revision)
2.	IRC:44-1976	Tentative Guidelines for Cement Concrete Mix Design for Pavements (for Non-Air Entrained and Continuously Graded Concrete) (First Revision)
3.	IRC:57-1974	Recommended Practice for Sealing of Joints in Concrete Pavements
4.	IRC:58-2002	Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Second Revision) (with floppy)
5.	IRC:61-1976	Tentative Guidelines for the Construction of Cement Concrete Pavements in Hot Weather
6.	IRC:68-1976	Tentative Guidelines on Cement-Flyash Concrete for Rigid Pavement Construction
7.	IRC:77-19	Tentative Guidelines for Repair of Concrete Pavements Using Synthetic Resins

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S. No.	Code/ Document No.	Title of the Publication
8.	IRC:84-1983	Code of Practice for Curing of Cement Concrete Pavements
9.	IRC:91-1985	Tentative Guidelines for Construction of Cement Concrete Pavements in Cold Weather
10.	IRC:SP:49-1998	Guidelines for the Use of Dry Lean Concrete as Sub-base for Rigid Pavement
11.	IRC:SP:62-2004	Guidelines for the Design and Construction of Cement Concrete Pavement for Rural Roads
12.	IRC:SP:63-2004	Guidelines for the Use of Interlocking Concrete Block Pavement
13.	IRC:SP:68-2005	Guidelines for Construction of Roller Compacted Concrete Pavements
1 (J) Project Preparation, Contract Management and Quality Control		
1.	IRC:42-1972	Proforma for Record of Test Values of Locally Available Pavement Construction Materials
2.	IRC:SP:16-2004	Guidelines for Surface Evenness of Highway Pavements (First Revision)
3.	IRC:SP:19-2001	Manual for Survey, Investigation and Preparation of Road Projects (Second Revision)
4.	IRC:SP:57-2001	Guidelines for Quality Systems for Road Construction
5.	IRC:SP:68-2005	Guidelines for Construction of Roller Compacted Concrete Pavements
1 (K) Hill Roads		
1.	IRC:52-2001	Recommendations About the Alignment Survey and Geometric Design of Hill Roads (Second Revision)
2.	IRC:SP:48-1998	Hill Road Manual
1 (L) Road Drainage		
1.	IRC:SP:42-1994	Guidelines on Road Drainage
2.	IRC:SP:50-1999	Guidelines on Urban Drainage

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S. No.	Code/ Document No.	Title of the Publication
1 (M) Road Machinery		
1.	IRC:43-1972	Recommended Practice for Tools, Equipment and Appliances for Concrete Pavement Construction
2.	IRC:72-1978	Recommended Practice for Use and Upkeep of Equipment, Tools and Appliances for Bituminous Pavement Construction
3.	IRC:90-1985	Guidelines of Selection, Operation and Maintenance of Bituminous Hot Mix Plant
4.	IRC:SP:22-1980	Recommendation for the Sizes for each Type of Road Making Machinery to Cater to the General Demand of Road Works
5.	IRC:SP:25-1984	Gopi and his Road Roller-Guidelines on Maintenance of Road Rollers
6.	IRC:SP:29-1994	Directory of Indigenous Manufacturers of Road/Bridge Construction Machinery & Important Bridge Components (First Revision)
7.	IRC:SP:34-1989	General Guidelines About the Equipment for Bituminous Surface Dressing
2. BRIDGES		
2 (A) Codes of Practice		
1.	IRC:5-1998	Standard Specifications and Code of Practice for Road Bridges, Section I - General Features of Design (Seventh Revision)
2.	IRC:6-2000	Standard Specifications and Code of Practice for Road Bridges, Section II - Loads and Stresses (Fourth Revision)
3.	IRC:18-2000	Design Criteria for Prestressed Concrete Bridges (Post Tensioned Concrete) (Third Revision)
4.	IRC:21-2000	Standard Specifications and Code of Practice for Road Bridges, Section III - Cement Concrete (Plain and Reinforced) (Third Revision)
5.	IRC:22-1986	Standard Specifications and Code of Practice for Road Bridges, Section VI - Composite Construction (First Revision)

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S. No.	Code/ Document No.	Title of the Publication
6.	IRC:24-2001	Standard Specifications and Code of Practice for Road Bridges, Section V - Steel Road Bridges (Second Revision)
7.	IRC:40-2002	Standard Specifications and Code of Practice for Road Bridges, Section IV - Brick, Stone and Block Masonry (Second Revision)
8.	IRC:78-2000	Standard Specifications and Code of Practice for Road Bridges, Section VII - Foundations and Substructure (Second Revision)
9.	IRC:83-1999	Standard Specifications and Code of Practice for Road Bridges, Section IX - Bearings, Part I : Metallic Bearings (First Revision)
10.	IRC:83-1987 (Part II)	Standard Specifications and Code of Practice for Road Bridges, Section IX - Bearings, Part II: Elastomeric Bearings
11.	IRC:83-2002 (Part III)	Standard Specifications and Code of Practice for Road Bridges, Section IX - Bearings, Part III: Pot, Pot-Cum-PTFE, Pin and Metallic Guide Bearings
12.	IRC:87-1984	Guidelines for the Design and Erection of False work for Road Bridges
13.	IRC:89-1997	Guidelines for Design and Construction of River Training & Control Works for Road Bridges (First Revision)
14.	IRC:SP:69-2005	Guidelines & Specifications for Expansion Joints
15.	IRC:SP:70-2005	Guidelines for the Use of High Performance Concrete in Bridges
16.	IRC:SP:71-2006	Guidelines for Design and Construction of Precast Pre-Tensioned Girders for Bridges.

2 (B) Inspection, Maintenance & Rehabilitation

1.	IRC:SP:35-1990	Guidelines for Inspection and Maintenance of Bridges
2.	IRC:SP:40-1993	Guidelines on Techniques for Strengthening and Rehabilitation of Bridges
3.	IRC:SP:52-1999	Bridge Inspector's Reference Manual

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S. No.	Code/ Document No.	Title of the Publication
2 (C) Project Preparation, Contract Management & Quality Control		
1.	IRC:SP:47-1998	Guidelines on Quality Systems for Road Bridges (Plain, Reinforced, Prestressed and Composite Concrete)
2.	IRC:SP:54-1999	Project Preparation Manual for Bridges
2 (D) Other Important Publications		
1.	IRC:7-1971	Recommended Practice for Numbering Bridges and Culverts (First Revision)
2.	IRC:SP:13-2004	Guidelines for the Design of Small Bridges and Culverts (First Revision)
3.	IRC:SP:51-1999	Guidelines for Load Testing of Bridges
3. MOSRTH PUBLICATIONS		
1.	MOSRTH Specifications for Road and Bridge Works 2001 (Fourth Revision)	
2.	MOSRTH Standard Plans for Single, Double and Triple Cell Box Culverts with and without Earth cushion.	
3.	MOSRTH Type Designs for Intersections on National Highways.	
4.	Manual for Safety in Road Design	

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BIHAR STATE ROAD DEVELOPMENT CORPORATION LIMITED
(A GOVT. OF BIHAR UNDERTAKING)

Development of Greenfield Bridge across River Ganges and its approaches connecting Bakhtiyarpur Bypass of NH-31 near village Karjan & NH-28 at Tajpur in the State of Bihar on DBFOT (Toll) basis

Concession Agreement
between
Bihar State Road Development Corporation Limited
And
Navayuga Jahnavi Toll Bridge Private Limited

Volume- II
Part – III : Pre-Bid Clarifications

Bihar State Road Development Corporation Ltd.
(A Govt. of Bihar Undertaking)
Central Mechanical Workshop Campus
Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28 (RFP STAGE)

ADDENDUM-1(RFP Stage)

1 The Bid Due date is extended by 15 days hence the clause 1.3 "Schedule of Bidding Process" of the ITB stands modified as following:

The Authority shall endeavour to adhere to the following schedule:

S. No.	Event Description	Date
1.	Last date for receiving queries	13th April, 2010
2.	Pre-Bid meeting	14th April, 2010 at Patna
3.	Authority response to queries latest by	22nd April, 2010
4.	Bid Due Date	20th May, 2010 at 16:00Hrs
5.	Opening of Bids	20th May, 2010 at 16:30 Hrs
6.	Letter of Award (LOA)	14th June, 2010
7.	Validity of Bids	16th November, 2010
8.	Signing of Concession Agreement	14th July, 2010

2 The clause 44.3 & 44.4 of the Concession Agreement is amended as follows **"Any dispute which is not resolved amicably by conciliation, as provided in Clause 44.2, shall be finally decided by reference to Bihar Arbitral Tribunal in accordance with Bihar Arbitral Tribunal Act, Rule framed thereunder or procedure prescribed by the Bihar Arbitral Tribunal. The award of Bihar Arbitral Tribunal shall be final and binding on the parties"**

3 For the purpose of this project the **"Authority"** shall mean **"Bihar State Road Development Corporation Limited"**. If the bidders find somewhere Road

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Construction Department, National Highway Authority of India etc in the RFP document it may be read as ***Bihar State Road Development Corporation Limited***.

4 All other terms and conditions as laid down in the RFP documents remain unaltered.

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Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Bihar State Road Development Corporation Ltd.
(A Govt. of Bihar Undertaking)
Central Mechanical Workshop Campus
Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28

Compliance of bidders queries.

