

**Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Project Directorate (ADB)
Kathmandu, Nepal**

**SASEC Highway Improvement Project (SHIP)
(ADB Loan No. 52097- 001)**

**Kanchanpur – Kamala Road (Section – 2)
From Km 189+300 to km 236+703**

Contract No. SHIP/OCB/KK/02

Phase 1: Upgrading Works

(Upgrading of existing road from 2-Lanes to 4 Lanes and Service Lanes, Structures, Bridges, etc. including Defect Notification Period)

Phase 2: Performance Based Maintenance Works

(Maintenance works consisting of all activities to be carried out to achieve and keep the road assets as defined in the PBM Specifications)

Bidding Document

Part I Bidding Procedures

Section 1	Instruction to Bidders
Section 2	Bid Data Sheet
Section 3	Evaluation and Qualification Criteria Section
Section 4	Bidding Forms incl. Bills of Quantities
Section 5	Eligible Countries

August, 2018

Preface

This Bidding Document for the Procurement of Works (Single Stage – Two Envelope) has been prepared by the Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB) and is based on the Standard Bidding Document for the Procurement of Works (SBD Works) issued by the Asian Development Bank dated May 2018.

ADB's SBD Works has the structure and the provisions of the Master Procurement Document entitled "Bidding Documents for the Procurement of Works", prepared by multilateral development banks and other public international financial institutions, except where ADB-specific considerations have required a change.

FOR REFERENCE ONLY

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This document has been issued under the authority of the Government of Nepal, Ministry of Physical Planning and Works, Department of Roads (July 2001), it can be purchased from the Central Road Laboratory, Kupandole, Lalitpur.	
Section 6C – Special Provisions	
This section contains amendments, supplements, etc. to the standard specifications to suit the specific requirements of the project, including sections regarding Minor Bridges and PBM works	
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This Section contains provisions that are specific to each contract and that modify or supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC

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FOR REFERENCE ONLY

Section 1 - Instructions to Bidders

(Single – Stage, Two-Envelope Bidding Procedure)

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FOR REFERENCE ONLY

Section 1 - Instructions to Bidders

A. General

1. Scope of Bid

1.1 In connection with the Invitation for Bids (IFB) indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues this Bidding Document for the procurement of Works as specified in Section 6 (Employer's Requirements). The name, identification, and number of contracts of the open competitive bidding (OCB) are provided in the BDS.

1.2 Throughout this Bidding Document,

- (a) the term "in writing" means communicated in written form and delivered against receipt;
- (b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and
- (c) "day" means calendar day.

2. Source of Funds

2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated in the BDS has applied for or received financing (hereinafter called "funds") from the Asian Development Bank (hereinafter called "ADB") toward the cost of the project named in the BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued.

2.2 Payments by the ADB will be made only at the request of the Borrower and upon approval by ADB in accordance with the terms and conditions of the Financing Agreement between the Borrower and ADB (hereinafter called "Financing Agreement"), and will be subject in all respects to the terms and conditions of that Financing Agreement. No party other than the Borrower shall derive any rights from the Financing Agreement or have any claim to the funds.

3. Fraud and Corruption

3.1 ADB's Anticorruption Policy requires Borrowers (including beneficiaries of ADB-financed activity), as well as Bidders, Suppliers, and Contractors under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, ADB

(a) defines, for the purposes of this provision, the terms set forth below as follows:

- (i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;
- (ii) "fraudulent practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;
- (iii) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

- (iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;
 - (v) "abuse" means theft, waste or improper use of assets related to ADB-related activity, either committed intentionally or through reckless disregard;
 - (vi) "conflict of interest" means any situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations;
 - (vii) "obstructive practice" means (a) deliberately destroying, falsifying, altering or concealing of evidence material to an ADB investigation, or deliberately making false statements to investigators, with the intent to impede an ADB investigation; (b) threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to a Bank investigation or from pursuing the investigation; or (c) deliberate acts intended to impede the exercise of ADB's contractual rights of audit or inspection or access to information; and
 - (viii) "integrity violation" is any act which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard
- (b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;
 - (c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the Borrower or of a beneficiary of ADB-financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the Borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation;
 - (d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate¹ in ADB-financed, -administered, or -supported activities or to benefit from an ADB-financed, -administered, or -supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations; and
 - (e) will have the right to require that a provision be included in bidding documents and in contracts financed by ADB, requiring Bidders, suppliers and contractors to permit ADB or its representative to inspect their accounts and records and other documents relating to

¹ Whether as a Contractor, Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document).

the bid submission and contract performance and to have them audited by auditors appointed by ADB.

3.2 All Bidders, consultants, contractors, suppliers, and other third parties engaged or involved in ADB-related activities have a duty to cooperate fully in any screening or investigation when requested by ADB to do so. Such cooperation includes, but is not limited to, the following:

- (a) being available to be interviewed and replying fully and truthfully to all questions asked;
- (b) providing ADB with any items requested that are within the party's control including, but not limited to, documents and other physical objects;
- (c) upon written request by ADB, authorizing other related entities to release directly to ADB such information that is specifically and materially related, directly or indirectly, to the said entities or issues which are the subject of the investigation;
- (d) cooperating with all reasonable requests to search or physically inspect their person and/or work areas, including files, electronic databases, and personal property used on ADB activities, or that utilizes ADB's ICT resources or systems (including mobile phones, personal electronic devices, and electronic storage devices such as external disk drives);
- (e) cooperating in any testing requested by ADB, including but not limited to, fingerprint identification, handwriting analysis, and physical examination and analysis; and
- (f) preserving and protecting confidentiality of all information discussed with, and as required by, ADB.

3.3 All Bidders, consultants, contractors and suppliers shall ensure that, in its contract with its sub-consultants, sub-contractors and other third parties engaged or involved in ADB-related activities, such sub-consultants, sub-contractors and other third parties similarly undertake the foregoing duty to cooperate fully in any screening or investigation when requested by ADB to do so.

3.4 The Employer hereby puts the Bidder on notice that the Bidder or any joint venture partner of the Bidder (if any) may not be able to receive any payments under the Contract if the Bidder or any of its joint venture partners, as appropriate, is, or is owned (in whole or in part) by a person or entity subject to applicable sanctions.

3.5 Furthermore, Bidders shall be aware of the provision stated in Subclause 1.15 and 15.6 of the Conditions of Contract

4. Eligible Bidders

4.1 A Bidder may be a natural person, private entity, or government-owned enterprise subject to ITB 4.5—or any combination of them with a formal intent to enter into an agreement or under an existing agreement in the form of a Joint Venture. In the case of a Joint Venture,

- (a) all partners shall be jointly and severally liable; and
- (b) the Joint Venture shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the Joint Venture during the bidding process and, in the event the Joint Venture is awarded the Contract, during contract execution.

- 4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section 5 (Eligible Countries). A Bidder shall be deemed to have the nationality of a country if the Bidder is a citizen or is constituted, incorporated, or registered, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.
- 4.3 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in the bidding process if any of, including but not limited to, the following apply:
- (a) they have controlling shareholders in common; or
 - (b) they receive or have received any direct or indirect subsidy from any of them; or
 - (c) they have the same legal representative for purposes of this bid; or
 - (d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influence the bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or
 - (e) a Bidder participates in more than one bid in this bidding process, either individually or as a partner in a joint venture, except for alternative offers permitted under ITB 13 of the Bidding Document. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of ITB 4.3(a)-(d) above, this does not limit the participation of a Bidder as a Subcontractor in another Bid or of a firm as a Subcontractor in more than one Bid; or
 - (f) a Bidder, joint venture partner, associates, parent company, or any affiliated entity, participated as a Consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or
 - (g) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer or Borrower as Engineer for the contract; or
 - (h) a Bidder would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the BDS ITB 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm.
- 4.4 A firm shall not be eligible to participate in any procurement activities under an ADB-financed, -administered, or -supported project while under temporary suspension or debarment by ADB pursuant to its Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by ADB, or enforced by ADB pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporary suspended or debarred firm will be rejected.
- 4.5 Government-owned enterprises in the Employer's country shall be eligible only if they can establish that they (i) are legally and

financially autonomous, (ii) operate under commercial law, and (iii) are not a dependent agency of the Employer.

- 4.6 A Bidder shall not be under suspension from bidding by the Employer as the result of the execution of a Bid-Securing Declaration.
- 4.7 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.
- 4.8 Firms shall be excluded if by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country or any payments to persons or entities in that country.
- 4.9 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.
- 5. Eligible Materials, Equipment and Services**
- 5.1 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as defined in ITB 4.2 above and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment, and services.
- 5.2 For purposes of ITB 5.1 above, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.

B. Contents of Bidding Document

- 6. Sections of Bidding Document**
- 6.1 The Bidding Document consist of Parts I, II, and III, which include all the sections indicated below, and should be read in conjunction with any addenda issued in accordance with ITB 8.

PART I Bidding Procedures

Section 1 - Instructions to Bidders (ITB)
Section 2 - Bid Data Sheet (BDS)
Section 3 - Evaluation and Qualification Criteria (EQC)
Section 4 - Bidding Forms (BDF)
Section 5 - Eligible Countries (ELC)

PART II Requirements

Section 6 - Employer's Requirements (ERQ)

PART III Conditions of Contract and Contract Forms

Section 7 - General Conditions of Contract (GCC)
Section 8 - Particular Conditions of Contract (PCC)
Section 9 - Contract Forms (COF)

- 6.2 The IFB issued by the Employer is not part of the Bidding Document.
- 6.3 The Employer is not responsible for the completeness of the Bidding Document and their addenda, if they were not obtained directly from the source stated by the Employer in the IFB.
- 6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.

7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting

- 7.1 A prospective Bidder requiring any clarification on the Bidding Document shall contact the Employer in writing at the Employer's address indicated in the BDS or raise his inquiries during the pre-bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received no later than 21 days prior to the deadline for submission of bids. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.
- 7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.
- 7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
- 7.4 The Bidder's designated representative is invited to attend a pre-bid meeting, if provided for in the BDS. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.
- 7.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than 1 week before the meeting.
- 7.6 Minutes of the pre-bid meeting, including the text of the questions raised, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3. Any modification to the Bidding Document that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an addendum pursuant to ITB 8 and not through the minutes of the pre-bid meeting.

7.7 Nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.

8. Amendment of Bidding Document

8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Document by issuing addenda.

8.2 Any addendum issued shall be part of the Bidding Document and shall be communicated in writing to all who have obtained the Bidding Document from the Employer in accordance with ITB 6.3.

8.3 To give prospective Bidders reasonable time in which to take an addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of Bids, pursuant to ITB 22.2

C. Preparation of Bids

9. Cost of Bidding

9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

10. Language of Bid

10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified in the BDS, in which case, for purposes of interpretation of the Bid, such translation shall govern.

11. Documents Comprising the Bid

11.1 The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Bid containing the documents listed in ITB 11.2 and the other the Price Bid containing the documents listed in ITB 11.3, both envelopes enclosed together in an outer single envelope.

11.2 The Technical Bid shall comprise the following:

- (a) Letter of Technical Bid;
- (b) Bid Security or Bid-Securing Declaration, in accordance with ITB 19;
- (c) alternative Bids, if permissible, in accordance with ITB 13;
- (d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2;
- (e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract;
- (f) Technical Proposal in accordance with ITB 16;
- (g) Any other document required in the BDS.

11.3 The Price Bid shall comprise the following:

- (a) Letter of Price Bid;
- (b) completed Price Schedules, in accordance with ITB 12 and ITB 14;
- (c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13;
- (d) Any other document required in the BDS.

11.4 In addition to the requirements under ITB 11.2, Bids submitted by a Joint Venture shall include a copy of the Joint Venture Agreement entered into by all partners. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all partners and submitted with the Bid, together with a copy of the proposed agreement.

12. Letters of Bid and Schedules

12.1 The Letters of Technical Bid and Price Bid, and the Schedules, including the Bill of Quantities, shall be prepared using the relevant forms furnished in Section 4 (Bidding Forms). The forms must be completed without any alterations to the text, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested and as required in the BDS.

13. Alternative Bids

13.1 Unless otherwise indicated in the BDS, alternative Bids shall not be considered.

13.2 When alternative times for completion are explicitly invited, a statement to that effect will be included in the BDS, as will the method of evaluating different times for completion.

13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the basic technical requirements shall be considered by the Employer.

13.4 When specified in the BDS, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be identified in the BDS and described in Section 6 (Employer's Requirements). The method for their evaluation will be stipulated in Section 3 (Evaluation and Qualification Criteria).

14. Bid Prices and Discounts

14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Bill of Quantities shall conform to the requirements specified below.

14.2 The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.

14.3 The price to be quoted in the Letter of Price Bid, in accordance with ITB 12.1, shall be the total price of the Bid, excluding any discounts offered. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the Bid.

14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1.

14.5 The prices shall be either fixed or adjustable as specified in the BDS.

(a) In the case of Fixed Price, prices quoted by the Bidder shall be fixed during the Bidder's performance of the contract and not

subject to variation on any account. A Bid submitted with an adjustable price will be treated as nonresponsive and rejected.

- (b) In the case of Adjustable Price, prices quoted by the Bidder shall be subject to adjustment during performance of the contract to reflect changes in the cost elements such as labor, material, transport, and contractor's equipment in accordance with the provisions of the Conditions of Contract. A Bid submitted with a fixed price will be treated as non-responsive and be rejected. The Bidder shall furnish the indexes and weightings for the price adjustment formulas in the Tables of Adjustment Data included in Section 4 (Bidding Forms) and the Employer may require the Bidder to justify its proposed indexes and weightings. Any bid that omits indexes and weightings shall be subject to clarification with the Bidder.

14.6 If so indicated in ITB 1.1, bids are being invited for individual contracts or for any combination of contracts (packages). Bidders wishing to offer any price reduction for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all contracts are submitted and opened at the same time.

14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 28 days prior to the deadline for submission of bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.

15. Currencies of Bid and Payment

15.1 The unit rates and the prices shall be quoted by the Bidder entirely in the currency specified in the BDS.

15.2 Bidders shall indicate the portion of the bid price that corresponds to expenditures incurred in the currency of the Employer's country in the Schedule of Payment Currencies included in Section 4 (Bidding Forms).

15.3 Bidders expecting to incur expenditures in other currencies for inputs to the Works supplied from outside the Employer's country and wishing to be paid accordingly may indicate up to other currencies in the Schedule of Payment Currencies included in Section 4 (Bidding Forms).

15.4 The rates of exchange to be used by the Bidder for currency conversion during bid preparation shall be the selling rates for similar transactions prevailing on the date 28 days prior to the deadline for submission of bids published by the source specified in the BDS. If exchange rates are not so published for certain currencies, the Bidder shall state the rates used and the source. Bidders should note that for the purpose of payments, the exchange rates confirmed by the source specified in the BDS as the selling rates prevailing 28 days prior to the deadline for submission of Bids shall apply for the duration of the Contract so that no currency exchange risk is borne by the Bidder.

15.5 Foreign currency requirements indicated by the Bidders in the Schedule of Payment Currencies shall include but not limited to the specific requirements for

- (a) expatriate staff and labor employed directly on the Works;
- (b) social, insurance, medical and other charges relating to such expatriate staff and labor, and foreign travel expenses;

- (c) imported materials, both temporary and permanent, including fuels, oil and lubricants required for the Works;
- (d) depreciation and usage of imported Plant and Contractor's Equipment, including spare parts, required for the Works;
- (e) foreign insurance and freight charges for imported materials, Plant and Contractor's Equipment, including spare parts; and
- (f) overhead expenses, fees, profit, and financial charges arising outside the Employer's country in connection with the Works.

15.6 Bidders may be required by the Employer to clarify their foreign currency requirements, and to substantiate that the amounts included in the unit rates and prices and shown in the Schedule of Payment Currencies are reasonable and responsive to ITB 15.3 above, in which case a detailed breakdown of its foreign currency requirements shall be provided by the Bidder.

15.7 Bidders should note that during the progress of the Works, the foreign currency requirements of the outstanding balance of the Contract Price may be adjusted by agreement between the Employer and the Contractor in order to reflect any changes in foreign currency requirements for the Contract, in accordance with Sub clause 14.15 of the Conditions of Contract. Any such adjustment shall be effected by comparing the percentages quoted in the bid with the amounts already used in the Works and the Contractor's future needs for imported items.

**16. Documents
Comprising the
Technical
Proposal**

16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule, and any other information as stipulated in Section 4 (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.

**17. Documents
Establishing the
Qualifications of
the Bidder**

17.1 To establish its qualifications to perform the Contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section 4 (Bidding Forms).

17.2 Domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility as described in ITB 36.

**18. Period of Validity
of Bids**

18.1 Bids shall remain valid for the period specified in the BDS after the bid submission deadline date prescribed by the Employer. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.

18.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 19, it shall also be extended 28 days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its Bid

**19. Bid Security/Bid-
Securing
Declaration**

19.1 Unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, in original form, either a Bid-Securing Declaration or a bid security as specified in the BDS. In the case of a bid security, the amount and currency shall be as specified in the BDS.

19.2 If a Bid-Securing Declaration is required pursuant to ITB 19.1, it shall use the form included in Section 4 (Bidding Forms). The Employer

will declare a Bidder ineligible to be awarded a Contract for a specified period of time, as indicated in the BDS, if the Bid-Securing Declaration is executed.

19.3 If a bid security is specified pursuant to ITB 19.1, the bid security shall be, at the Bidder's option, in any of the following forms:

- (a) an unconditional bank guarantee,
- (b) an irrevocable letter of credit, or
- (c) a cashier's or certified check,
- (d) swift message in the form of MT760.

all from a reputable source from an eligible country as described in Section 5 (Eligible Countries). In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section 4 (Bidding Forms) or another form acceptable to the Employer. The form must include the complete name of the Bidder. The bid security shall be valid for 28 days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.

19.4 Unless otherwise specified in the BDS, any Bid not accompanied by a substantially compliant bid security or Bid-Securing Declaration, if one is required in accordance with ITB 19.1, shall be rejected by the Employer as nonresponsive.

19.5 If a bid security is specified pursuant to ITB 19.1, the bid security of unsuccessful Bidders shall be returned promptly upon the successful Bidder's furnishing of the performance security pursuant to ITB 45.

19.6 If a bid security is specified pursuant to ITB 19.1, the bid security of the successful Bidder shall be returned promptly once the successful Bidder has signed the Contract and furnished the required performance security.

19.7 The bid security may be forfeited or the Bid Securing Declaration executed,

- (a) if notwithstanding ITB 24.3, a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid, except as provided in ITB 18.2; or
- (b) if the successful Bidder fails to
 - (i) sign the Contract in accordance with ITB 44;
 - (ii) furnish a performance security in accordance with ITB 45;
 - (iii) accept the arithmetical correction of its Bid in accordance with ITB 34; or
 - (iv) furnish a domestic preference security, if so required.

19.8 If the bid security is required as per ITB 19.1, the bid security of a Joint Venture shall be in the name of the Joint Venture that submits the Bid. If the Joint Venture has not been legally constituted at the time of bidding, the bid security shall be in the name of any or all of the Joint Venture partners. If the Bid-Securing Declaration is required as per ITB 19.1, the Bid-Securing Declaration of a Joint Venture shall be in the name of the Joint Venture that submits the Bid. If the Joint Venture has not been legally constituted at the time of bidding, the Bid-Securing Declaration shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.

**20. Format and
Signing of Bid**

- 20.1 The Bidder shall prepare one original set of the Technical Bid and one original set of the Price Bid comprising the Bid as described in ITB 11 and clearly mark it "ORIGINAL - TECHNICAL BID" and "ORIGINAL - PRICE BID." Alternative Bids, if permitted in accordance with ITB 13, shall be clearly marked "ALTERNATIVE." In addition, the Bidder shall submit copies of the Technical and Price Bids, in the number specified in the BDS, and clearly mark each of them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.
- 20.2 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the BDS and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. If a Bidder submits a deficient authorization, the Bid shall not be rejected in the first instance. The Employer shall request the Bidder to submit an acceptable authorization within the number of days as specified in the BDS. Failure to provide an acceptable authorization within the prescribed period of receiving such a request shall cause the rejection of the Bid. If either the Letter of Technical Bid or Letter of Price Bid or Bid-Securing Declaration (if applicable) are not signed, the Bid shall be rejected.
- 20.3 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.

D. Submission and Opening of Bids

**21. Sealing and
Marking of Bids**

- 21.1 Bidders may always submit their Bids by mail or by hand. When so specified in the BDS, Bidders shall have the option of submitting their Bids electronically. Procedures for submission, sealing, and marking are as follows:
- (a) Bidders submitting Bids by mail or by hand shall enclose the original of the Technical Bid, the original of the Price Bid, and each copy of the Technical Bid and each copy of the Price Bid, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL - TECHNICAL BID," "ORIGINAL - PRICE BID," and "COPY NO... - TECHNICAL BID" and "COPY NO.... - PRICE BID." These envelopes, the first containing the originals and the others containing copies, shall then be enclosed in one single envelope per set. If permitted in accordance with ITB 13, alternative Bids shall be similarly sealed, marked and included in the sets. The rest of the procedure shall be in accordance with ITB 21.2 and ITB 21.5.
 - (b) Bidders submitting Bids electronically shall follow the electronic bid submission procedures specified in the BDS.
- 21.2 The inner and outer envelopes shall
- (a) bear the name and address of the Bidder;
 - (b) be addressed to the Employer in accordance with BDS 22.1; and
 - (c) bear the specific identification of this bidding process indicated in the BDS 1.1.

- 21.3 The outer envelopes and the inner envelopes containing the Technical Bid shall bear a warning not to open before the time and date for the opening of Technical Bid, in accordance with ITB 25.1.
- 21.4 The inner envelopes containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 25.7.
- 21.5 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.
- 22. Deadline for Submission of Bids**
- 22.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the BDS.
- 22.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.
- 23. Late Bids**
- 23.1 The Employer shall not consider any Bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.
- 24. Withdrawal, Substitution, and Modification of Bids**
- 24.1 A Bidder may withdraw, substitute, or modify its Bid – Technical or Price – after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be
- (a) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked “WITHDRAWAL,” “SUBSTITUTION,” “MODIFICATION”; and
- (b) received by the Employer no later than the deadline prescribed for submission of Bids, in accordance with ITB 22.
- 24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall be returned unopened to the Bidders.
- 24.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the Bidder on the Letters of Technical Bid and Price Bid or any extension thereof.
- 25. Bid Opening**
- 25.1 The Employer shall open the Technical Bids in public at the address, on the date and time specified in the BDS in the presence of Bidders’ designated representatives and anyone who chooses to attend. Any specific electronic bid opening procedures required if electronic bidding is permitted in accordance with ITB 21.1, shall be as specified in the BDS. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and the Price Bid are submitted together in one envelope, the Employer may reject the entire Bid. Alternatively, the Price Bid may be immediately resealed for later evaluation.

- 25.2 First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding Bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening.
- 25.3 Second, outer envelopes marked "SUBSTITUTION" shall be opened. The inner envelopes containing the Substitution Technical Bid and/or Substitution Price Bid shall be exchanged for the corresponding envelopes being substituted, which are to be returned to the Bidder unopened. Only the Substitution Technical Bid, if any, shall be opened, read out, and recorded. Substitution Price Bid will remain unopened in accordance with ITB 25.1. No envelope shall be substituted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.
- 25.4 Next, outer envelopes marked "MODIFICATION" shall be opened. No Technical Bid and/or Price Bid shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original as well as Modification, will remain unopened in accordance with ITB 25.1.
- 25.5 All other envelopes holding the Technical Bids shall be opened one at a time, and the following read out and recorded:
- (a) the name of the Bidder;
 - (b) whether there is a modification or substitution;
 - (c) the presence of a bid security or Bid-Securing Declaration, if required; and
 - (d) any other details as the Employer may consider appropriate.
- Only Technical Bids and alternative Technical Bids read out and recorded at bid opening shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Technical Bid are to be initialed by at least three representatives of the Employer attending bid opening. No Bid shall be rejected at the opening of Technical Bids except for late bids, in accordance with ITB 23.1.
- 25.6 The Employer shall prepare a record of the opening of Technical Bids that shall include, as a minimum, the name of the Bidder and whether there is a withdrawal, substitution, or modification; alternative proposals; and the presence or absence of a bid security or Bid-Securing Declaration, if one was required. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.
- 25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of

the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given reasonable notice of the opening of Price Bids.