Name of the Bidders: Trans Asia Infrastructure (India) Private Limited, New Delhi

S. No.	Queries	Compliance
1	**Navigational Span:** what is the requirements of Navigational Span i.e. minimum horizontal clearance (pier to pier) and minimum vertical clearance (above HFL) whether these horizontal and vertical clearances are applicable for the entire length (2.75 km) upto which the "Navigational Span" has been marked in the drawings?	The vertical and horizontal clearances are as per the requirements of IWAI for navigational spans.
2	Non-navigational Spans: Individual spans of 50 m each were given. Whether this can be increased or reduced or any minimum span length is obligatory?	Bidders can increase the span beyond 50m, whereas, the reduction in span length up to 44m is permitted.
3	Viaduct Span: Is there any limitations for these viaduct spans whether some viaduct spans can be covered by substituting with embankment	The arrangement of viaducts spans and embankment given in drawings is mandatory to follow based on Hydraulic Studies.
4	Whether any composite structure (i.e. steel with concrete deck) is permissible.	Bidders can propose these types of structures as per guidelines of IRC keeping in view the Aesthetics of the Bridge.
5	Whether length of bridge can be reduced by providing earthen embankment in Island Portion of the river, keeping minimum Lacey waterways i.e. (Q=90000 cumecs, W = 4.8(90,000)^1/2=1350m) as because the bridge length provided is much more than this lacey's waterways	Bidders to follow the arrangement as given in drawing which is based on Hydraulic Studies.
6	Whether any change in the span arrangements is allowed, Reducing the length of the bridge by replacing the bridge length by embankment	The arrangement as given in drawings for navigational spans is to be followed. In case of non-navigational span

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	or guide bunds	changes as permissible in sl. no. 2 duly approved by authority may be considered.
7	Refer schedule – Annex 1 (schedule B) Clause 1.3. The salient features given under this clause i.e. double D well foundation and sub structure comprises of two separate piers supported on a single double D well foundation, four lane segmental balance cantilever super structure shall be mandatory. Or any other alternative may be accepted.	The bidders can propose alternative structure arrangements within the parameters stipulated in bid documents such as span arrangements, deck width, type of foundations etc.
8	Whether pile foundation as an alternative to well foundation will be allowed? In case well in main river bridge is mandatory – whether piles (large dia.) can be used in via-duct and other areas wherever feasible.	Well foundation is mandatory for both navigational as well as non-navigational spans.
9	Is foundation level mentioned in the drawings are mandatory or it can be changed depending on the drawings?	The foundation level can be changed as per the detailed design & hydraulic studies by the bidders provided it satisfies the design requirements as per IRC standards.
10	For seismic forces whether latest seismic codes as per IRC 6 will be applicable as against coefficient of 0.18 G given in the document.	The preliminary design of the bridge is carried out before issuance of revised guidelines of IRC 6 clause 222. However the bidders can adopt the latest guidelines issued by IRC for revision in clause 222 of IRC 6 in June 2009.
11	Whether at both connecting ends a project road with NH 31 and NH 28, any interchange structure (signal free) are needed whatever shown in the drawings are mandatory.	The details shown in the drawings are the Minimum requirement as given in the bid document to be followed by the bidders.
12	Whether high strength cable (like 19 T 15 as against 19T13) can be used.	Bidders can propose high strength H.T. steels as per design requirement.
13	Availability of land nearest to bridge alignment and its approaches for casting yard may be informed, as this will be a very vital land of construction.	Bidders to arrange land for casting yard.
14	Refer annexure 1 schedule D para 2 of RFP document where it is written pre-cast segmental super structure is mandatory but where cast in situ construction can it be allowed.	Pre-cast segmental super structure is mandatory for navigational spans.
15	Minimum spacing of expansion joints is given as 150m whether it is applicable for non-navigational spans and via-duct spans. Where 50 m individual spans have been provided in such cases 3 spans continuous PSC box need	Bidders to follow the tender conditions.

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	to be provided.	
16	Guidelines given in IWAI may be provided in case it is available.	Parameters are fixed based on IWAI guidelines.
17	As indicated in the RFP, cultivable/agricultural land is available within 60 to 90 m of RoW. Whether the authority will acquire those land and handover to the concessionaire.	Authority will provide land to the concessionaire. Whereas, concessionaire has to extend all necessary support as required during land acquisition.
18	Whether the GAD of ROB at chainage 21.086 km has been approved by the railway authority. If not whether it will be the responsibility of the concessionaire to deal with the railways with payment of all fees.	Concessionaire shall obtain all necessary approvals as required for implementation of the project, whereas, authority will provide all necessary assistance to concessionaire.

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Bihar State Road Development Corporation Ltd.

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Central Mechanical Workshop Campus
Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28

Compliance of bidders queries.

Name of the Bidders: HES Infrastructure Pvt. Ltd., Hyderabad

S. No.	Queries	Compliance
1	The drawings supplied to us are not legible. Kindly issue a set of legible drawings or soft copies of drawings.	Drawing shall be provided to Bidders.
2	Concession Agreement – Page No. 88 is missing.	Page No. 88 is enclosed.
3	Drawings from Serial No. 78 to 84 are missing.	Page No. 78 to 84 is enclosed. Soft copy already provided. It may be referred.
4	Shock Transmissions Units have been proposed to be used at bridge Piers for the Main Bridge. These are not manufactured in India. Where do we procure them from?	Shock Transmissions Units are provided in Bridges recently constructed in India. The bidders are free to design the bridge with or without Shock Transmissions Units.
5	Mid-Span Expansion Joints with stiffening Beams have been proposed at the Junction of two Cantilever tips in case of Main Bridge. This kind of joints is difficult for maintenance as the stiffening Beams and bearings are inside the box. Is it binding on us to use this kind of joints?	Bidders can use their own design for articulateous within accepted international practice.
6	For the Main Bridge, can be use Pile Foundation of larger diameter. If our design satisfy the provisions stipulated by the IRC & IS codes.	Well foundation is mandatory for both navigational as well as non-navigational spans.
7	Independent Engineer will be appointed by the client / authority?	Client will appoint Independent Engineer for this project.
8	There is no provision of Guide Bund?	Guide Bunds are not proposed for this bridge.

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9	Ship Impact / Vessel Collision loads have not been specified for the designing the sub-structure / foundation of navigational span?	The bridge sub-structure has to be design for Ship Impact / Vessel Collision as per latest standards of IRC or any International standards such as AASHTO or BS.
10	The sinking of well shall be carried out with Jack Down method and hence the steining thickness of 1.5m proposed in report / drawing is not inline with revised IRC-78: 2000 provisions, the required thickness of well steining for navigational span wells is above 3m. Is this reduction of 50% in thickness is acceptable to the authorities?	The reduction in steining thickness is due to adopting the Jack Down Method of sinking.
11	In the navigational span with mid span expansion joint, there are no pre-stressing cables at the bottom. However, it has been mentioned in the report that the joint transfers shear and moment. If it transfers moment, then there should be bottom pre-stressing cables. If no bottom cable is required than there will be no sagging moments.	Cable arrangement in span shall be as per the design of bidders for the proposed super structure arrangements.
12	Preliminary design calculations for the structure Vol-II B not provided to us (Page No. 2 Final Preliminary Project Report – Bridge Design).	Preliminary design calculations are not the part of bidding document.
13	Site Visit:- 1. During site visit consultant could not shown the complete alignment at certain interval (say 5/10 Km.). If during our field survey work any site specific problem comes up to which date we will send our quarries. 2. Please provide GPS co-ordinate of setting out point along the alignment with chainage and land mark, name of the nearest village.	Quarries may be sent by 22nd April, 2010. Stake out report is already provided to the bidders during pre-bid meeting.

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Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28

Compliance of bidders queries.

Name of the Bidders: Navayuga Engineering Company Ltd., Hyderabad

S. No.	Queries	Compliance
1	We request you to kindly confirm that the arrangement and design of spans shown in the bid documents is indicative and the bidder is free to choose his own arrangement. We also request you to limit the number of navigational spans to 2 or 3.	Bidders has to follow the arrangements as shown in the drawings.
2	We request you to kindly confirm that the construction of the bridge super structure as indicated in the bid document is indicative and the bidders is free to choose his own method of construction.	Bidders can propose his own method of construction.
3	We request you to kindly confirm that the bridge can be founded RCC bored cast-in-situ piles instead of wells as indicated in the bid documents.	Well foundation is mandatory for both navigational as well as non-navigational spans..
4	We request you to kindly extend the due date of bid submission by another six weeks to enable us submit our most competitive offer.	Bid due date is extended by 15 days.

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Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28

Compliance of bidders queries.

Name of the Bidders: SEW Infrastructure Ltd., Hyderabad

S. No.	Queries	Compliance
1	**Ref. : Schedule 'R', Schedules, Definitions – Concession Agreement – Fee Notification.** While schedule 'R' seems to indicate that three wheelers will not be charged toll. CA in the definition of car has clearly indicated 3 wheelers. Clarification is required whether 3 wheelers would be tolled. If yes would it be at the same rate as car. Would the local concessions apply in this case also?	Yes. It would be charged at the same rate as car.
2	**Cost of structure (bridge only)** While the total cost is mentioned, the cost of bridge is required separately to work out the toll rate.	All ready furnished in the PPR.
3	**Ref.: ITB; Schedules – Tolling length.** The ITB indicates a total length of 49.5 Km. including bridge length. In the schedules the bridge length is indicated as 5.5 Kms. and 42 Km as approach road including major and minor bridges. Clarifications are required on the exact tolling length excluding structure.	Please refer Table 0.7:- "Structure on Alignment" of Volume – I "Final Preliminary Design Report" for exact breakup.
4	**Bid submission date.** Kindly extend the bid submission date by 6 weeks. As the project is on BOT basis a detailed pre bid design has to be done to submit a competitive bid.	Bid due date is extended by 15 days.

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Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Bihar State Road Development Corporation Ltd.
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Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28 (RFP STAGE).

ADDENDUM-2 (RFP Stage)

1 The Bid Due Date stands extended to 16:00 hrs IST on 28th May, 2010, hence the clause 1.3 "Schedule of Bidding Process" of the ITB stands modified as follows. The Authority shall endeavour to adhere to the following schedule:

S. No.	Event Description	Date
1.	Last date for receiving queries	13th April, 2010
2.	1st Pre-Bid meeting	14th April, 2010 at Patna
3.	Authority response to queries latest by	22nd April, 2010
4	2nd Pre- Bid meeting	4th May, 2010 at Patna
5	Authority response to queries latest by	14th May, 2010
4.	Bid Due Date	28th May, 2010 at 16:00Hrs
5.	Opening of Bids	28th May, 2010 at 16:30 Hrs
6.	Letter of Award (LOA)	22nd June, 2010
7.	Validity of Bids	24th November, 2010
8.	Signing of Concession Agreement	22nd July, 2010

2 **With reference to Clause 1.3, Page 14 of Annexure-I of Schedule B** – If bidders propose to adopt the pile foundation, the proposal shall be duly supported with all design details & calculations conforming to the hydraulic & structural design requirements, construction methodology etc. as per the latest IRC guidelines & best international practice subject to approval from Authority / Govt. of Bihar.

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3 In order to enable through connectivity with proposed alignment of Bakhtiyarpur Bypass of NH 31 under Bakhtiyarpur – Khagharia Section, considered for up-gradation under NHDP – III by NHAI. The proposed southern side approach road shall be extended upto proposed Bakhtiyarpur Bypass alignment of NH 31 near village Karzan with provisions for connectivity with present alignment of NH 31 near village Rupas to furnish through connectivity with NH 31. The details of link of proposed alignment with proposed Bakhtiyarpur Bypass as part of Bakhtiyarpur – Khagharia Section of NH-31 is attached at ***Annexure A*** *(Alignment Plan in 5 sheets).* ***The modified "Schedule A & B" of the DCA*** is attached herewith as ***Annexure B***.