25.8 The Employer will notify Bidders in writing who have been rejected on the grounds of their Technical Bids being substantially nonresponsive to the requirements of the Bidding Document and return their Price Bids unopened.

25.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, in the presence of Bidders' representatives who choose to attend at the address, on the date, and time specified by the Employer. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.

25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:

- (a) the name of the Bidder;
- (b) whether there is a modification or substitution;
- (c) the Bid Prices, including any discounts and alternative offers; and
- (d) any other details as the Employer may consider appropriate.

Only Price Bids discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Price Bid and Bill of Quantities are to be initialed by at least three representatives of the Employer attending bid opening. No Bid shall be rejected at the opening of Price Bids.

25.11 The Employer shall prepare a record of the opening of Price Bids that shall include, as a minimum, the name of the Bidder, the Bid Price (per lot if applicable), any discounts, and alternative offers. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.

E. Evaluation and Comparison of Bids

26. Confidentiality

26.1 Information relating to the examination, evaluation, comparison, and postqualification of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on the Contract award is communicated to all Bidders.

26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the Bids or Contract award decisions may result in the rejection of its Bid.

26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.

27. Clarification of Bids

27.1 To assist in the examination, evaluation, and comparison of the Technical and Price Bids, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall

not be considered. The Employer's request for clarification and the response shall be in writing. No change in the substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Price Bids, in accordance with ITB 33.

27.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.

28. Deviations, Reservations, and Omissions

28.1 During the evaluation of Bids, the following definitions apply:

- (a) "Deviation" is a departure from the requirements specified in the Bidding Document;
- (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and
- (c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

29. Examination of Technical Bids

29.1 The Employer shall examine the Technical Bid to confirm that all documents and technical documentation requested in ITB 11.2 have been provided, and to determine the completeness of each document submitted.

29.2 The Employer shall confirm that the following documents and information have been provided in the Technical Bid. If any of these documents or information is missing, the offer shall be rejected.

- (a) Letter of Technical Bid;
- (b) written confirmation of authorization to commit the Bidder;
- (c) Bid Security or Bid-Securing Declaration, if applicable; and
- (d) Technical Proposal in accordance with ITB 16.

30. Responsiveness of Technical Bid

30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the bid itself, as defined in ITB 11.

30.2 A substantially responsive Technical Bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that,

- (a) if accepted, would:
 - (i) affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or
 - (ii) limit in any substantial way, inconsistent with the Bidding Document, the Employer's rights or the Bidder's obligations under the proposed Contract; or
- (b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.

30.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section 6 (Employer's Requirements) have been met without any material deviation, reservation, or reservation.

**31. Nonmaterial
Nonconformities**

30.4 If a Bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities in the Bid that do not constitute a material deviation, reservation, or omission.

31.2 Provided that a Technical Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the Price Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

31.3 Provided that a Technical Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component. The adjustment shall be made using the method indicated in Section 3 (Evaluation and Qualification Criteria).

**32. Qualification of
the Bidder**

32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Bidders meet the qualifying criteria specified in Section 3 (Evaluation and Qualification Criteria).

32.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1. Unless permitted in the BDS, the determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialist Subcontractors if permitted in ITB 33.2 of the Bidding document), or any other firm(s) different from the Bidder.

32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. The Employer reserves the right to reject the bid of any bidder found to be in circumstances described in GCC 15.2(e). A negative determination shall result into the disqualification of the Bid, in which event the Employer shall return the unopened Price Bid to the Bidder.

33. Subcontractors

33.1 Unless otherwise stated in the BDS, the Employer does not intend for the contractor to execute any specific elements of the Works through nominated subcontractors.

33.2 If subcontractors are proposed for any of the key activities listed in Section 3 – Evaluation and Qualification Criteria 2.4.2, they shall be considered as "Specialist Subcontractors" and shall meet qualification requirements for the relevant key activities.

**34. Correction of
Arithmetical
Errors**

34.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis:

- (a) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected.
- (b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected.
- (c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Price Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Price Bid will be corrected.
- (d) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b) and (c) above.

34.2 If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its Bid shall be disqualified and its bid security may be forfeited or its Bid-Securing Declaration executed.

**35. Conversion to
Single Currency**

35.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.

**36. Domestic
Preference**

36.1 Unless otherwise specified in the BDS, domestic preference shall not apply.

**37. Evaluation and
Comparison of
Price Bids**

37.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

37.2 To evaluate the Price Bid, the Employer shall consider the following:

- (a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including Daywork items, where priced competitively;
- (b) price adjustment for correction of arithmetic errors in accordance with ITB 34.1;
- (c) price adjustment due to discounts offered in accordance with ITB 14.4;
- (d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 34;
- (e) adjustment for nonconformities in accordance with ITB 31.3;
- (f) assessment whether the bid is abnormally low in accordance with ITB 38; and
- (g) application of all the evaluation factors indicated in Section 3 (Evaluation and Qualification Criteria).

37.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.

37.4 If this Bidding Document allows Bidders to quote separate prices for different contracts, and the award to a single Bidder of multiple contracts, the methodology to determine the lowest evaluated price of the contract combinations, including any discounts offered in the Letter of Price Bid, is specified in Section 3 (Evaluation and Qualification Criteria).

37.5 The Employer shall compare all substantially responsive Bids to determine the lowest evaluated Bid price, in accordance with ITB 37.2.

38. Abnormally Low Bids

38.1 An abnormally low bid is one where the bid price, in combination with other elements of the bid, appears to be so low that it raises concerns as to the capability of the Bidder to perform the contract for the offered bid price.

38.2 When the bid price appears to be abnormally low, the Employer shall undertake a three-step process as follows:

- (a) identify abnormally low costs and unit rates by comparing them with the engineer's estimates, other substantially responsive bids, or recently awarded similar contracts;
- (b) clarify and analyze the bidder's resource inputs and pricing, including overheads, contingency and profit margin; and
- (c) decide on whether to accept or reject the bid.

38.3 With regard to ITB 38.2 (b) above, the Employer will seek a written explanation from the bidder of the reasons for the offered bid price, including a detailed analysis of costs and unit prices, by reference to the scope, proposed methodology, schedule, and allocation of risks and responsibilities. This may also include information regarding the economy of the manufacturing process; the services to be provided, or the construction method to be used; the technical solutions to be adopted; and any exceptionally favorable conditions available to the bidder for the works, equipment or services proposed.

38.4 After examining the explanation given and the detailed price analyses presented by the bidder, the Employer may:

- (a) accept the bid, if the evidence provided satisfactorily accounts for the low bid price and costs, in which case the bid is not considered abnormally low;
- (b) accept the bid, but require that the amount of the performance security be increased at the expenses of the bidder to a level sufficient to protect the Employer against financial loss. The amount of the performance security shall generally be not more than 20% of the contract price; or
- (c) reject the bid if the evidence provided does not satisfactorily account for the low bid price, and make a similar determination for the next ranked bid, if required.

39. Unbalanced or Front-Loaded Bids

- 39.1 If the Bid, which results in the lowest evaluated Bid Price, is seriously unbalanced or front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed, as well as the pricing and sources of materials, equipment and labor.
- 39.2 After the evaluation of the information and detailed price analyses presented by the Bidder, the Employer may as appropriate:
- (a) accept the Bid; or
 - (b) accept the Bid, require that the total amount of the Performance Security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract subject to ITB 45.2; or
 - (c) reject the Bid and make a similar determination for the next ranked bid.

40. Employer's Right to Accept Any Bid, and to Reject Any or All Bids

- 40.1 The Employer reserves the right to accept or reject any Bid, and to annul the bidding process and reject all Bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.

41. Notice of Intention for Award of Contract

- 41.1 If Standstill provisions apply as specified in the BDS, the standstill period shall be defined in the BDS to specify the duration subsequent to notification of intention for award of contract (before making the actual contract award) within which any unsuccessful bidder can challenge the proposed award.

F. Award of Contract

42. Award Criteria

- 42.1 The Employer shall award the Contract to the Bidder whose offer has been determined in line with ITB 37 to 39 above to be the lowest evaluated Bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

43. Notification of Award

- 43.1 Prior to the expiration of the period of bid validity and upon expiry of the standstill period specified in ITB 41.1, or upon satisfactory resolution of a complaint filed within standstill period, if applicable, the Employer shall transmit the Notification of Award (using the form included in Section 9 (Contract Forms)) to the successful Bidder, in writing, that its Bid has been accepted.
- 43.2 Unless standstill period applies, upon notification of award, unsuccessful Bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their Bids were not selected. The Employer shall promptly respond in writing and/or in a debriefing meeting to any unsuccessful Bidder who, after publication of contract award, requests a debriefing.
- 43.3 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

43.4 Within 2 weeks of the award of contract or expiry of the standstill period, where such period applies, or, if a complaint has been filed within the standstill period, upon receipt of ADB's confirmation of satisfactory resolution of the complaint, the borrower shall publish in an English language newspaper or widely known and freely accessible website the results identifying the bid and lot or package numbers, as applicable and the following information:

- (a) name of each Bidder who submitted a Bid;
- (b) bid prices as read out at bid opening;
- (c) name and evaluated prices of each Bid that was evaluated;
- (d) name of bidders whose bids were rejected and the reasons for their rejection; and
- (e) name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded.

44. Signing of Contract

- 44.1 Promptly after notification, the Employer shall send the successful Bidder the Contract Agreement.
- 44.2 Within 28 days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

45. Performance Security

- 45.1 Within 28 days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the conditions of contract, subject to ITB 38 and 39, using for that purpose the Performance Security Form included in Section 9 (Contract Forms), or another form acceptable to the Employer. If the institution issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.
- 45.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security or execution of the Bid-Securing Declaration. In that event, the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.
- 45.3 The above provision shall also apply to the furnishing of a domestic preference security if so required.

46. Bidding-Related Complaints

- 46.1 The procedures for dealing with Bidding-related Complaints arising out of this bidding process are specified in the BDS.

Section 2 - Bid Data Sheet

A. General

ITB 1.1	The number of the Invitation for Bids (IFB) is: SHIP/2018-01
ITB 1.1	The Employer is: Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB), Kathmandu, Nepal The Authorised Representative is: Project Director The Project Directorate (ADB) The Employer's Site Representative is: Project Manager Kanchanpur- Kamala Road
ITB 1.1	The name of the open competitive bidding (OCB) is Upgrading of Kanchanpur-Kamala Road (Section 02) from Km 189+300 to Km 236+703 with two phases viz. Phase 1: Upgrading Works - Upgrading from 2- lanes to 4-lanes and service lanes, structures, Bridges, etc. including Defect Notification Period and Phase 2: Performance Based Maintenance Works - PBM maintenance works consisting of all activities to be carried out to achieve and keep the road assets as defined in the Specifications on that upgraded road section. The identification number of the OCB is: SHIP/OCB/KK/02 The number and identification of lots comprising this OCB are "2(two)" with the following Contract identification numbers: Contract ID No.:SHIP/OCB/KK/01 Contract ID No.:SHIP/OCB/KK/02
ITB 1.1	The Works under the Contract will consist of: Phase 1: Upgrading Works Upgrading of existing road from 2-Lanes to 4 Lanes and Service Lanes, Structures, Bridges, etc. including Defect Notification Period. Phase 2: Performance Based Maintenance Works 1. Maintenance Works consisting of all activities to be carried out by the Contractor to achieve and keep the road asset as defined in the Performance Based Maintenance Specifications, and all activities related to their management. 2. Emergency Works consisting of activities needed to reinstate any road assets which have been abnormally damaged as a result of natural or manmade phenomena such as storms, flooding, earthquakes, major accidents, etc. and which are not covered under monthly lump sum rates of maintenance works.
ITB 2.1	The Borrower is: Nepal
ITB 2.1	The name of the Project is SASEC Highway Improvement Project (SHIP)

B. Contents of Bidding Documents

ITB 7.1	For clarification purposes only, the Employer's address is: Attention : The Project Director Project Directorate (ADB), Department of Roads Bishalnagar, Kathmandu Tel No.: +977 1 4437492/4437493 Fax. No.: +977 1 4437488 E-mail: pdadb@wlink.com.np
ITB 7.4	A Pre-Bid meeting shall take place. It will be at the following date, time and place: Date : 1 st October 2018 Time : 13:00 hours (Nepal Standard Time) Place: Project Directorate (ADB). Bishalnagar, Kathmandu A site visit conducted by the Employer will not be organized.

C. Preparation of Bids

ITB 10.1	The language of the Bid Is English .
ITB 11.2 (g)	The Bidder shall submit with its Technical Bid the following additional documents: None
ITB 11.3 (d)	The Bidder shall submit with its Price Bid the following additional documents: None
ITB 12.1	The units and rates in figures entered into the Bill of Quantities and Daywork Schedule should be typewritten or if written by hand, must be in print form. Bill of Quantities and Daywork Schedule not presented accordingly may be considered nonresponsive.
ITB 13.1	Alternative Bids shall not be permitted.
ITB 13.2	Alternative times for completion shall not be permitted.
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Works: Not Applicable
ITB 14.5	The prices quoted by the Bidder shall be adjustable "The formula for adjusting the prices and explanatory details are specified in the GCC Clause 13.8. Bidder shall fill out the Tables of Adjustment Data in Section 4 (Bidding Forms)"
ITB 15.1	The unit rates and the prices shall be quoted by the Bidder entirely in: Nepalese Rupees (NRs.)
ITB 15.4	The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by: Nepal Rastra Bank, Kathmandu, Nepal
ITB 18.1	The bid validity period shall be 150 days .
ITB 19.1	The Bidder shall furnish a bid security in the amount of NRs. 222 Million or its equivalent in freely convertible foreign currency.
ITB 19.2	The ineligibility period will be: Not Applicable

ITB 19.4	Subject to the succeeding, any bid not accompanied by an irrevocable and callable bid security shall be rejected by the Employer as nonresponsive. However, if a bidder submits a bid security that (i) deviates in form, amount, and/or period of validity, or (ii) does not provide sufficient identification of the Bidder (including, without limitation, failure to indicate the name of the Joint Venture or, where the Joint Venture has not yet been constituted, the names of the all future Joint Venture Partners), the Employer shall request the Bidder to submit a compliant bid security within Fourteen (14) days of receiving such a request. Failure to provide a compliant bid security within the prescribed period of receiving such a request shall cause the rejection of the Bid.
ITB 20.1	In addition to the original of the bid, the number of copies is: One (1)
ITB 20.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: An organizational document, board resolution or its equivalent, or power of attorney specifying the representative's authority to sign the Bid on behalf of, and to legally bind, the Bidder. If the Bidder is an intended or an existing joint venture, the power of attorney should be signed by all partners and specify the authority of the named representative of the joint venture to sign on behalf of, and legally bind, the intended or existing joint venture. If the joint venture has not yet been formed, also include evidence from all proposed joint venture partners of their intent to enter into a joint venture in the event of a contract award in accordance with ITB 11.4.
ITB 20.2	The Bidder shall submit an acceptable authorization within Fourteen (14) days .

D. Submission and Opening of Bids

ITB 21.1	Bidders shall not have the option of submitting their bids electronically.
ITB 22.1	For <u>bid submission purposes</u> only, the Employer's address is: Project Directorate (ADB) Department of Roads Bishalnagar, Kathmandu Attention: The Project Director The deadline for bid submission is: Date: 26th October 2018 Time: 12:00 hours (Nepal Standard Time)
ITB 25.1	The opening of the Technical Bid shall take place at: Project Directorate (ADB) Department of Roads Bishalnagar, Kathmandu Date: 26th October 2018 Time: Immediately after the deadline for submission of bids
ITB 25.5	The letter of Technical Bid shall be initialed by Three (3) representatives of the Employer attending Bid opening.
ITB 25.10	The letter of Price Bid and Bill of Quantities shall be initialed by Three (3) representatives of the Employer attending Bid opening.

E. Evaluation and Comparison of Bids

ITB 32.2	Qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors shall not be permitted.
ITB 33.1	The Employer does not intend for the contractor to execute any specific elements of the Works through nominated subcontractors.
ITB 33.2	Bidders may propose Subcontracting up to 40% of the Accepted Contract Amount. The proposed Subcontractor shall meet, on a pro rata basis, the following criteria as specified in Section 3 Evaluation and Qualification Criteria: (i) Average Annual Construction Turnover; (ii) Financial Resources; (iii) Construction Experience in Contract of Similar Size and Nature that is similar to the proposed subcontract; and
ITB 35.1	The currency that shall be used for bid evaluation and comparison purposes to convert all bid prices expressed in various currencies into a single currency is: Nepalese Rupees The source of the selling exchange rate shall be: Nepal Rastra Bank, Kathmandu, Nepal The date for the selling exchange rate shall be: 28 days prior to the deadline for submission of bids.
ITB 36.1	Domestic preference shall apply. The application methodology shall be as stipulated in Section 3 (Evaluation and Qualification Criteria).
ITB 41.1	The Standstill period shall apply. The duration of standstill period will be Seven (7) days from the date of notice of Intention for award of contract. The Employer shall, at the start of the Standstill period, notify in writing each bidder that submitted a bid, of its intention to award a contract to the successful bidder at the end of Standstill period. The notification (using the form included in Section 9 (Contract Forms) shall include the following information: (a) the name of each Bidder who submitted the Bid; (b) the bid prices as read out at bid opening; (c) the name and evaluated prices of each bid that was evaluated; (d) the name of bidders whose bids were rejected and the reasons for their rejection; (e) the name of the winning bidder, and the price it offered , as well as the duration and summary scope of the contract awarded; and (f) a statement of the reason(s) the bid of the unsuccessful bidder to whom the notification is addressed was unsuccessful, unless the price information under (e) of this paragraph already reveals the reason.

G. Award of Contracts

ITB 46.1	The procedures for Bidding-related Complaints are referenced in the “Procurement Regulations for ADB Borrowers (Appendix 7).” The Bidder should submit its complaint following these procedures, in writing, to: For the attention: The Project Director Title/position: Project Directorate (ADB), Employer: Project Directorate (ADB), Department of Roads Bishalnagar, Kathmandu Email address: pdadb@wlink.com.np Fax number: +977 1 4437488
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FOR REFERENCE ONLY

Section 3 - Evaluation and Qualification Criteria

- Without Prequalification -

This Section contains all the criteria that the Employer shall use to evaluate bids and qualify Bidders. In accordance with ITB 32 and ITB 36, no other methods, criteria and factors shall be used. The Bidder shall provide all the information requested in the forms included in Section 4 (Bidding Forms).

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1. Evaluation

In addition to the criteria listed in ITB 37.2 (a) – (f), other relevant factors are as follows:

1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section 6 (Employer's Requirements).

Non-compliance with equipment and personnel requirements described in Section 6 (Employer's Requirements) shall not normally be a ground for bid rejection and such non-compliance will be subject to clarification during bid evaluation and rectification prior to contract award.

1.2 Completion Time

An alternative Completion Time, if permitted under ITB 13.2, will be evaluated as follows:

Not Applicable

1.3 Technical Alternatives

Technical alternatives, if permitted under ITB 13.4, will be evaluated as follows:

Not Applicable

1.4 Specialist Subcontractors

Only the specific experience of Specialist Subcontractors for key activities specified in criterion 2.4.2 Construction Experience in Key Activities will be considered. The experience of similar size and nature and financial resources of the Specialist Subcontractors shall not be added to those of the Bidder for purposes of qualification of the Bidder.

1.5 Quantifiable Nonconformities and Omissions

Subject to ITB 14.2 and ITB 37.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows:

"Pursuant to ITB 31.3, the cost of all quantifiable nonmaterial nonconformities shall be evaluated, including omissions in Daywork where competitively priced but excluding omission of prices in the Bill of Quantities. The Employer will make its own assessment of the cost of any nonmaterial nonconformities and omissions for the purpose of ensuring fair comparison of Bids."

1.6 Domestic Preference

If a margin of preference is provided for under ITB 36.1, the following procedure shall apply:

1.6.1 In comparing domestic bids with foreign bids, a margin of preference will be granted to eligible domestic contractors, as defined below, in accordance with the following provisions:

(a) For application of domestic preference, all responsive bids will first be classified under the following two categories:

- (i) Category I: Bids offered by Domestic Contractors and Joint Ventures eligible for the preference in accordance with the criteria set forth in Subclause 1.6.2 below; and
- (ii) Category II: Bids offered by other Contractors.

The Employer will review each bid to confirm the appropriateness of, or to modify as necessary, the category to which the Bid was assigned by the Bidder in preparing it.

(b) The lowest evaluated Bid of each category will then be determined by comparing all

evaluated Bids in each category among themselves.

- (c) Such lowest evaluated Bids will next be compared with each other and if, as a result of this comparison, a Bid from Category I is found to be the lowest, it will be selected for the award of contract.
- (d) If, however, as a result of the comparison under (c) above, the lowest Bid is found to be from Category II, it will be further compared with the lowest evaluated Bid from Category I. For the purpose of this further comparison only an upward adjustment will be made to the lowest evaluated bid price of Category II by adding an amount equal to seven and one-half per cent (7½%) of the bid price. If, after such comparison, the Category I Bid is determined to be the lowest, it will be selected for the award of contract; if not, the lowest evaluated Bid from Category II will be selected.

1.6.2 Domestic Contractors and Joint Ventures between a Domestic Contractor(s) and its foreign partner(s) shall meet the following minimum criteria for eligibility of the Domestic Preference Scheme:

- (a) Domestic Contractor(s):
 - (i) firms are incorporated or constituted in Nepal; and “For the purpose of defining the domestic preference , a foreign firm having its branch office or liaison office registered in Nepal shall not be considered as incorporated in Nepal.”
 - (ii) firms have majority ownership by nationals of Nepal; and
 - (iii) firms will not subcontract to foreign contractors more than forty percent (40%) of the Accepted Contract Amount.
- (b) A Joint Venture between a Domestic Contractor(s) and its foreign partner(s) will be eligible for the preference only if:
 - (i) the Domestic Partner(s) are individually eligible for the preference according to the criteria stated above;
 - (ii) the Domestic Partner(s) would not qualify for the Works on technical or financial grounds without the foreign participation; and
 - (iii) the Domestic Partner(s) will, under the arrangements proposed, carry out at least fifty percent (50%) of the Works measured in terms of value.

1.6.3 Bidders applying for the preference shall provide all evidence, including details of ownership, necessary to prove that they are qualified for the preference according to the criteria set forth in paragraph 1.6.2 above.

1.6.4 If the Contract is awarded to a Bidder who has received the preference pursuant to the foregoing provisions, such Contractor shall not subcontract to Foreign Contractors more than forty percent (40%) of the Accepted Contract Amount.