4 **Instruction to Bidders Sr. No. 1.1.1 para 2 shall be read as follows**

Name of the Highway	**Length** (in Km)	**Estimated Project Cost** (In Rs. cr.)
Greenfield Bridge across River Ganga Connecting proposed Bakhtiyarpur bypass of NH-31 & NH-28 at Tajpur .	**50.943**	**1502.74**

5 **Instruction to Bidders, Sr. No. 1.1.3 shall be read as follows**

The scope of work will broadly include Development of new Greenfield Bridge across River Ganges Connecting proposed Bakhtiyarpur bypass of NH-31 & NH-28 at Tajpur in the State of Bihar and the operation and maintenance thereof. This shall involve construction of about 5.550 km of four-lane bridge and about 45.393 km length of four-lane approach roads

6 All other terms and conditions as laid down in the RFP documents remain unaltered.

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Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Development of Greenfield Bridge across River Ganges and its approaches connecting NH-31 near Bakhtiyarpur & NH-28 at Tajpur in the State of Bihar on DBFOT (Toll) basis

Schedules

Bihar State Road Development Corporation Limited

(A Government of Bihar undertaking)

Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

SCHEDULE – A

(See Clause 10.1)

SITE OF THE PROJECT

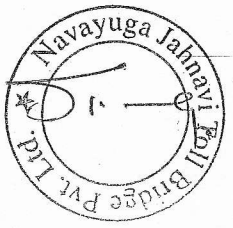
1 The Site

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

1.2 An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Concessionaire, and such inventory shall form part of the memorandum referred to in Clause 10.3.1 of the Agreement.

1.3 Additional land required for Toll Plazas, Traffic Aid Posts, Medical Aid Posts and vehicle rescue posts or for construction of works specified in the Change of Scope Order issued under Clause 16.2.3 of this Agreement shall be acquired in accordance with the provisions of Clause 10.3.6 of this Agreement. Upon acquisition, such land shall form part of the Site and vest in the Authority.





Annex - I

(Schedule-A)

Site for the Project

[**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.]

1. Site

The existing site of the Project does not comprise of any existing facility as this is a proposed Greenfield Bridge and approach road project. Presently there is only natural stream of river Ganga, barren and agricultural land, canals, railway lines and some minor settlement areas.

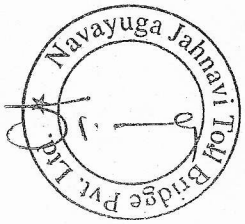
The site of the Four-Lane Greenfield Bridge and its approaches is a missing link between NH-31 near Karjan village of Bakhtiyarpur and NH-28 at Tajpur. The proposed facility comprises of 4 lane Bridge across River Ganges (5.55 km long) and 45.598 km long approach road including RoB, major & minor bridges.

The land along the proposed approach road is a combination of barren land and cultivated land with some built-up, commercial pockets in terms of small urban development. Some part of land is passing through flood plains of Ganges and being used as agricultural land. There are shrubs along the banks of Ganges. The project road is not passing through any reserved forest area.

The list of villages enroute are listed as under:

1	Karjan Village
2	Jamalpur Village
3	Athmalgola
4	Bingama Village
5	Chak Saho Village
5	Chak Raj Ali Village
7	Ismailpur Village
8	Nandini Lagunia Rly Station
9	Ramnagar Chokdar Village
10	Bhagwatipur Village
11	Hundi Tajpur Village
12	Bazidpur Village
13	Pachbhinda Village
14	Dadanpur Village
15	Harpur Bhendi Village
16	Chandauli Village
17	Rajkhand Village
18	Asari Village Village
19	End of Approach on NH-28 at Tajpur





2. Land

S. No.	Chainage (In km)		Total ROW (In m)	Remarks
	From	To		
1.	N/A	N/A	N/A	Since this is a proposed Greenfield alignment so there is no existing facility.

60m Right of Way is required to be acquired for Four-Lane Greenfield Bridge and its approaches. However in area of high embankment near bridge abutment, 90 m ROW is to be acquired.

3. Carriageway

There is no existing carriageway since this is a proposed Greenfield alignment.

4. Major Bridges

S.No	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

5. Railway Over Bridges

S.No.	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

6. Grade Separators

S.No	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

Since this is a proposed Greenfield alignment so there is no existing facility.

7. Minor Bridges

S. No.	Chainage (In Km)	Type of Structure	No. of Spans	Width (In m)
1.	N/A	N/A	N/A	N/A

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Since this is a proposed Greenfield alignment so there is no existing facility.

8. **Total number of structures**

Since this is a proposed Greenfield alignment so there is no existing facility.

9. **Bus bays and Truck Lay byes**

Since this is a proposed Greenfield alignment so there is no existing facility.

10. **Permanent Bridge, Bye Pass or Tunnel costing Rs. 50 crore or more**

Since this is a proposed Greenfield alignment so there is no existing facility.

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Annex - II

(Schedule-A)

Site for [Six-Laning]

Six-laning is beyond the purview of the present study.

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SCHEDULE - B

(See Clause 2.1)

DEVELOPMENT OF THE PROJECT

1 **Development of the Project**

Development of the Project shall include construction of the Greenfield Bridge and its approaches connecting NH-31 (Proposed Bypass) & NH-28 as described in this Schedule-B and in Schedule-C.

2 **Construction of the Project**

2.1 Construction of the Project shall include construction of the Greenfield bridge and its approaches connecting NH-31 (Proposed Bypass) & NH-28 as described in Annex-I of this Schedule-B and Annex-I of Schedule-C.

2.2 Construction of the Project shall be completed by the Concessionaire in conformity with the Specifications and Standards set forth in Annex-I of Schedule-D.

3 **[Six-Laning]**

Six-laning is beyond the purview of present study

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Annex - I
(Schedule-B)

Description of the Project

1 Width of Carriageway

1.1 The paved carriageway shall be 18 metres wide excluding the median:

Provided that in the urban and semi-urban sections, the carriageway shall, subject to availability of Right of Way, have four lane (18 m wide excluding median) with service roads and foot paths. Since this is a proposed Greenfield alignment, it has been so planned that there is no constriction of carriageway width even at the urban stretches.

The service road locations are enlisted as under:

Sr. No.	Design Chainage	Side	Length (km)
1	12+750 to 13+400	both	1.30
2	13+875 to 14+700	both	1.65
3	18+025 to 19+000	both	1.95
4	25+675 to 26+675	both	2.00
5	31+275 to 32+225	both	1.90
6	45+350 to 45+975	both	1.25

The improvements given above are the minimum required.

1.2 Except as otherwise provided in this Agreement, the width of the paved carriageway shall conform to Clause 1.1 above.

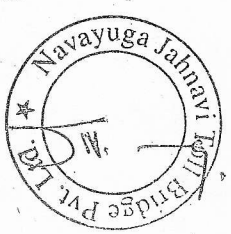
1.3 **Bridges**

The new bridge across river Ganges, viaduct on both sides of approaches to bridge and structures other than Ganges bridges shall be developed in accordance with Manual of Specification & Standard for 4 laning of National Highways through Public Private Partnership & then prevailing IRC/MoRT&H standards & guidelines.

The proposed Greenfield Bridge and its approach viaduct shall have following salient features:

1. The total length of bridge is 5550m comprising of 2250m as navigational spans and 3250m as non navigational spans. Beyond 5500m length of bridge, embankment and spans for length 1075m & 430 m towards South & North side respectively has been proposed.
2. However, if bidders propose to adopt the pile foundation, the proposal shall be duly supported with all design details & calculations conforming to the hydraulic & structural design requirements, construction methodology etc. as per the latest





IRC guidelines & best international practice subject to approval from Authority / Govt. of Bihar." In such case, the concessionaire shall be solely responsible for undertaking all the necessary surveys, investigations and detailed designs in accordance with good industry practice and due diligence, and shall have no claim against the authority for any loss, damage, risk, costs, liabilities or obligations arising out of or in relation to the project report and other information provided by the Authority. The project reports & other information as provided by the Authority shall be used by the Concessionaire only for its own reference

3. The substructure having appropriate shape and supported on foundations shall be proposed

4. The four lane segmental/cast-in-situ balanced cantilever superstructure comprising of two 2-lane carriageway is supported on foundations

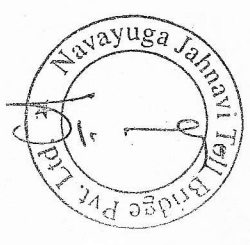
5. 11.75m Deck width has been proposed both for each 2 lane bridge across Ganges and approach viaduct. The deck width comprise of 0.250m for railing, 1.5m for walk way, 0.5m for two crash barriers and 9.0 m for carriageway.

1.4 Proposed Flyovers, Underpass and RoB

Other than bridge on Ganges and approach viaduct, the following major structures are proposed on the alignment. Details of Flyover, Underpass and RoB on the corridor are as listed in the following Table.

Sr. No.	Proposed Chainage	Span configuration	Deck width	Location	Type of structure
1	Km 3+350 (Centre of proposed Bakhtiyarpur Bypass of NH-31)	50	2 X 11.75	Near Kasampur Dhari Village (Over proposed Bakhtiyarpur bypass of NH-31, km 0.00 at existing NH-31)	Grade Separator
2	Km 2+650	1X20	2 X 11.75	Minor Stream near Village Kasampur Dhari (Over proposed Bakhtiyarpur bypass of NH-31, km 0.00 at existing NH-31)	Minor Bridge
3	Km 1+330	1X20+1X45+1X20	2 X 11.75	Jamalpur (Patna-Howrah Main line) Towards Bakhtiyarpur Bypass of NH-31, km 0.00 at existing NH-31	Rail Over Bridge





4	Km 0+000 (Centre of Existing NH-31)	50	2 X 11.75	Near Rupas Village on existing NH 31.	Grade Separator
5	Km 16+000	3X21	2 X 11.75	Across River Baya	Major Bridge
6	Km 21+086	1 X30 + 1 X45 + 1X 30	2 X 11.75	Ismailpur (on North Eastern Railway main line)	Rail Over Bridge crossing North Eastern line
7	Km 31+725	1 x 45	2 X 11.75	Chaklalsahi on NH-103	Grade Separator
8	Km 34+750	1 X30 + 1 X45 + 1X 30	2 X 11.75	Across River Nun	Major Bridge

Note:

i. Chainages referred to in this section are Design road chainages along the project road alignment. The extended length of southern approach for 3.35 km in length has been considered

ii. Increase in spans due to change in skew angle of Proposed bridges, cross-drainage structures, flyovers, underpasses, overpasses or any other structure, shall be deemed to be included in the scope of the project.

The requirements given above are the minimum requirement for smooth flow of traffic. Any additional requirements as per Manual of specifications & Standards for 4 laning of National Highways through Public Private Partnership shall be carried out in consultation with Independent Engineer. The same shall not constitute a change in scope of work. However any additional works suggested by Independent Engineer based on site requirements shall neither form a change in scope of work nor qualify for variation.

1.5 Proposed Vehicular Underpasses/Cattle Crossing / Pedestrian Underpass

The locations and size of all proposed underpasses are tabulated below:

Sr. No.	Chainage (Km)	Opening Size (m)	Location	Type
1	Km 0+350 (Centre of Existing NH-31)	10.5 x 5	Existing NH-31 to Jamalpur (Over proposed Bakhtiyarpur bypass of NH 31, km 0.00 at	Vehicular

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			existing NH 31)	
2	Km 0+850 (Centre of Existing NH-31)	10.5 x 5	Existing NH-31 to Atmalgola & Kalyanpur village (Over proposed Bakhtiyarpur bypass of NH 31, km 0.00 at existing NH 31)	Vehicular
3	Km 13+165	10.5 x 5	Mehnar to Mohiuddiinagar	Vehicular
4	Km 14+282	10.5 x 5		Vehicular
5	Km 18+360	10.5 x5.5	Chakrajali to Sivaisinghpur	Vehicular
6	Km 19+760	4 x 3	Ismailpur to Saidpur	Pedestrian /Cattle
7	Km 23+370	4 x 3	Shahpur to Chakraman	Pedestrian /Cattle
8	Km 26+025	10.5 x 5	Jorpura to Bhagawatipur	Vehicular
9	Km 28+730	4 x 3	Lodhipur to Ohakandsa	Pedestrian /Cattle
10	Km 30+110	4 x 3	Bazidpur to Inerwara	Pedestrian /Cattle
11	Km 31+725	10.5 x 5	Pachbhinda to Muhammadpur	Vehicular
12	Km 38+240	4 x 3		Pedestrian /Cattle
13	Km 43+000	10.5 x 5	Chandauli to Morba	Vehicular
14	Km 44+000	4 x 3	Amritpur to Chandauli	Pedestrian /Cattle
15	Km 45+673	10.5 X 5		Vehicular
16	Km 47+000	10.5 x 5	Tajpur to Patori	Vehicular

The requirements given above are the minimum requirement. Any additional requirements as per Manual of specifications & Standards for 4 laning of National Highways through Public Private Partnership shall be carried out in consultation with

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Independent Engineer. The same shall not constitute a change in scope of work. However any additional works suggested by Independent Engineer based on site requirements shall neither form a change in scope of work nor qualify for variation.

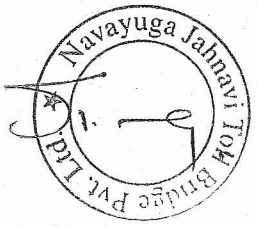
2 Project Facilities

Project facilities shall be constructed in conformity with Annex-I of Schedule-C.

3 Specifications and Standards

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

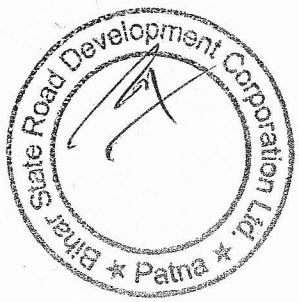


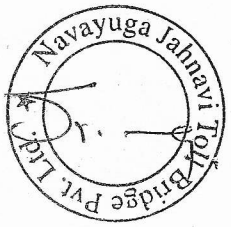


Annex - II
(Schedule-B)

Description of [Six-Laning]

Six-laning is beyond the purview of the present study.





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INSTRUCTION TO BIDDERS				
1.	1.1.1	Estimated Project Cost	What is the date the estimation was done?	*September 2009.*
2.	1.2.4	Bid Security	Kindly confirm that the validity of the Bid Security is 180 days from the Bid Due Date.?	Kindly refer Cl. 1.2.4 of ITB. The validity of the Bid Security, to be sub mitted along with the Bid, shall not be less than 180 days from the Bid Due Date with an additional claim period of 60 (sixty) days.
3.	1.3 Schedule of Bidding process	Bid Due Date: 20th May 2010	We request you to extend the Bid Due date by three weeks.	The Bid Due Date stands extended to 16:00 hrs IST on 28th May, 2010.
4.	General Terms of Bidding 2.1 clause 2.1.15	A bidder shall be liable for disqualification and forfeiture of Bid security if any legal, financial or technical adviser of the authority in relation to the project is engaged by the bidder.....whatsoever to the selected bidder or concessionaire for the same.	Please let us know the names of the consultants engaged in the project so that they will not be appointed by bidders and thus save bidders from getting disqualified and forfeiture of Bid Security?	• The Authority has engaged IL&FS Infrastructure Development Corporation Limited as Transaction Advisors for the Project. • M/s Gifford India Pvt Ltd. is the technical advisor to IL&FS Infrastructure Development Corporation Limited • The services of IIT Roorkee has been taken for the hydraulic modelling. However, the Bidders are also requested to independently verify the compliance of the prescribed requirement from the Consultants/Advisors they propose to engage for the Project.
5.	Clarification	A copy of Concession Agreement	Kindly clarify when here the term	The Bid and its copy shall be typed

	s 2.11 Sealing and marking of Bids 2.11.2 (d)	with page initialled by the person signing the bid..... To in clause (b) above	Concession Agreement is referred to be submitted. Kindly clarify whether Only the Draft Concession Agreement is to be signed and initialled Or Instruction to Bidders Draft Concession Agreement Schedules & any addendums issued pursuant to the issue of the RFP documents have to be submitted. Feasibility Report Please let us know for submission of the same.	or written in indelible ink and signed by the authorized signatory of the Bidder who shall also initial each page of the following documents in blue ink. • Draft Concession Agreement . • Schedules & • any addendums/mom issued pursuant to the issue of the RFP documents till bid due date have to be submitted.
6.	Clarification s 2.11 Sealing and marking of Bids & 2.11.3	A true copy of the documents accompanying the Bid, as specified in Clause 2.11.2 above, shall ..... the pages shall be numbered serially. Each page thereof shall be initialled in blue ink by the authorised signatory. ..... "Copy of Documents".	Kindly clarify what it means by a true copy. Is it 1. A photocopy of the initialled documents already provided as per clause 2.11.2 (d) of ITB or 2. A fresh photocopy of the original documents initialled by the bidder's representative in original. (i.e. a duplicate copy) Or 3. A photocopy of the original documents which has to be notarised as a true copy by a notary.	Clause 2.11.3 requires that the Bidder to submit a photocopy of the document accompanying the Bid which shall be "Certified as True" [a rubber stamp needs to be affixed] and each page of the copy needs to be duly initialled/signed by the Authorised Signatory of the Bidder.

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			Also, in case of 1 & 3 above please waive the signing of these documents once again by the signatory as it is a photocopy which is already signed.	
7.	3.3.2	In the event two or more bidders quote the same amount....the Authority shall identify the Selected Bidder by draw of lots, ...who choose to attend.	This practice for Tie Bidders is unfair, We suggest the following In the event two or more Bidders have quoted the same Premium or same Grant AUTHORITY may – "Invite fresh financial proposals only from the Bidders having the same Financial proposal. In the fresh Financial proposals the Bidder would be required not to modify their Financial proposals to the disadvantage of AUTHORITY in financial terms". Upon acceptance of the Premium payment or Grant, AUTHORITY may declare the successful Bidder.	No change envisaged.
8.	Appendix – I Point 1.	With reference to your RFP document dated **********	Kindly let us know which date is to be inserted here 1. The starting date for issue of RFP documents. Or The date on which the RFP	Bidders should mention the starting date for issue of RFP documents in the Letter comprising the Bid [Appendix – I], which happens to be 25th March, 2010.

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			documents have been purchased by the bidder.	
9.	Appendix I Point 9	I/We declare that we/any Member of the consortium are/is not a Member of a/any other consortium submitting a Bid for the project.	Please let us know in case of a sole bidder what has to be mentioned in this point. As it seems that this point is specific for a consortium and not a sole bidder. Or Is this point not be mentioned in case of a sole bidder submits this duly filled Appendix I.	Point 9 in Appendix I is applicable for both sole Bidder as well as Consortium members. In case the Bidder is a Sole Entity, it is required to accordingly delete any reference to the 'Member of the consortium' in the said point 9 of the Letter.
10.	Appendix I Point 12		Please confirm Point no 12 as it is missing in the Appendix I	Serial numbers 13 to 28 stand renumbered as 12 to 25 in sequence.
11.	Appendix I Point 14	We acknowledge that our consortium/proposed consortium was pre qualified .....in respect of change in ownership	Please let us know in case of a sole bidder what has to be mentioned in this point. As it seems that this point is specific for a consortium and not a sole bidder. Or Is this point not be mentioned in case of a sole bidder submits this duly filled Appendix I.	In case the Bidder is a Sole Entity, the Point 14 is not applicable.

DRAFT CONCESSION AGREEMENT				
1.	Article 4.1.2	Provided that the Authority may from time to time by notice extend, for up to 6 (six) months, the period for procuring the approval set forth	Kindly make the following modification in the clause: Provided that the Authority may by	No Change envisaged. Also, the period of extension under the said clause is a maximum & aggregate period.

		in Sub-clauses(c).....	notice extend, for up to a maximum period of 1(one) month, the period for procuring the approval set forth in Sub-clauses(c).....	
2.	Conditions Precedent Article 4.1.1	Conditions Precedent Save and except as expressly provided in Articles 4,9, 10, 24, 34, 44 and 47, the respective rights and obligations of the Parties under this Agreement shall be subject to the satisfaction in full of the conditions precedent specified in this Clause 4.1 (the "Conditions Precedent").	We suggest the following modification in this Article: "Save and except as expressly provided in Articles 4, 6.3,9,10, 24, 30, 34, 44 and 47, the respective rights and obligations of the Parties under this Agreement shall be subject to the satisfaction in full of the conditions precedent specified in this Clause 4.1 (the "Conditions Precedent")."	No change envisaged.
	Article 4.1.2	(e) procured all Applicable Permits relating to environmental protection and conservation of the Site:	We request the clause to be modified as follows: (e) procured all Applicable Permits relating to environmental protection and conservation of the Site and any permits or Forest clearances/MOEF Clearances.	No Change envisaged.
4.	Article 4.2	Damages for delay by the Authority In the event that (i) the Authority does not procure fulfilment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof in this Agreement, and ....., subject to a maximum of 20% (twenty percent) of the Performance Security.	The right of Termination shall be available to the Concessionaire if such Condition Precedent is not fulfilled within the specified period and extension shall be granted.	No Change envisaged.

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5.	Article 5 Obligation of the Concessionaire Article 5.1.4 (e)	"Make reasonable efforts to facilitate the acquisition of land required for the purposes of the agreement."	The responsibility of acquisition of land is to be with the Authority. Concessionaire's role and responsibility in this regard may be clarified.	The Concessionaire is required to provide all assistance which the Authority may require in the process of acquisition of land.
6.	Article 5.3.2	Change in Ownership (i)all acquisitions of Equity by an acquirer, either by himself or with any person acting in concert, directly or indirectly, including by transfer of the direct or indirect legal or beneficial ownership or control of any Equity, in aggregate of not less than 15% of the total Equity of the Concessionaire..... .....For the avoidance of doubt, it is expressly agreed that approval of the Authority hereunder shall be limited to national security and public interest perspective, and the authority shall endeavour to convey its decision thereon expeditiously.	We request AUTHORITY to omit this clause the acquisition of 15% equity of the Concessionaire would hardly have an impact on the operations or management of the Concessionaire We request you to modify the provision as follows: "The authority shall endeavour to convey its decision thereon expeditiously and in no event later than 15 days."	No Change envisaged.
7.	Article 5.6	The Concessionaire having been set up for the sole purpose of exercising the rights and observing and performing its obligations and liabilities under this Agreement, the Concessionaire or any of its subsidiaries shall not, except with	Upon achieving Commercial Operations for the Project, the obligation of the Concessionaire is limited to the maintenance and operation of the Project Highway. Hence, we request Authority to make the following additions at the end:	No Change envisaged.