1.6.5 A Joint Venture that is awarded the Contract as a result of the application of the above domestic preference provisions, shall furnish the Employer, together with the Performance Security, a "Domestic Preference Security" to guarantee that the profit and loss distribution and work-sharing arrangements with which the joint venture satisfied the criteria of Subclause 1.6.2 (b) above will not be modified throughout the execution of the Contract. The domestic preference security shall be in the form of an unconditional on-demand bank guarantee or standby letter of credit acceptable to the Employer, for an amount in a convertible currency equivalent to the difference between the Joint Venture's bid price and the bid price of the lowest foreign bid. The domestic preference security shall be issued either (a) by a bank located in the country of the Employer, or (b) directly by a foreign bank acceptable to Employer. The domestic preference security shall be valid until the Contractor has substantially completed the Works and a Taking-Over Certificate has been issued by the Engineer in accordance with the provisions of GCC 10 and such security shall be returned to the Contractor together with the Taking - Over Certificate

1.7 Other Criteria

Add any other relevant criteria to take into account in bid evaluation and specify the evaluation methodologies:

Not Applicable

1.8 Multiple Contracts

Works are grouped in multiple contracts and pursuant to ITB 37.4, the Employer shall evaluate and compare Bids on the basis of a contract, or a combination of contracts, or as a total of contracts in order to arrive at the least-cost combination for the Employer by taking into account discounts offered by Bidders in case of award of multiple contracts.

If a Bidder as defined in ITB 4.1 submits several successful (lowest evaluated substantially responsive) bids, the evaluation will also include an assessment of the Bidder's capacity to meet the following aggregated requirements as presented in the bid:

- Average annual construction turnover,
- Financial resources,
- Equipment to be allocated, and
- Personnel to be fielded.

FOR REFERENCE ONLY

2. Qualification

2.1 Eligibility

Criteria	Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture		Submission Requirements
		All Partners Combined	Each Partner	

2.1.1 Nationality

Nationality in accordance with ITB Subclause 4.2.	must meet requirement	must meet requirement	must meet requirement	not applicable	Forms ELI - 1; ELI - 2 with attachments
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2.1.2 Conflict of Interest

No conflicts of interest in accordance with ITB Subclause 4.3.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
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2.1.3 ADB Eligibility

Not having been declared ineligible by ADB, as described in ITB Subclause 4.4.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
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2.1.4 Government-Owned Entity

Bidder required to meet conditions of ITB Subclause 4.5.	must meet requirement	must meet requirement	must meet requirement	not applicable	Forms ELI - 1; ELI - 2 with attachments
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2.1.5 United Nations Eligibility

Not having been excluded by an act of compliance with a United Nations Security Council resolution in accordance with ITB Subclause 4.8	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
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2.2 Historical Contract Non-Performance

2.2.1 History of Non-Performing Contracts

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Non-performance of a contract ^a did not occur as a result of contractor default since 1st January 2013.	Must meet requirement	Must meet requirement	Must meet requirement ^b	N/A	Form CON-1

2.2.2 Suspension Based on Execution of Bid-Securing Declaration

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Not under suspension based on execution of a Bid-Securing Declaration pursuant to ITB 4.6.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid

2.2.3 Pending Litigation and Arbitration

Pending litigation and arbitration criterion **shall not** apply.

^a Nonperformance, as decided by the Employer, shall include all contracts where (i) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract; and (ii) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where the Employer's decision was overruled by the dispute resolution mechanism. Nonperformance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

^b This requirement also applies to contracts executed by the Bidder as Joint Venture member.

2.3 Financial Situation

2.3.1 Historical Financial Performance

Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Submission of audited financial statements or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for the last Five (5) years to demonstrate the current soundness of the Bidder's financial position. As a minimum, (i) the Bidder's net worth for the last year calculated as the difference between total assets and total liabilities should be positive, and (ii) the Bidder's working capital for the last year calculated as the difference between current assets and current liabilities should be positive.	must meet requirement	not applicable	must meet requirement	not applicable	Form FIN - 1 with attachments

FOR REFERENCE ONLY

2.3.2 Average Annual Construction Turnover

Criteria		Compliance Requirements			Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Minimum average annual construction turnover of NRs. 6,379 Million calculated as total certified payments received for contracts in progress or completed, within the last Five (5) years .	must meet requirement	must meet requirement	must meet 25% of the requirement	must meet 40% of the requirement	Form FIN - 2

FOR REFERENCE ONLY

2.3.3 Financial Resources

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
For Single Entities: The Bidder must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its current contract commitments defined in FIN - 4, meet or exceed the total requirement for the Subject Contract of NRs. 797 Million	must meet requirement	not applicable	not applicable	not applicable	Form FIN – 3 and Form FIN – 4
For Joint Ventures: (1) One partner must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its own current contract commitments defined in FIN - 4, meet or exceed its required share of NRs. 319 Million. From the total requirement for the Subject Contract. AND	not applicable	not applicable	not applicable	must meet requirement	Form FIN – 3 and Form FIN – 4
(2) Each partner must demonstrate that its financial resources defined in FIN - 3, less its financial obligations for its own current contract commitments defined in FIN - 4, meet or exceed its required share of NRs. 199 Million from the total requirement for the Subject Contract. AND	not applicable	not applicable	must meet requirement	not applicable	Form FIN – 3 and Form FIN – 4
(3) The joint venture must demonstrate that the combined financial resources of all partners defined in FIN - 3, less all the partners' total financial obligations for the current contract commitments defined in FIN - 4, meet or exceed the total requirement for the Subject Contract of NRs. 797 Million	not applicable	must meet requirement	not applicable	not applicable	Form FIN – 3 and Form FIN – 4

2.4 Construction Experience

2.4.1 Contracts of Similar Size and Nature

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Participation as a contractor, JV partner, or subcontractor, in at least two contracts that have been successfully or substantially completed within the last Five (5) years and that are similar to the proposed works, where the value of the Bidder's participation under each contract exceeds NRs 7,655 Million. The similarity of the Bidder's participation shall be based on construction of at least one road with 20 km length of four (4) lanes or more.	must meet requirement	must meet requirement Either one partner must meet requirement Or Any two partners must each demonstrate one (1) successfully or substantially completed contract of similar size and nature	Must meet requirement as follows: Participation in at least one contract that has been successfully or substantially completed within the last 5 years and that is similar to the proposed works, where the value of the Bidder's participation exceeds NRs 2392 Million or its equivalent	not applicable	Form EXP - 1

FOR REFERENCE ONLY

2.4.2 Construction Experience in Key Activities

May be complied with by the Bidder or by Specialist Subcontractor. In case of a Joint Venture Bidder, at least one of the partners must have experience in key activities if the Bidder itself will carry out the relevant key activity. In case if Specialist Subcontractors are proposed by the Bidder for key activities, each Specialist Subcontract must have experience in related key activity as a single entity.

If the key activity is to be undertaken by a Specialist Subcontractor, the Employer shall require evidence of the subcontracting agreement from the Bidder.

Criteria		Compliance Requirements	Documents
Requirement	Single Entity or its Specialist Subcontractor	Joint Venture or its Specialist Subcontractor	Submission Requirements
For the above or other contracts executed during the period stipulated in 2.4.1 above, a minimum construction experience in the following key activities:	must meet requirement	must meet requirement	Form EXP - 2
(a) Construction of road with Asphalt concrete works of 84,000 cu m completed within the last Five (5) years in not more than three Contract.	must meet requirement	must meet requirement	
(b) Construction of Two (2) bridges having length of at least 100 m each with Pre-stressed Concrete (PSC) superstructure completed within the last Five (5) years.	must meet requirement	must meet requirement	
(c) Construction of Two (2) bridges with cast in-situ pile foundation of minimum pile diameter 1000 mm completed within the last Five (5) years.	must meet requirement	must meet requirement	

Section 4 - Bidding Forms

- Without Prequalification -

This Section contains the forms to be completed by the Bidder and submitted as part of its Bid.

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Letter of Technical Bid

-Note-

The bidder must accomplish the Letter of Technical Bid on its letterhead clearly showing the bidder's complete name and address.

Date:

OCB No.:

Invitation for Bid No.:

To:

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) 8.
- (b) We offer to execute in conformity with the Bidding Documents the following Works:
.....[.....insert narrative.....].....
- (c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of [.insert bid validity period as specified in ITB 18.1 of the BDS] days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (d) Our firm, including any Subcontractors or Suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.
- (e) We, including any Subcontractors or Suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 4.3.
- (f) We are not participating, as a Bidder, either individually or as partner in a joint venture, in more than one Bid in this bidding process in accordance with ITB 4.3(e), other than alternative offers submitted in accordance with ITB 13.
- (g) Our firm, joint venture partners, associates, parent company, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, are not subject to, or not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the Asian Development Bank or a debarment imposed by the Asian Development Bank in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the Asian Development Bank and other development banks.¹
- (h) Our firm, joint venture partners, associates, parent company, affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the Contract, are not, or have never been, temporarily suspended, debarred, declared ineligible, or blacklisted by the employer's country, any international organization, and other donor agency.

¹ These institutions include African Development Bank, European Bank for Reconstruction and Development (EBRD), Inter-American Development Bank (IADB), and the World Bank Group. According to paragraph 9 of the Agreement, other international financial institutions may join upon the consent of all Participating Institutions and signature of a Letter of Adherence by the international financial institution substantially in the form provided (Annex B to the Agreement). Upon adherence, such international financial institution shall become a Participating Institution for purposes of the Agreement. Bidders are advised to check www.adb.org/integrity for updates.

If so debarred, declared ineligible, temporarily suspended, or blacklisted, please state details (as applicable to each joint venture partner/associate/parent company /affiliate/ subsidiaries/ subcontractors/ suppliers):

- (i) Name of Institution: _____
(ii) Period of debarment, ineligibility, or blacklisting (start and end date): _____
(iii) Reason for the debarment, ineligibility, or blacklisting: _____

- (i) Our firm's, joint venture partners', associates', parent company's affiliates' or subsidiaries', including any Subcontractors or Suppliers key officers and directors have not been [charged or convicted] of any criminal offense (including felonies and misdemeanors) or infractions/violations of ordinance which carry the penalty of imprisonment.

If so charged or convicted, please state details:

- (i) Nature of the offense/violation: _____
(ii) Court/Area of jurisdiction: _____
(iii) Resolution (i.e. dismissed; settled; convicted/duration of penalty): _____
(iv) Other relevant details: _____

- (j) We understand that it is our obligation to notify ADB should our firm, joint venture partners, associates, parent company, affiliates or subsidiaries, including any Subcontractors or Suppliers, be temporarily suspended, debarred or become ineligible to work with ADB or any other MDBs, the employer's country, international organizations, and other donor agencies, or any of our key officers and directors be charged or convicted of any criminal offense or infractions/violations of ordinance which carry the penalty of imprisonment.
- (k) Our firm, joint venture partners, associates, parent company, affiliates or subsidiaries, including any subcontractors or suppliers, are not from a country which is prohibited to export goods to or receive any payments from the employer's country by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations.
- (l) [We are not a government-owned enterprise] / [We are a government-owned enterprise but meet the requirements of ITB 4.5].¹
- (m) We have not been suspended nor declared ineligible by the Employer based on execution of a Bid-Securing Declaration in accordance with ITB 4.6.
- (n) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.
- (o) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section 6 (Employer's Requirements) and our technical proposal, or as otherwise agreed with the Employer.
- (p) We understand that any misrepresentation that knowingly or recklessly misleads, or attempts to mislead may lead to the automatic rejection of the Bid or cancellation of the contract, if awarded, and may result in remedial actions, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (as amended from time to time).

Name

In the capacity of

Signed

Duly authorized to sign the Bid for and on behalf of

Date

¹ Use one of the two options as appropriate.

Letter of Price Bid

Note-

The bidder must accomplish the Letter of Price Bid on its letterhead clearly showing the bidder's complete name and address.

Date:

OCB No.:

Invitation for Bid No.:

To: [...insert complete name of the employer ...]

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) 8.
- (b) We offer to execute in conformity with the Bidding Documents and the Technical Bid submitted for the following Works. [...insert narrative ...]
- (c) The total price of our Bid, excluding any discounts offered in item (d) below isor, when left blank, is the Bid Price indicated in the summary of Bill of Quantities

[amount of foreign currency in words], [amount in figures], and [amount of local currency in words], [amount in figures]

- (d) The discounts offered and the methodology for their application are: [...insert discounts and methodology for their application if any ...]
- (e) Our Bid shall be valid for a period of [...insert bid validity period as specified in ITB 18.1 of the BDS ...] days from the date fixed for the bid submission deadline in accordance with the Bidding Documents and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (f) If our Bid is accepted, we commit to obtain a performance security in accordance with the Bidding Documents.
- (g) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract.¹

Name of Recipient	Address	Reason	Amount
.....			
.....			

- (h) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed.

¹If none has been paid or is to be paid, indicate "None"

- (i) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.
- (j) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.

Name

In the capacity of

Signed

Duly authorized to sign the Bid for and on behalf of

Date

.....

FOR REFERENCE ONLY

Bid Security Bank Guarantee

.....*Bank's name, and address of issuing branch or office*¹.....

Beneficiary:*Name and address of the employer*.....

Date:

Bid Security No.:

We have been informed that*name of the bidder*..... (hereinafter called "the Bidder") has submitted to you its bid dated (hereinafter called "the Bid") for the execution of
.....*name of contract* under Invitation for Bids No. ("the IFB").

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we*name of bank*..... hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of*amount in words* (.....
.....*amount in figures*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder

- (a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letters of Technical and Price Bid; or
- (b) does not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the performance security, in accordance with the ITB, or (iii) fails or refuses to furnish a domestic preference security, if required.

This guarantee will expire (a) if the Bidder is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Bidder and the Performance Security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful Bidder, or (ii) 28 days after the expiration of the Bidder's bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458.²

.....*Authorized signature(s) and bank's seal (where appropriate)*.....

¹ All italicized text is for use in preparing this form and shall be deleted from the final document.

² Or 758 as applicable.

Technical Proposal

The Bidder shall submit Technical Proposal separately for each Phase 1: Upgrading Works and Phase 2: Performance Based Maintenance Works in the forms and sheets as attached in the Bidding Forms in the following pages.

Phase 1: Upgrading Works

Personnel

The bidder shall propose for deployment full complement of staff necessary for the successful execution of the works.

Equipment

The bidder shall provide required construction equipment and ensure their maintenance for efficient and continuous work progress. Bidder will also provide proper work shop and other maintenance facilities at site.

Site Organization

The bidder is required to submit proposed site organization structure (organogram) showing the management, supervisory and quality control units indicating their lines of communication and responsibility shown in an organogram.

Method Statement

The bidder shall state all major works, site camp facilities (sanitary, water supply, telecommunication, inspection vehicles etc.), road alignment, earth work, pavement work, drainage structure, bridges & culverts works etc. The bidder is required to describe works how to start and complete different sections of works.

Mobilization Schedule

The bidder shall mobilize personnel, equipment, deployment of work force, collection of construction materials and prepare a mobilization bar chart. Likewise, the bidder will provide site camp, stack yard etc. at different working places for efficient execution of works.

Construction Schedule

The bidder shall submit Schedule using MS Project or equivalent project management software showing sequence of works for items in Bill of Quantities (BOQ) together with program and progress of works.

Phase 2: Performance Based Maintenance Works

Personnel

The bidder shall propose for deployment full complement of staff necessary for the successful execution of the performance based maintenance works and services.

Equipment

The bidder shall provide required equipment for the performance based maintenance works and ensure their maintenance for efficient and continuous work process. Bidder will also provide proper work shop and other maintenance.

Site Organization (If different from Phase 1)

The bidder is required to submit proposed site organization structure (organogram) showing the management supervisory and quality control units indicating their lines of communication and responsibility shown in as organogram.

Method Statement

The bidder shall state how he will execute the performance based maintenance works and shall submit a draft Program of Performance and a proposal for the Daily Inspections of Operational Service Levels.

FOR REFERENCE ONLY

Personnel

Form PER – 1: Proposed Personnel

Bidder should provide the details of the proposed personnel and their experience record in the relevant Information Forms below for each candidate:

The Bidder shall provide separately for each Phase 1: Upgrading Works and Phase 2: Performance Based Maintenance Works

1.	Title of position*
	Name
2.	Title of position*
	Name
3.	Title of position*
	Name
4.	Title of position*
	Name
5.	Title of position*
	Name
6.	Title of position*
	Name
etc.	Title of position*
	Name

-- Note --

* As listed in Section 6 (Employer's Requirements).

The Bidder shall provide all the information requested below. Use one form for each position.

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

[illegible]

Equipment

Form EQU: Equipment (Bidder shall provide the details of equipment for both Phases 1 and 2)

The Bidder shall provide adequate information and details to demonstrate clearly that it has the capability to meet the equipment requirements indicated in Section 6 (Employer's Requirements), using the Forms below. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item of Equipment	
Equipment Information	Name of manufacturer
	Model and power rating
	Capacity
	Year of manufacture
Current Status	Current location
	Details of current commitments
Source	Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured

Omit the following information for equipment owned by the Bidder.

Owner	Name of owner	
	Address of owner	
	Telephone	Contact name and title
	Fax	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the project	

Site Organization

FOR REFERENCE ONLY

Method Statement

FOR REFERENCE ONLY

Mobilization Schedule

FOR REFERENCE ONLY

Construction Schedule

FOR REFERENCE ONLY

Bidders Qualification

To establish its qualifications to perform the contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included here under.

FOR REFERENCE ONLY

Form ELI - 1: Bidder's Information Sheet

Bidder's Information	
Bidder's legal name	
In case of a Joint Venture, legal name of each partner	
Bidder's country of constitution	
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative (name, address, telephone number(s), fax number(s), e-mail address)	
Attached are copies of the following documents. ☐ 1. In case of a single entity, articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2. ☐ 2. Authorization to represent the firm or Joint Venture named above, in accordance with ITB 20.2. ☐ 3. In case of a Joint Venture, a letter of intent to form a Joint Venture or Joint Venture agreement, in accordance with ITB 4.1. ☐ 4. In case of a government-owned enterprise, any additional documents not covered under 1 above required to comply with ITB 4.5.	

Form ELI - 2: Joint Venture Information Sheet

Each member of the Joint Venture and Specialist Subcontractor must fill out this form separately.

Joint Venture / Specialist Subcontractor Information	
Bidder's legal name	
Joint Venture Partner's or Specialist Subcontractor's legal name	
Joint Venture Partner's or Specialist Subcontractor's country of constitution	
Joint Venture Partner's or Specialist Subcontractor's year of constitution	
Joint Venture Partner's or Specialist Subcontractor's legal address in country of constitution	
Joint Venture Partner's or Specialist Subcontractor's authorized representative information (name, address, telephone number(s), fax number(s), e-mail address)	
Attached are copies of the following documents. ☐ 1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2. ☐ 2. Authorization to represent the firm named above, in accordance with ITB 20.2. ☐ 3. In the case of a government-owned enterprise, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5.	

Form CON - 1: Historical Contract Non-Performance

Each Bidder must fill out this form in accordance under Criterion 2.2.1 and 2.2.3 of Section 3 (Evaluation and Qualification Criteria) to describe any history of non-performing contracts and pending litigation or arbitration formally commenced against it.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Table 1: History of Non-Performing Contracts			
Choose one of the following: ☐ No non-performing contracts. ☐ Below is a description of non-performing contracts involving the Bidder (or each Joint Venture member if Bidder is a Joint Venture).			
Year	Description	Amount of non-performed portion of contract (\$ equivalent)	Total Contract Amount (\$ equivalent)
[insert year]	Contract Identification: [indicate complete contract name/ number, and any other identification] Name of Employer: [insert full name] Address of Employer: [insert street/city/country] Reason(s) for nonperformance: [indicate main reason(s)]	[insert amount]	[insert amount]

Form FIN - 1: Historical Financial Performance

Each Bidder must fill out this form.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Financial Data for Previous Years [\$ Equivalent]				
Year 1:	Year 2:	Year 3:	Year 4:	Year 5:

Information from Balance Sheet

Total Assets (TA)					
Total Liabilities (TL)					
Net Worth = TA – TL					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital = CA - CL					

Most Recent Working Capital		To be obtained for most recent year and carried forward to FIN - 3 Line 1; in case of Joint Ventures, to the corresponding Joint Venture Partner's FIN – 3.
-----------------------------	--	---

Information from Income Statement

Total Revenues					
Profits Before Taxes					
Profits After Taxes					

- ☐ Attached are copies of financial statements (balance sheets including all related notes and income statements) for the last ____ years, as indicated above, complying with the following conditions:
- Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the financial situation of the legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries, or affiliates.
 - Historical financial statements must be audited by a certified accountant.
 - Historical financial statements must be complete, including all notes to the financial statements.
- Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

Form FIN - 2: Average Annual Construction Turnover

Each Bidder must fill out this form.

The information supplied should be the Annual Turnover of the Bidder or each member of a Joint Venture in terms of the amounts billed to clients for each year for work in progress or completed, converted to US dollars at the rate of exchange at the end of the period reported.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Annual Turnover Data for the Last Years (Construction only)			
Year	Amount Currency	Exchange Rate	\$ Equivalent
Average Annual Construction Turnover			

Form FIN – 3: Availability of Financial Resources

Bidders must demonstrate sufficient financial resources, usually comprising of Working Capital supplemented by credit line statements or overdraft facilities and others to meet the Bidder's financial requirements for

- (a) its current contract commitments, and
- (b) the subject contract.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Financial Resources		
No.	Source of financing	Amount (\$ equivalent)
1	Working Capital (to be taken from FIN - 1)	
2	Credit Line ^a	
3	Other Financial Resources	
Total Available Financial Resources		

^a To be substantiated by a letter from the bank issuing the line of credit.

Form FIN- 4: Financial Requirements for Current Contract Commitments

Bidders (or each Joint Venture partner) should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

In case of a Joint Venture, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

Current Contract Commitments						
No.	Name of Contract	Employer's Contact (Address, Tel, Fax)	Contract Completion Date	Outstanding Contract Value (X) ^a	Remaining Contract Period in months (Y) _b	Monthly Financial Resources Requirement (X / Y)
1						
2						
3						
4						
Total Monthly Financial Requirement for Current Contract Commitments						\$

^a Remaining outstanding contract values to be calculated from 28 days prior to the bid submission deadline (\$ equivalent based on the foreign exchange rate as of the same date).

^b Remaining contract period to be calculated from 28 days prior to bid submission deadline.

**Form FIN - 5: Self-Assessment Tool for Bidder's Compliance to Financial Resources
(Criterion 2.3.3 of Section 3)**

This form requires the same information submitted in Forms FIN - 3 and FIN - 4. All conditions of "Available Financial Resources Net of CCC $\geq$ Requirement for the Subject Contract" must be satisfied to qualify.

Form FIN - 5A: For Single Entities

For Single Entities: (A)	Total Available Financial Resources from FIN - 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN - 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
_____ (Name of Bidder)					

Form FIN - 5B: For Joint Ventures

For Joint Ventures: (A)	Total Available Financial Resources from FIN - 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN - 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
One Partner:					
_____ (Name of Partner)					
Each Partner:					
_____ (Name of Partner 1)					
_____ (Name of Partner 2)					
_____ (Name of Partner 3)					
All partners combined	$\Sigma D =$ Sum of available financial resources net of current contract commitments for all partners		$\Sigma D =$ _____		

- Note -

Form FIN - 5 is made available for use by the bidder as a self-assessment tool, and by the employer as an evaluation work sheet, to determine compliance with the financial resources requirement as stated in 2.3.3. Failure to submit Form FIN - 5 by the Bidder shall not lead to bid rejection.

Form EXP – 1: Contracts of Similar Size and Nature

Fill out one (1) form per contract.

The exchange rate to be used to calculate the value of the contract for conversion to a specific currency shall be the selling rate of borrower's national bank on the date of the contract.

Contract of Similar Size and Nature		
Contract No of	Contract Identification	
Award Date	Completion Date	
Total Contract Amount	NRs. or Its Equivalent	
If partner in a Joint Venture or subcontractor, specify participation of total contract amount	Percent of Total	Amount
Employer's name Address Telephone number Fax number E-mail		
Description of the Similarity in Accordance with Criterion 2.4.1 of Section 3 (Evaluation and Qualification Criteria)		
(a) Two (2) Contracts with similar nature valued over NRs. 7,655 Million or its equivalent within the last Five (5) years. . The similarity of the Bidder's participation shall be based on construction of at least one road with 20 km length of four (4) lanes or more.		