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		the previous written consent of the Authority, be or become directly or indirectly engaged, concerned or interested in any business other than as envisaged herein.zzzzzzzzzzzzzzz	"which consent shall not be unreasonably withheld after the Commercial Operations Date."	
8.	Obligations of the Authority Article 6.1.2(e)	Obligations of the Authority (e) Subject to and in accordance with the Applicable Laws, grant to the Concessionaire the Authority to regulate traffic on the Project Highway.	Please confirm that such Authority to regulate traffic on the Project Highway shall be granted to the Concessionaire from the Appointed date and amend the clause accordingly in the following way: "Subject to and in accordance with the Applicable Laws, grant to the Concessionaire the Authority to regulate traffic on the Project Highway such that the Concessionaire will be able to operate the existing road from the Appointed Date."	The authority granted to the Concessionaire under the Concession Agreement is exclusively with respect to the Project Highway. No Change envisaged.
9.	Article 6.3	Obligations relating to Competing Roads The Authority shall.....any Government Instrumentality shall, at any time before the 10th (tenth) anniversary of the Appointed Date, construct or cause to be constructed any Competing Road Upon breach of its obligations hereunder, the Authority shall be liable to payment of compensation to the Concessionaire under and in accordance with Clause 35.4	It is our request to amend the Clause as follows: "The Authority shall not construct or cause to be constructed any Competing Road from the date of Bid submission till the 10th anniversary." It will be unfair to not provide for any termination rights to the Concessionaire in the event that the Authority is in breach of this Clause. Therefore, we request you to modify the Clause in the following manner	Kindly have reference to Article 35.5 wherein the Concessionaire is entitled to Termination Payments, if any. No Change envisaged.

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			"The Concessionaire shall, without prejudice to its other rights and remedies under this Agreement including Termination thereof, be entitled to receive compensation from the Authority under and in accordance with Clause 35.4" Such compensation shall be adjusted against the Premium, if any that the Concessionaire has to pay to the Authority under this Agreement.	
10.	Right of Way Licence, Access and Right of Way Article 10.2.5	The Concessionaire hereby irrevocably appoints the Authority (or its nominee) to be its true and lawful attorney, to execute and sign in the name of the Concessionaire a transfer or surrender of the License granted hereunder at any time after the Concession Period has expired or has been terminated earlier in terms hereof, a sufficient proof of which will be the declaration of any duly authorised officer of the Authority, and the Concessionaire consents to it being registered for this purpose.	We request Authority to make the following amendments: "The Concessionaire hereby irrevocably appoints the Authority (or its nominee) to be its true and lawful attorney, to execute and sign in the name of the Concessionaire a transfer or surrender of the License granted hereunder at any time after the Concession Period has expired or has been terminated earlier in terms hereof, provided Termination Payments (if applicable) shall have been paid in full, a sufficient proof of which will be the declaration of any duly authorised officer of the Authority, and the Concessionaire consents to it being registered for this purpose."	No Change envisaged.
11.	Article 10.3.2	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree..... shall not include	Kindly confirm the status of land acquisition.	Land plan is prepared and acquisition process is to be initiated shortly.

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		more than 20% (twenty percent) of the total area of the Site required and necessary for the .....Clause 4.2.		
12.	Article 10.3.4	The Authority shall make best efforts to provide and grant the Right of Way to the Concessionaire in respect of all land included..... from the 91st (ninety first) day of the Appointed Date and until such Right of Way is procured.	The clause mentions that in case of delay in land acquisition, the Authority shall be liable to pay damages. In the event damages are paid by the Authority, the Concessionaire shall have to complete all Construction works before the Project Completion Date. This ultimately transfers the land acquisition risk to the Concessionaire. For instance, if there is a 6 month delay in land acquisition, though the Authority will be liable to pay damages, it will be unrealistic for the Concessionaire to complete the project in time; As a result, we will end up paying damages too for delay in project completion.	The Construction Period only commences from the Appointed Date which is later of the date of Financial Close or achievement of Conditions Precedent by the Parties. Kindly refer to the date of 'Appointed Date' and 'Construction Period'. No change envisaged.
13.	Article 10 Right of Way (Procurement of Site) 10.3.4	The Authority shall make best efforts to provide and grant the Right of Way.....until such Right of Way is procured.	Kindly make the necessary changes as below: The Authority should ensure the grant of Right of Way.....until such Right of Way is procured.	No Change envisaged.
14.	Utilities, Associated Roads and Trees Article 11.3.2	The Authority may, by notice require the Concessionaire to connect any adjoining road to the Project Highway.	Maintenance of adjoining roads can adversely affect the financial viability of the project. Therefore, maintenance of adjoining roads should not be the obligation of the	Such construction, if required by the Authority, would be governed as per Article 16.

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			concessionaire.	
15.	Article 11.3.3	The Authority may by notice require the Concessionaire to connect, through a paved road…..and maintained by the concessionaire upon Advance Payment of the cost to be made by the beneficiary entity in accordance with the amount and period as determined by the Independent Engineer.	Kindly modify the following clause as follows; "The Authority may by notice require the concessionaire to connect, through a paved road…..and maintained by the concessionaire upon Advance Payment of the cost to be made by the beneficiary entity in accordance with the amount and period as determined by Independent Engineer in consultation with the Concessionaire"	No Change envisaged.
16.	Article 11.4 Utilities, Associated Roads and Trees Felling of Trees	The Authority shall assist the Concessionaire in obtaining the Applicable Permits for felling of trees to be identified by the Authority…….deem appropriate	The obligation of obtaining the Applicable Permit for felling of trees & other Clearances related to Ministry of Environment & clearances Forest should be with the Authority and the assistance to be done by the Concessionaire. The Concessionaire will do actual feeling of trees but the permit has to be obtained by the Authority. Thus we request the clause to be modified as follows: The Concessionaire shall assist the Authority in obtaining the Applicable Permits for felling of trees to be identified by the Authority…….deem appropriate.	The Authority will facilitate in obtaining the applicable permits and the Concessionaire shall be responsible for obtaining applicable permits and felling of trees. No change envisaged.
17.	Construction of service	The Authority, shall at any time after the 8th (Eighth) anniversary	Maintenance of service lanes constructed by the Authority during the remaining	No Change envisaged.

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	lanes by the Authority 12.8	.....in accordance with the provision of this agreement.	operation period can not be a obligation of the Concessionaire as it will adversely affect the financial viability of the project. Therefore, maintenance of services lanes constructed by the Authority should not be the obligation of the Concessionaire.	
18.	Numbering of Clause 12.4, 12.7, 12.4.1.12.4.3		There is discrepancy in numbering of clause 12.4, 12.7, 12.4.1.12.4.3. Request you to correct the same.	Cls. 12.4.1, 12.4.2 & 12.4.3 shall be read as Cl. 12.7.1, 12.7.2 & 12.7.3 respectively in page 52 & 53 of DCA.
19.	Power of the Authority to undertake works 16.5.1	In accordance with Clause 16.5.1 Notwithstanding anything to the contrary contained in clause 16.1, 16.2 & 16.3, the Authority may, after giving notice to the concessionaire and considering its reply thereto, award such works or services to any person on the basis of open competitive bidding	Kindly modify as "If change of scope work awarded through competitive bidding to other party then the Authority will be solely responsible to maintain the additional work and services under change of scope"	No Change envisaged.
20.	Reduction in Scope of the Project 16.6.1	If the concessionaire shall have failed to complete Any Construction Work on account of Force Majeure or any reasons solely attributable to the Authority.....require the concessionaire to pay 80% of the sum saved therefrom, and upon such payment	In such an eventuality of the Reduction in the Scope of the Project firstly the right of Termination shall be available to the Concessionaire. And further, the clause should be modified as follows. "If the concessionaire shall have failed to complete Change of Scope Construction Work on account of Force Majeure or any reasons solely attributable to the	No Change envisaged.

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			Authority.....require the concessionaire to pay 80% of the sum saved there from, and upon such payment ...."	
21.	17.1.3	The Concessionaire shall maintain, in conformity with Good Industry Practice, all stretches of approach roads, over-passes, under-passes or other structures situated on the Site but not forming part of the carriageway.	The Concessionaire shall maintain all stretches of approach roads, over-passes, under-passes or other structures situated on the Site but not forming part of the carriageway. This imposes additional cost on O&M. We need some clarity on such structures already existing on the Site not forming part of carriageway.	No Change envisaged. The Concessionaire is advised to visit the Project Site & have an independent due diligence of the existing structures on the Project Site.
22.	Expenditure on Safety Requirements 18.2	.....costs and expenses on works and services not covered hitherto before and arising out of safety funds requirements shall be borne form out of a dedicated safety funds to funded owned and operated by the Authority or a substitute thereof.	Kindly clarify what will happen to the safety funds on transfer date? Also clarify whether Concessionaire shall be allowed to use the balance amount remaining from safety funds?	The Safety Fund is the dedicated fund to meet all costs and expenses arising out of or relating to Safety Requirements of the Highway and is funded, owned & operated by the Authority. It shall at all times, even after the Transfer Date, vest with the Authority for catering to any safety requirements of the Project Highway after the Transfer Date.
23.	Additional Concession Fee 26.2	Without prejudice to the provisions of clause 26.1 the concessionaire agrees to pay to .....Total realisable fee for the respective year.	Kindly provide us the Methodology of arriving at premium to be quoted before COD.	The Bidder is advised to carry out its own financial analysis and accordingly structure its Bid for the Project.
24.	Article 29 Effect of Variations in	The Authority and the Concessionaire acknowledge that the traffic as on 1st October, 2020	Kindly provide Target Traffic. Also, kindly provide the methodology to arrive at Target Traffic.	Chapter 2 of Preliminary Design Report Vol. 1 includes the desired details and can be referred for

	Traffic Growth	(the "Target Date") is estimated to be **** PCUs per day....shall be deemed to be the actual traffic.		further reference.
25.	Article 29 Effect of Variations in Traffic Growth	Footnote 1 and 2	Footnote 1: Please confirm whether the Target Date is 10 years from the date of this Agreement or 1st October 2020. Footnote 2: Please confirm the base traffic assumed for this project.	Target date shall be 10 years from the date of agreement, as enunciated in DCA. However, such date shall not be later than 3 years prior to the date of expiry of the Concession Period Kindly refer to the reply under Sl. No. 24.
26.	Article 29.1.1	Effect of Variations in Traffic Growth	In order to arrive at Actual Traffic after having a continuous 7 days count during anytime within 15 days prior to the dates specified in the clause 29.1.1 Kindly, clarify that in order to arrive at the Actual Traffic PCU to be compared with the Target Traffic. Along with the Actual tollable traffic, whether all the trips performed by local traffic is considered or only one trip per day based on their schedule of toll payment is considered For e.g.- There may be 1000 vehicles crossing the toll plaza in 24 hours, but actually say 800 are paying toll (crossing toll plaza once) and the remaining 200 vehicles (performing 2 trips each in a day) are	Kindly refer to the reply under Sl. No. 24

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			paying toll on return basis. In this case, whether 1000 vehicles will be considered with Target Traffic or 800 vehicles plus 100 local vehicles = 900 vehicles will be considered for comparing with the target traffic? Kindly clarify?	
27.	Definition	Change in Law means the occurrence of any of the following after the date of Bid: (e) any change in the rates of any of the Taxes that have a direct effect on the Project;	Any change in rate of Taxes will always have an impact on the Concessionaire and not the Project. Therefore, we request you to replace the word 'Project' with 'Concessionaire'.	The incidence of the change in rate of taxes on the Concessionaire cannot be a liability on the State Exchequer. No Change envisaged.
28.	Definition	Equity	We suggest the following modification: Equity means the sum expressed in Indian Rupees representing ..... include preference shares, convertible instruments or other similar...but does not include Equity Support;	Preference Shares are, as per the Companies Act, 1956, not considered a part of Equity. No Change envisaged.
29.	Definition	"Financial Close" means the fulfillment of all conditions precedent to the initial availability of funds under the Financing Agreements	Kindly make the following changes: "Financial Close means the fulfillment of all conditions precedent or waiver thereof to the initial availability of funds under the Financing Agreements"	The Conditions Precedent, in the said definition, refer to the prescribed conditions under the Financing Agreements [with lenders]; fulfillment of which entitle the Developer to initial drawdown of funds. No Change envisaged.
30	Schedule C	The Project Facilities shall include [(g) others (to be specified)]	Please clarify the brief description of the Project Facilities.	The project facilities as listed in Annex 1 (a to f) of schedule C are

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			Also confirm the others mentioned in sub clause (g)	required before project completion date, whereas, other facilities shall be as per Sl. No. 1 of Schedule C in conformity with IRC Guidelines.
31	Schedule D , Annex-I	..(An authenticated draft copy of the Manual (IRC:SP:84-2009) has been provided to the Concessionaire as part of the bid document.	The copy is not provided along with the bid document. The same may kindly be provided.	The IRC: SP: 84 - 2009 is standard document and available for sale with IRC. This can be procured from IRC point of sale.
32	Schedule R-Fee Notification Article 4 (2)	The rate of fee for use of section of national highway of four or more lanes shall be for the base year 2007-08 , be product of the length of such section	Kindly confirm Tollable length of the Project to be considered to arrive at applicable Toll rates.	The revised Length of approach road & viaduct is 45.393 km as per "Addendum 2", while the length of bridge is 5.55 km and shall be considered for financial model.
	Schedule R-Fee Notification Article 4 (3)	Provided that while computing fee for the section of national highway on which permanent bridge, bypass or tunnel costing Rupees fifty crores or more is situated the length of such section of national highway and fee shall be levied at the rates specified for such permanent bridge, bypass and tunnel..	The Project being the construction of permanent bridge and estimated cost of the Project is more than Rs 50 Crores we request the Authority to confirm the cost of the Structure to be considered to arrive at the Toll Rates. Also, the Authority may kindly confirm Tolling length of the portion of Approaches which are less than Rs 50 Crores to arrive at Toll rates.	Chapter 4, Updated Cost Estimate of Preliminary Design Report Vol. 1 includes the desired details and can be referred for further reference, whereas for ready reference Bridge Length – 5.55 km (Cost Rs. 710.64 Cr.) Approach Length (Revised) – 45.393 km (Cost Rs. 479.71 Cr.) There is no individual structure in the approach road costing more than 50 crores.
34	Schedule R-Fee Notification Article 5, sub clause (3)	Annual revision of rate of fee.-(1) The formula for determining the applicable rate of fee shall be as follows:- Applicable rate of fee = base rate +	Annual revision of rate of fee has been explained by the way of illustration for first year only. We request you, Kindly provide by the way of an illustration the working for annual revision of rate of fee for a period of consecutive three years	This is as per National Highway Fee (Determination of Rates & Collection) Rules, 2008 dated 5th Dec. 2008. Refer Schedule R, Rule 5

		base rate X {(WPI A - WPI B)/WPI B} x 0.4 Explanation.- for the purposes of this sub-rule ,- (a) applicable rate of fee shall be the rate payable by the user; (b) base rate shall be the rate specified in rule 4 read with sub-rule (1); (c) WPI A means the wholesale price index of the week ending on or subsequent to 1st January immediately preceding the date of revision under these rules; and (d) WPI B means the wholesale price index of the week ending on 6th January, 2007 i.e. 208.7. Illustration: If the revision is to be made for the year 2008-09 by applying the wholesale price index of the week ending on 5th January 2008 (i.e. 216.6), then the rate for car, jeep or van will be 0.6796 as computed below: Applicable rate of fee: 0.6695 + $0.6695 \times \left\{\frac{216.6-208.7}{208.7}\right\} \times 0.4 = 0.6796$		

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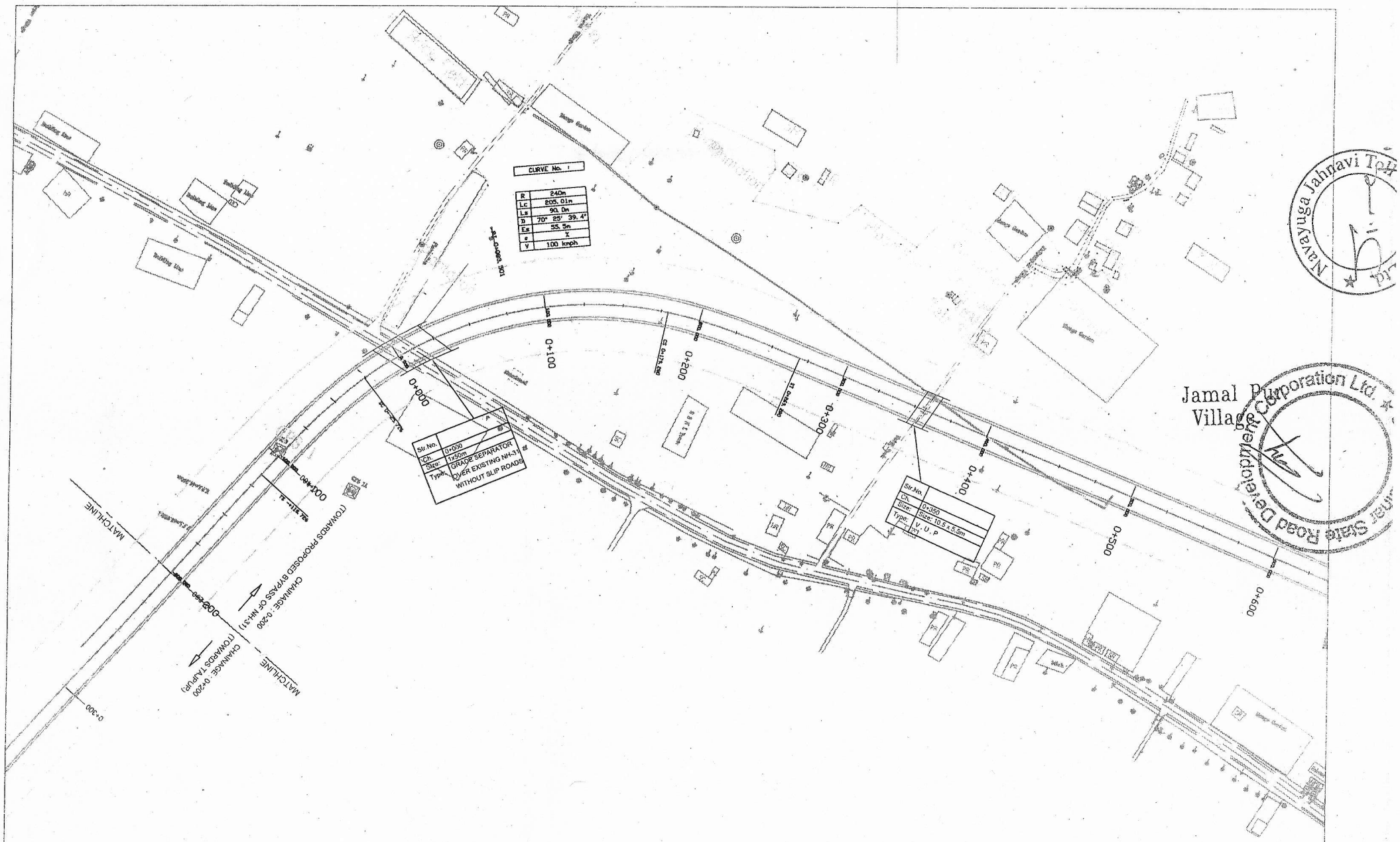
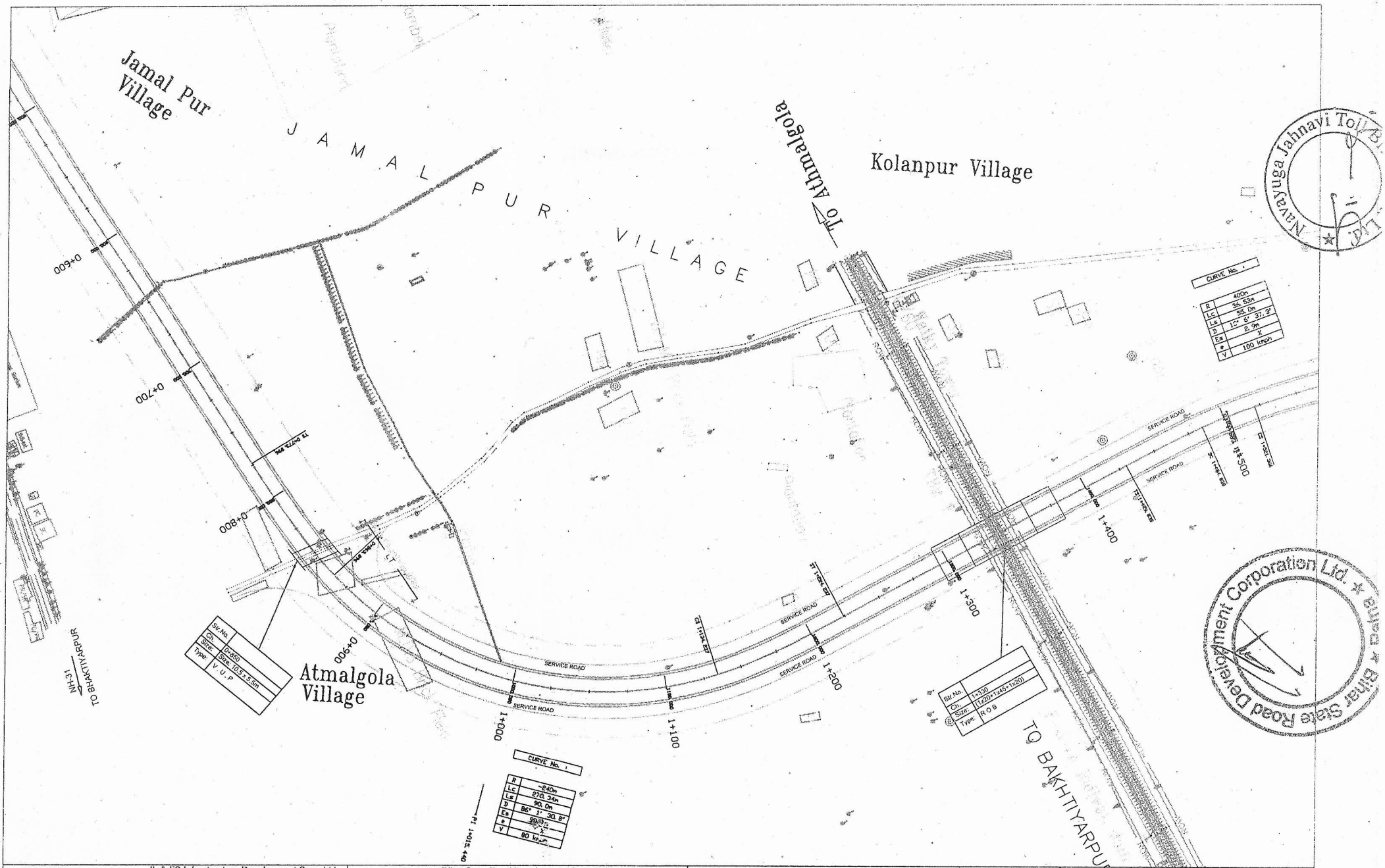
35	Schedule R-Fee Notification Article 5, sub clause (2)	"Applicable Base Rate"	Kindly define Applicable Base Rate.	Refer Schedule R, Sub Rule 1 of Rule 5.
36		Land Acquisition & Permissions/Clearances	Kindly Let us know the status of Land Acquisitions & permission /Clearances taken for the Project.	Refer Sl. No. 11. The process for procuring Environmental Clearance for the Project from Ministry of Environment & Forests, Government of India is being initiated.
37		Start of Construction Works	Kindly clarify whether the Concessionaire start work before the appointed date.	No. Refer Clause 12.4.1 of the draft Concession Agreement which stands renumbered as 12.7.1, pg. 52.