Form EXP - 2: Construction Experience in Key Activities

Fill out one (1) form per contract.

Each Bidder must fill out this form.

In case of a Joint Venture, at least one of the Joint Venture Partners who will comply with the requirements must fill out this form and provide the Joint Venture Partner's name below:

Joint Venture Partner: _____

If complied by Specialist Subcontractor, the Specialist Subcontractor must fill out this form and provide the Specialist Subcontractor's name below:

Specialist Subcontractor: _____

Contract with Similar Key Activities		
Contract No of	Contract Identification	
Award Date	Completion Date	
Total Contract Amount	NRs. or Its Equivalent	
If partner in a Joint Venture or subcontractor, specify participation of total contract amount	Percent of Total	Amount
Employer's name Address Telephone number Fax number E-mail		
Description of the Key Activities in Accordance with Criterion 2.4.2 of Section 3 (Evaluation and Qualification Criteria)		
(a) Construction of road with Asphalt concrete works of 84,000 cum completed within the last Five (5) years in not more than three Contract.		
(b) Construction of Two (2) bridges having length of at least 100m each with Pre-stressed Concrete (PSC)superstructure completed within the last Five (5) years.		

(c) Construction of Two (2) bridges with cast in-situ pile foundation of minimum pile diameter 1000 mm completed within the last Five (5) years.	
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FOR REFERENCE ONLY

Schedules

Schedule of Payment Currencies

Forinsert name of Section of the Works

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				100.00
Provisional Expressed in Sums Currency Local		1.00		
BID PRICE				

- Note -

The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.

Tables of Adjustment Data

Table A - Local Currency

Index Code	Index Description	Source of Index	Base Value and Date	Bidder's Local Currency Amount	% Range of Weighting	Bidder's Proposed Weighting
A	Nonadjustable	-	-	-	15	
B	Labour	National Salary and Wage Index : Construction Labourer published by Nepal Rastra Bank			10 - 20	
C	Diesel	Nepal Oil Corporation			10 - 20	
D	Bitumen	Nepal Bitumen & Barrel Udyog			10 - 20	
E	Cement	Udayapur Cement Udhog, Nepal			5 - 15	
F	Reinforcement Bar	Ex-factory rate of Steel factory, Nepal			5 - 15	
G	Other	National Wholesale Price Index: Overall Index published by Nepal Rastra Bank			15 - 25	
Total					100%	1.00

Table B - Foreign Currency

Name of Currency:

If the Bidder wishes to quote in more than one foreign currency, this table should be repeated for each foreign currency.

Index Code	Index Description	Source of Index	Base Value and Date	Bidder's Currency in Type/Amount	Equivalent in FC1	Bidder's Proposed Weighting
A	Nonadjustable	--	--	--	--	0.15
B						
C						
D						
E						
F						
G						
Total						1.00

- Note -

As per GCC 1.1.3.1, "Base Date" means the date 28 days prior to the latest date for submission of the bid.

Tables of Adjustment Data shall only be included if prices are to be quoted as adjustable prices in accordance with ITB 14.5.

Bill of Quantities

A. Preamble

1. The Bill of Quantities shall be read in conjunction with the Instruction to Bidders, Bidding Data, General and Particular Conditions of Contract, Standard Specifications and Special Provisions, and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out as measured by the Contractor and verified by the Engineer and valued at the rates and prices bid in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.
3. The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract, include all constructional equipment, labor, supervision, materials, erection, maintenance, insurance, profit, taxes, and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed covered by other rates and prices entered in the Bill of Quantities. The units and rates in figures entered into the Bill of Quantities should be typewritten or if written by hand, must be in print form. Bill of Quantities not presented accordingly may be considered nonresponsive.
5. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no items are provided the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
6. General directions and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities.
7. Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with the Conditions of Contract.
8. The method of measurement of completed work for payment shall be in accordance with the Specifications (see Part II: Employer's Requirement, Section 6B and 6C of these documents).
9. Arithmetic errors will be corrected by the Employer as follows:
 - (a) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected.
 - (b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected.
 - (c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Bid will be corrected.
 - (d) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b), and (c) above.

10. Bidders shall price the Bill of Quantities in Nepalese Rupees (NRs.) only and shall indicate in the "Schedule of Payment Currencies" the percentage expected for payment in foreign currency or currencies.
11. Payment for Performance Based Maintenance (PBM) Works and Services measured in kilometre- month shall include the cost of all the activities that is required to be carried out by the Contractor as per the Specifications during performance based maintenance period except determined under Emergency Works, subject only to any reduction as provided in the relevant Section of the Specifications.

B. Dayworks Schedule

General

1. Work shall not be executed on a Daywork basis except by written order of the Engineer. Bidders shall enter basic rates for Daywork items in the Schedules, which rates shall apply to any quantity of Daywork ordered by the Engineer. Nominal quantities have been indicated against each item of Daywork, and the extended total for Daywork shall be carried forward as a Provisional Sum to the Summary Total Bid Amount. Unless otherwise adjusted, payments for Daywork shall be subject to price adjustment in accordance with the provisions in the Conditions of Contract.

Daywork Labour

2. In calculating payments due to the Contractor for the execution of Daywork, the hours for labor will be reckoned from the time of arrival of the labor at the job site to execute the particular item of Daywork to the time of return to the original place of departure, but excluding meal breaks and rest periods. Only the time of classes of labor directly doing work ordered by the Engineer and for which they are competent to perform will be measured. The time of gangers (charge hands) actually doing work with the gangs will also be measured but not the time of foremen or other supervisory personnel.
3. The Contractor shall be entitled to payment in respect of the total time that labor is employed on Daywork, calculated at the basis rates entered by him in the Schedule of Daywork Rates:
 1. Labor. The rates for labor shall be deemed to cover all costs to the Contractor, including (but not limited to) the amount of wages paid to such labor, transportation time, overtime, subsistence allowances, and any sums paid to or on behalf of such labor for social benefits in accordance with (Country of Borrower) law, as well as Contractor's profit; overheads; superintendence; liabilities and insurance and allowance to labor; timekeeping and clerical and office work; the use of consumable stores water, lighting, and power; the use and repair of stagings, scaffolding workshops and stores portable power tools; manual plant and tools; supervision by the Contractor's staff, foremen, and other supervisory personnel; and charges incidental to the foregoing. The rates shall be stated in the Nepalese Rupees (NRs.) but the payments will be made on currency proportions as indicated in the "Schedule of Payment Currencies".

Daywork Material

4. The Contractor shall be entitled to payment in respect of materials used for Daywork (except for materials for which the cost is included in the percentage addition to labor costs as detailed heretofore), at the rates entered by him in the Schedule of Daywork Rates:
 2. Materials and shall be deemed to include overhead charges and profit as follows:
 - (a) the rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc., and shall provide for delivery to store for stockpiling at the Site. The rates shall be stated in the Nepalese Rupees (NRs.) but the payments will be made on currency proportions as indicated in the "Schedule of Payment Currencies".
 - (b) the cost of hauling materials for use on work ordered to be carried out as Daywork from the store or stockpile on the Site to the place where it is to be used shall also be deemed included in the same rate.

Daywork Equipment

5. The Contractor shall be entitled to payments in respect of Contractor's Equipment already on Site and employed on Daywork at the basic rental rates entered by him in the Schedule of Daywork Rates: 3. Contractor's Equipment. The said rates shall be deemed to include due and complete allowance for depreciation, interest, indemnity and insurance, repairs, maintenance, supplies, fuel, lubricants, and other consumables, and all overhead profit and administrative costs related to the use of such equipment. The cost of drivers, operators, and assistants shall also be included in the rate of the equipment and no separate payment shall be made for it.
6. In calculating the payment due to the Contractor's Equipment employed on Daywork, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Engineer, the traveling time from the part of the Site where the Construction Plant was located when ordered by the Engineer to be employed on Daywork and the time for return journey thereto shall be included for payment.
7. The basic rental rates for Contractor's Equipment employed on Daywork shall be stated in Nepalese Rupees (NRs.) but the payments will be made on currency proportions as indicated in the "Schedule of Payment Currencies".

Units of Measurement

The following units of measurement and abbreviations are used:

Unit	Abbreviation	Unit	Abbreviation
a) cubic meter	m ³ or cu m	b) millimeter	mm
c) hectare	ha	d) month	mon
e) hour	h	f) number	nr
g) kilogram	kg	h) square meter	m ² or sq m
i) kilometer	km	j) kilometer month	km-mon
k) lump sum	sum	l) personday	per day
m) meter	m	n) week	wk
o) metric ton (1,000 kg)	t	p) square millimeter	mm ² or sq mm
q) litre	lt	r) personmonth	per mon
s) vehicle Month	veh - mon	t) provisionalsum	ps

C. Work Items (Bill of Quantities)

FOR REFERENCE ONLY

SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -1)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02

Summary of Bill of Quantities

Part / Bill No.	Description	Amount (NRs.)	Remarks
A	GENERAL		
	SUB-TOTAL OF PART A:		
B	ROAD WORKS		
B1	Site Clearance		
B2	Earthworks		
B3	Pavement Works		
B4	Structures		
B5	Road Furniture and Traffic Safety Measures		
B6	Environmental Mitigation Works and Bio engineering		
	SUB-TOTAL OF PART B:		
C	BRIDGE WORKS		
C1	General Items		
C2	Foundation Works		
C3	Sub-structure Works		
C4	Super-structure Works		
C5	River Training and Protection Works		
C6	Testing Works		
	SUB-TOTAL OF PART C:		
D	PBM WORKS AND SERVICES		
	SUB-TOTAL OF PART D:		
E	SCHEDULE OF DAY WORKS		
	SUB-TOTAL OF PART E:		
F	PROVISIONAL SUM	512,839,172.00	
	SUB-TOTAL OF PART F:	512,839,172.00	
1	SUB-TOTAL (Part A TO Part F)		
2	VAT @ 13% of (1)		
3	Grand Total (Including VAT)		

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
A1.01	119	Insurance of works, plant, material and Contractor's equipment and third party property and persons under CAR policy						
a.		Insurance cover for works, plant, material and the Contractor's Equipment	sum	1.00				
b.		Insurance cover for third party property and persons	sum	1.00				
A1.02	101.01	Employer's office at site						
a.		Construction of office building (Pre-Fab Structure, Single Storey with 230 mm brick wall in cement-sand mortar in the outer face) including electrical, plumbing and sanitary works all complete as per the Drawings and the Specifications. The building shall remain the property of the Employer upon completion of the contract.	sum	1.00				
b.		Maintaining and operating the Employer's office at site, including consumables etc., all complete.	mon	108.00				
c.		Providing furniture and equipment at the Employer's office at site, etc., all complete. The furniture and equipment shall remain the property of the Employer upon completion of the contract.	sum	1.00				
A1.03	101.01	Employer's accommodation at site						
a.		Construction of accommodation building (RCC Structure, two stories) including electrical, plumbing and sanitary works all complete as per the Drawings and Specifications. The building shall remain the property of the Employer upon completion of the contract.	sum	1.00				
b.		Maintaining and operating the Employer's accommodation at site, including consumables etc., all complete.	mon	108.00				
c.		Providing furniture and equipment at the Employer's accommodation at site, etc., all complete. The furniture and equipment shall remain the property of the Employer upon completion of the contract.	sum	1.00				
A1.04	101.02	Supplying, maintaining and operating the vehicle for the Employer's use at site. The vehicles shall remain the property of the Contractor upon completion of the contract.						
a.		Type 1 vehicle for the Employer's use at site.	veh-mon	108.00				
b.		Type 2 vehicle for the Employer's use at site.	veh-mon	48.00				