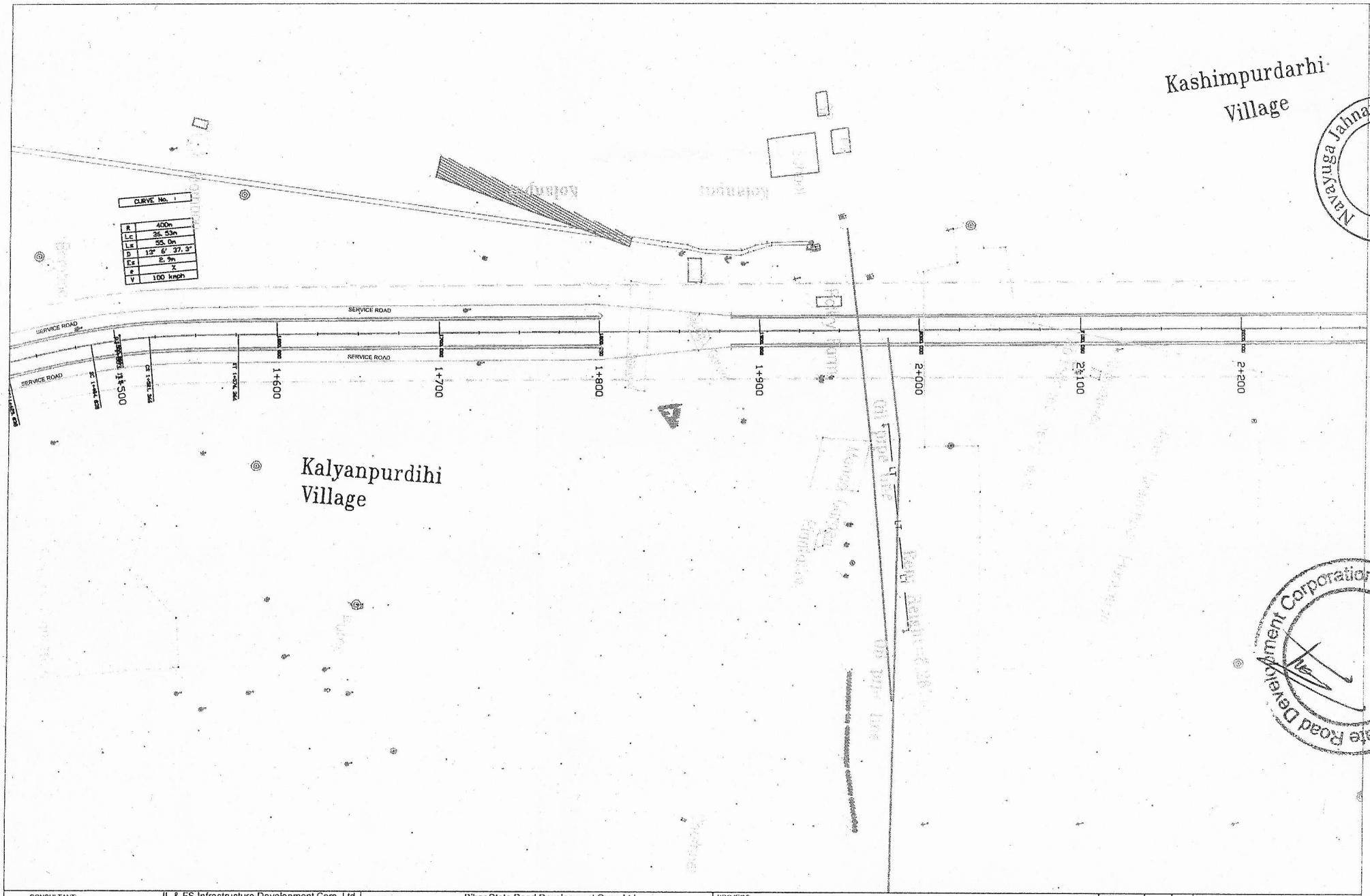


CONSULTANT: IL&FS	IL & FS Infrastructure Development Corp. Ltd. Eros Business Complex 3rd Floor Hotel Shangri-La 19, Ashoka Road New Delhi-110001	CLIENT: BSRDC	Bihar State Road Development Corp. Ltd. (A Govt. of Bihar Undertaking) Central Mechanical Workshop Campus Near Patna Airport Patna - 800001.	PROJECT: Consultancy Services for Preparation of Feasibility Cum-Preliminary Project Report of Major Road Bridge Across River Ganges Connecting Bakhtiyarpur and Shahpur Patori in Bihar	DESIGN: RS DRAWN: HCS CHECKED: GT APPROVED: TITLE: PLAN FOR NH31 BYPASS DRG. NO. 14974/B/GANGA/01 DATE: MAY-2010 SCALE: 1:1500 REVISION: R-0



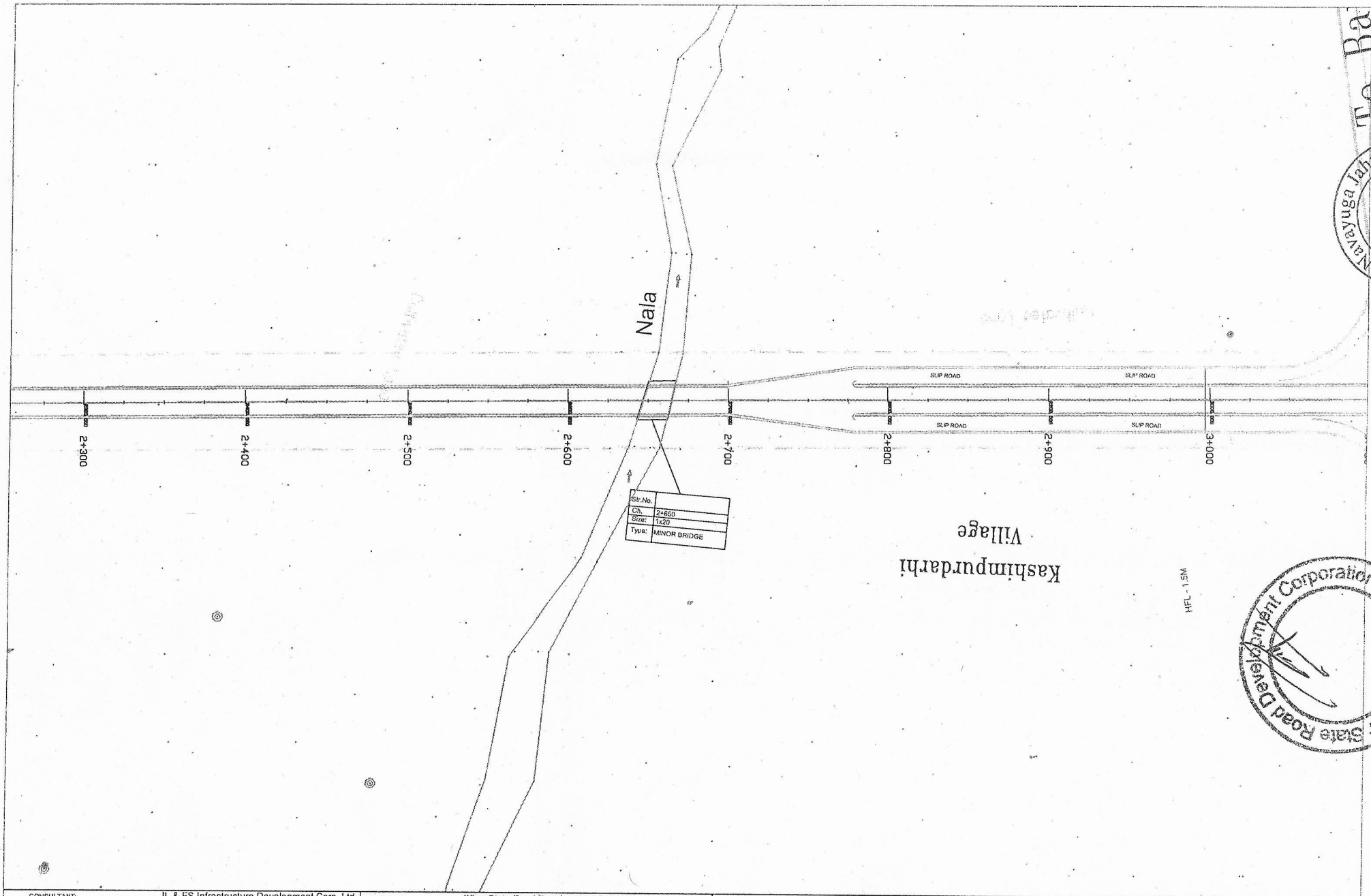
CONSULTANT: IL&FS	IL & FS Infrastructure Development Corp. Ltd. Eros Business Complex 3rd Floor Hotel Shangri-La 19, Ashoka Road New Delhi-110001	CLIENT: BSRDC	Bihar State Road Development Corp. Ltd. (A Govt. of Bihar Undertaking) Central Mechanical Workshop Campus Near Patna Airport Patna - 800001.	PROJECT: Consultancy Services for Preparation of Feasibility Cum-Preliminary Project Report of Major Road Bridge Across River Ganges Connecting Bakhtiyarpur and Shahpur Patori in Bihar	DESIGN: RS DRAWN: HCS CHECKED: GT APPROVED:

TITLE: PLAN FOR NH31 BYPASS
DRG. NO. 14974/B/GANGA/02
DATE: MAY-2010 | SCALE: 1:1500 | REVISION: R-0



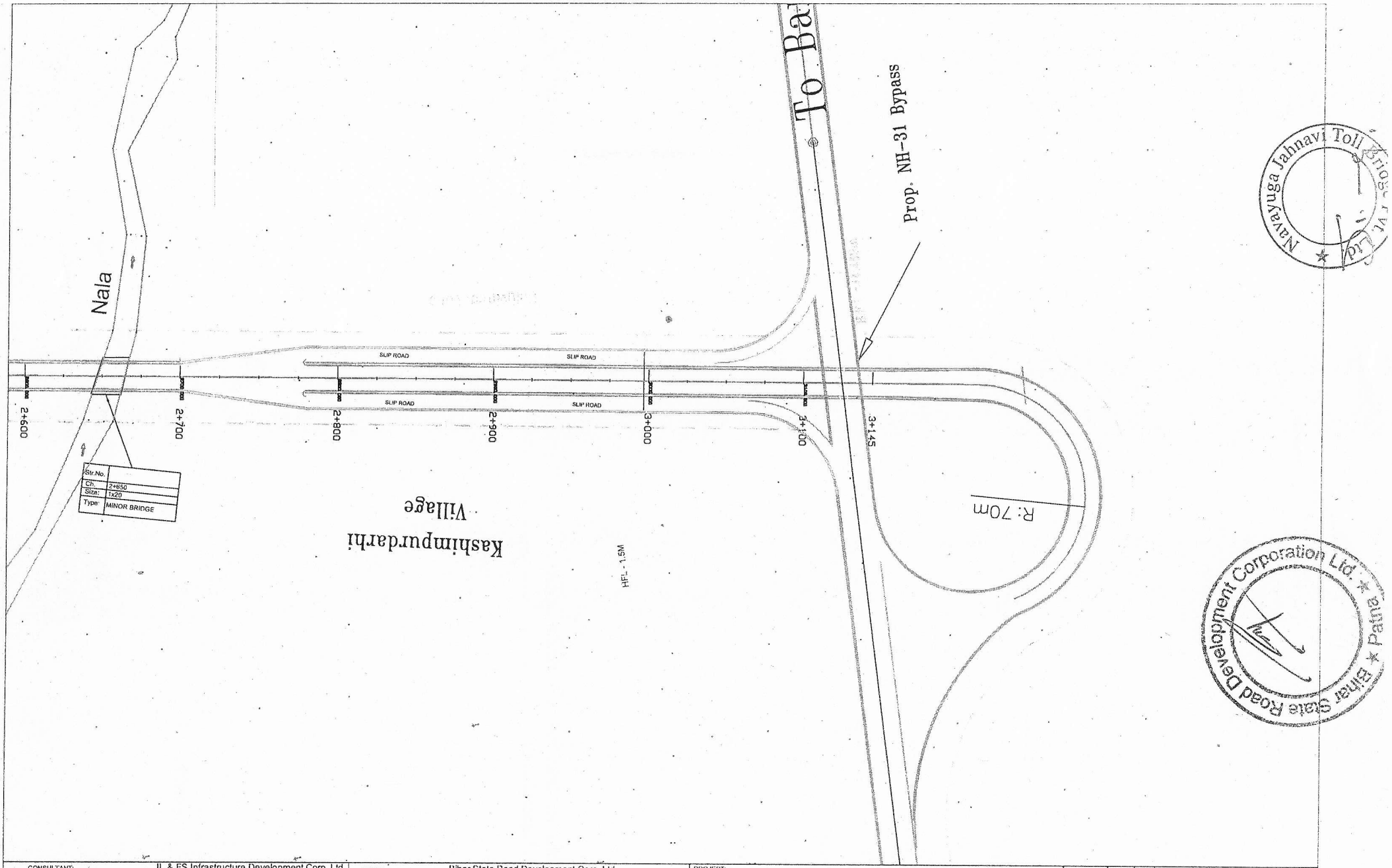
CONSULTANT: IL&FS	IL & FS Infrastructure Development Corp. Ltd. Eros Business Complex 3rd Floor Hotel Shangri-La 19, Ashoka Road New Delhi-110001	CLIENT:	Bihar State Road Development Corp. Ltd. (A Govt. of Bihar Undertaking) Central Mechanical Workshop Campus Near Patna Airport Patna - 800001.	PROJECT: Consultancy Services for Preparation of Feasibility Cum-Prelliminary Project Report of Major Road Bridge Across River Ganges Connecting Bakhtiyarpur and Shahpur Patori in Bihar	DESIGN: RS DRAWN: HCS CHECKED: GT APPROVED

TITLE: PLAN FOR NH31 BYPASS
DRG. NO. 14974/B/GANGA/03
DATE: MAY-2010 | SCALE: 1:1500 | REVISION: R-0



CONSULTANT: IL&FS	IL & FS Infrastructure Development Corp. Ltd. Eros Business Complex 3rd Floor Hotel Shangri-La 19, Ashoka Road New Delhi-110001	CLIENT: BSRDCL	Bihar State Road Development Corp. Ltd. (A Govt. of Bihar Undertaking) Central Mechanical Workshop Campus Near Patna Airport Patna - 800001.
PROJECT: Consultancy Services for Preparation of Feasibility Cum-Preliminary Project Report of Major Road Bridge Across River Ganges Connecting Bakhtiyarpur and Shahpur Patori in Bihar			

DESIGN:	RS		TITLE: PLAN FOR NH31 BYPASS	
DRAWN:	HCS		DRG. NO. 14974/B/GANGA/M	
CHECKED:	GT		DATE:	SCALE:	REVISION:
APPROVED:			MAY-2010	1:1500	R-0



CONSULTANT: IL&FS	IL & FS Infrastructure Development Corp. Ltd. Eros Business Complex 3rd Floor Hotel Shangri-La 19, Ashoka Road New Delhi-110001	CLIENT:	Bihar State Road Development Corp. Ltd. (A Govt. of Bihar Undertaking) Central Mechanical Workshop Campus Near Patna Airport Patna - 800001.	PROJECT: Consultancy Services for Preparation of Feasibility Cum-Preliminary Project Report of Major Road Bridge Across River Ganges Connecting Bakhtiyarpur and Shahpur Patori in Bihar	DESIGN: RS DRAWN: HCS CHECKED: GT APPROVED:	TITLE: PLAN FOR NH31 BYPASS DRG. NO. 14974/B/GANGA/05 DATE: MAY-2010 SCALE: 1:1500 REVISION: R-0

Bihar State Road Development Corporation Ltd.

(A Govt. of Bihar Undertaking)
Central Mechanical Workshop Campus
Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28 (RFP STAGE).

ADDENDUM-3 (RFP Stage)

1 The Bid Due Date stands extended to 16:00 hrs IST on 4th June, 2010, hence the clause 1.3 "Schedule of Bidding Process" of the ITB stands modified as follows. The Authority shall endeavour to adhere to the following schedule:

S. No.	Event Description	Date
1.	Last date for receiving queries	13th April, 2010
2.	1st Pre-Bid meeting	14th April, 2010 at Patna
3.	Authority response to queries latest by	22nd April, 2010
4	2nd Pre- Bid meeting	4th May, 2010 at Patna
5	Authority response to queries latest by	14th May, 2010
4.	Bid Due Date	4th June, 2010 at 16:00Hrs
5.	Opening of Bids	4th June, 2010 at 16:30 Hrs
6.	Letter of Award (LOA)	30th June, 2010
7.	Validity of Bids	2nd December, 2010
8.	Signing of Concession Agreement	30th July, 2010

2 All other terms and conditions as laid down in the RFP documents remain unaltered.

Bihar State Road Development Corporation Ltd. * Patna *

Navayuga Jahnavi Toll Bridge Pvt. Ltd.

Bihar State Road Development Corporation Ltd.

(A Govt. of Bihar Undertaking)
Central Mechanical Workshop Campus
Near Patna Airport
Patna- 800014

Project: Development of Major Bridge across river Ganga connecting NH-31 near Bakhtiyarpur and Tajpur on NH-28 (RFP STAGE).

ADDENDUM-4 (RFP Stage)

1 The Bid Due Date stands extended to 16:00 hrs IST on 14th June, 2010, hence the clause 1.3 "Schedule of Bidding Process" of the ITB stands modified as follows. The Authority shall endeavour to adhere to the following schedule:

S. No.	Event Description	Date
1.	Last date for receiving queries	13th April, 2010
2.	1st Pre-Bid meeting	14th April, 2010 at Patna
3.	Authority response to queries latest by	22nd April, 2010
4	2nd Pre- Bid meeting	4th May, 2010 at Patna
5	Authority response to queries latest by	14th May, 2010
4.	Bid Due Date	14th June, 2010 at 16:00Hrs
5.	Opening of Bids	14th June, 2010 at 16:30 Hrs
6.	Letter of Award (LOA)	9th July, 2010
7.	Validity of Bids	13th December, 2010
8.	Signing of Concession Agreement	9th August, 2010

2 All other terms and conditions as laid down in the RFP documents remain unaltered.

Bihar State Road Development Corporation Ltd. ★ Patna ★

Navayuga Jahnavi Toll Bridge Pvt. Ltd.