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
c.		Type 3 vehicle (Motorbike) for the Employer's use at site.	veh-mon	48.00				
A1.05	101.03	Contractor's material testing laboratory at site						
a.		Providing laboratory space, maintaining and operating, etc. of the material testing laboratory at site, all complete.	mon	36.00				
b.		Providing furniture and equipment at the material testing laboratory at site, all complete. The furniture and equipment of the lab shall remain the property of the Contractor upon completion of the contract.	sum	1.00				
A1.06	107	Routine/Recurrent Maintenance of road						
a.		Routine/Recurrent Maintenance of road during construction period of 36 months	km-mon	1,706.50				
b.		Routine Maintenance of road during defect liability/notification period of 12 months	km-mon	568.83				
A1.07	108	Provision and installation of Project Notice Board	nos.	2.00				
A1.08	111	Prepare and supply video documentary of the site before, during and after the site works.	nos.	1.00				
A1.09	102	Compliance with traffic management provisions, including construction and maintenance of temporary road and bridge diversions, access roads to bridge construction sites, etc. all complete covering entire construction period.	sum	1.00				
Total of Part A - Carried to Summary :								
PART B: ROAD WORKS								
BILL 1 Site Clearance								
B1.01	201	Clearing and grubbing including uprooting, transporting and disposing of vegetation, grass, bush, sapling and trees of girth up to 300 mm (measured at a height of 1 m above the ground level), all complete	sqm	195,328.60				
B1.02	201	Felling trees (the girth measured at a height of 1 m above the ground level) including cutting of trunks and branches, removing the roots, stacking serviceable material, disposal of unserviceable material and back filling the depressions/pits, all complete						
a.		Above 300 mm to 900 mm	nos.	2,306.00				
b.		Above 900 mm to 1800 mm	nos.	711.00				
c.		Above 1800 mm	nos.	568.00				

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
B1.03	202	Dismantling the structures including stockpiling of the reusable materials and disposal of unusable materials, all complete						
a.		Stone masonry in cement sand mortar	cum	9,363.90				
b.		Gabion masonry	cum	1,092.00				
c.		Brick masonry	cum	718.78				
d.		Plain cement concrete	cum	25.00				
e.		Reinforced cement concrete work	cum	3,960.54				
f.		Dry stone masonry	cum	298.12				
g.		RCC Pipe culverts	rm	387.50				
B1.04	201	Clearance of Landslides, debris from culverts and side drains including haulage and disposal , all complete.	cum	5,460.00				
Total of Bill B1 - Carried to Summary :								
Bill 2 Earthworks								
B2.01	900	Roadway excavation including side drain with haulage and disposal in approved safe tipping sites, in common material including hard rock, all complete.	cum	401,523.96				
B2.02	900,1003	Formation of embankment including haulage, all complete						
a.		Formation of embankment from excavated material in road-way excavation including watering, compacting in a layer not exceeding of 150 mm compacted depth as per the specification, all complete	cum	104,107.49				
b.		Formation of embankment from approved borrowing material outside the right of way (RoW) including watering, compacting in a layer not exceeding of 150 mm compacted depth as per the specification, all complete	cum	584,423.62				
B2.03	900	Excavation for structures (Cross drainage, Retaining & off-road structures) with haulage and disposal in approved safe tipping site, in common material including Hard Rock, all complete	cum	14,905.99				
B2.04	900	Backfilling to structures, foundation pits, etc. with suitable material including compaction, all complete.	cum	1,623.81				
Total of Bill B2 - Carried to Summary :								

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
Bill 3 Pavement Works								
B3.01		Sub-grade						
a.	1003	Scarifying, removing of existing bituminous pavement layer including safe disposal.	sqm	450,326.03				
b.	1003	Preparation of sub-grade to design grade, level and camber including watering and compaction in all types of soil, all complete.	sqm	1,172,581.95				
c.	1002, 1003	Supply, place and compact capping layer, as per specification, all complete.	cum	4,000.00				
B3.02		Sub-base and Base						
a.	1201	Supply, place and compact granular sub-base as per specification, all complete.	cum	258,775.95				
b.	1202	Supply, place and compact crushed stone Base (CSB) as per specification, all complete.	cum	211,593.96				
B3.03		Prime Coat						
a.	1302	Provide, prepare and spray bituminous prime coat including cutter, air scrubbing, cleaning the road surface using wire, brushes, broom etc.	ltr	1,057,969.81				
B3.04		Tack Coat						
a.	1301, 1302	Providing and spraying bituminous Tack coat including cleaning the road surface using wire, brushes, broom etc. before applying tack coat.	ltr	293,747.99				
B3.05		Asphalt Concrete Works						
a.	1307, 1308	Provide, prepare including laying, levelling and compaction of Asphalt Concrete (Binder Course) as per the approved design using VG 30 bitumen.	cum	47,829.89				
b.	1307, 1308	Provide, prepare including laying, levelling and compaction of Asphalt Concrete (Wearing Course) as per the approved design using VG 30 bitumen.	cum	57,121.89				
c.	1307, 1308	Rate per kilogram for over or under usage of bitumen in Asphalt Concrete, quantity to be in accordance with actual bitumen usage (Job mix formula).	kg.	-				
		Total of Bill B3 - Carried to Summary :						

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Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
Bill 4 Structures								
B4.01	2000	Provide and place machine mixed M15/20 grade concrete including compaction, curing, testing etc., all complete.	cum	15,445.75				
B4.03	2000	Provide and place machine mixed M25/20 grade concrete including compaction, curing, testing etc., all complete.	cum	1,483.00				
B4.04	2000	Providing and placing machine mixed M35/20 grade cement concrete for the super structure, deck slab, girder, etc. including compaction, curing, testing and lead 30 m . etc. all complete as per specification and drawing.	cum	1,895.49				
B4.05	2000	Providing and laying Reinforcement bar including cutting, bending, binding, fixing in position, all complete.	t	329.56				
B4.06	2600	Providing and laying random rubble stone masonry in cement sand mortar MM7.5 for structure work including scaffolding, curing, preparation of mortar, pointing etc., all complete.	cum	21,345.70				
B4.07	700	Providing and laying RCC pipes (Class NP3) with or without collars, jointed with stiff mixture of cement mortar (1 cement : 2 sand), all complete.						
a)		300 mm diameter (internal)	rm	2,972.00				
b)		900 mm diameter (internal)	rm	2,376.00				
B4.08	1800	Providing, preparing and installing formwork including necessary supports and removing after completion for works in any type of structure (Class F2 Finish).	sqm	9,891.40				
B4.09	2400/ 3110	Supply and place geotextile as per design drawings.	sqm	26,070.00				
B4.10	2400	Supply and place dry stone packing/soling , all complete	cum	3,434.74				
B4.11	1804, 1805	Providing , Preparing and Installing formwork including necessary supports and removing after completion for foundation and footings. (Class F1 Finish) Using Timber (soft wood)	sqm	1,040.42				

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Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs.)	Remarks
					In Figures	In Words		
Box Culverts								
B4.13	2000 (cast-in-situ), 2100A (precast) 1804, 1805, 1800, 2400	Supply, transportation from casting yard to construction site and installation at site of precast or construction of cast-in-situ RCC box culverts including associated works, all complete as shown in drawings and specifications. (Dimensions below are internal openings)						
i)		Precast Box Culverts (Single Cell)						
a.		W 1.0 x D 1.2	rm	276.00				
b.		W 1.2 x D 1.2	rm	638.00				
c.		W 1.5 x D 1.2	rm	604.00				
d.		W 1.8 x D 1.2	rm	278.00				
e.		W 2.0 x D 1.2	rm	472.00				
ii)		Precast Box Culverts (Double Cell)						
a.		W 1.2 x D 1.2	rm	56.00				
b.		W 1.5 x D 1.2	rm	196.00				
c.		W 1.8 x D 1.2	rm	138.00				
d.		W 2.0 x D 1.2	rm	84.00				
iii)		Cast-in-Situ Box Culverts (Single Cell)						
a.		W2.0 x D2.8	rm	82.00				
b.		W2.25 x D1.8	rm	166.00				
c.		W2.5 x D1.6	rm	82.00				
d.		W3.0 x D1.5	rm	112.00				
e.		W3.0 x D3.0	rm	28.00				
f.		W3.5 x D1.8	rm	136.00				
iv)		Cast-in-Situ Box Culverts (Double Cell)						
a.		W2.0 x D2.0	rm	84.00				
b.		W2.5 x D1.5	rm	138.00				
c.		W3.0 x D1.5	rm	84.00				
d.		W3.0 x D2.0	rm	56.00				
e.		W3.0 x D2.8	rm	82.00				
f.		W3.5 x D2.6	rm	28.00				
v)		Upstream and downstream works of Culverts						
a.	900	General excavation in all type of soil	cum	4,482.15				
b.	900	Backfilling, common material	cum	4,740.18				
c.	900	Backfilling, Filter material	cum	913.76				
d.	2000	Concrete M 15/20	cum	5,609.42				
e.	2000	Concrete M 25/20	cum	568.80				

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Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
f.	2000	Reinforcement bar	t	115.44				
g.	2000	Reinforcement bar (Approach Slab)	t	17.82				
h.	1800	Form work: Wing walls & Approach Slab (F2 Finish)	sqm	8,604.74				
i.	2400	Stone Soling	cum	1,376.14				
vi)		Side Drains (Precast "U" type RCC)						
a.		Side Drain W0.8 x D0.6	rm	29,868.00				
b.		Side Drain W1.0 x D0.8	rm	14,308.00				
c.		Iron grit along footpath drain (rain inlet) (at the interval of 30 m at both sides of footpath)	nos.	692.00				
Total of Bill B4 - Carried to Summary :								
Bill 5 Road Furniture and Traffic Safety Measures								
B5.01	1501	Supply and erect Traffic Signs in place including required size of steel tubes, steel plates, cement concrete, painting, writing and supporting steel angles, nuts and bolts etc. all complete, as per Drawings.						
a.		Single post	nos.	1,512.00				
b.		Double or more posts	nos.	80.00				
B5.02	1503	Supply and place Road Marker (RCC Kilometer post) including excavation, concrete back filling, painting and writing etc. all complete as per Drawings.						
a.		Standard Kilometer stone.	nos.	37.00				
b.		Standard 5 th Kilometer stone.	nos.	10.00				
B5.03	1401	Supply and fix in place precast concrete Kerb Stone with M20/20 concrete grade including foundation preparation, erection, back filling, painting etc all complete as per Drawings.	rm	123,583.71				
B5.04	1511	Providing and installation of precast RCC New Jersey block with reflective paint in line and level on prepared level surface etc., all complete as per the specification and drawing.	rm	6,312.95				
B5.05	1502	Road Marking with hot applied thermoplastic compound with reflectorizing glass beads on bituminous surface as specified in Traffic Sign Manual and as per the drawings.	sqm	30,454.14				

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Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs.)	Remarks
					In Figures	In Words		
B5.06	1505	Provide and erect "W" metal beam crash barrier comprising of 3.43 mm thick corrugated sheet metal beam rail, 700 mm above road/ground level, fixed on ISMC series channel vertical post, 150 mm x 75 mm x 5 mm spaced at 2 m c/c, 1.8 m high of which 1.1 m shall be below ground/road level. All steel parts and fitment shall be galvanized by hot dip process	rm	14,817.72				
B5.07	3111	Providing and laying 60 mm thick interlocking concrete block with line type audio tactile blocks (500 mm wide strip) using stone dust/sand bed on 75 mm thick compacted granular sub base in a footpath including stone dust filled in between the blocks etc., all complete as per the drawings and specification	sqm	60,855.90				
B5.08	3105 (5)	Providing and installing of 75 mm - Φ GI pipe railing and precast RCC railing post including foundation excavation and preparation, concrete back filling, painting and erection etc., all complete as per specification and drawing.	rm	102,896.00				
B5.09	IS 617:1994	Supplying and fixing of road marker (cat's eye / reflective studs)	nos.	4,639.00				
B5.10		Supply and installation of street lights and linking system including foundation works, erection, cabling, conduits, accessories all complete as per drawings, Specification and instruction of the Engineer.						
a.		(i) Grid powered streetlights with underground cables	rm	15,180.00				
b.		(ii) Solar powered streetlights	nos.	323.00				
B5.11		Supply and erection and foundation works of gantry mounted including fixing three direction signs, all complete	nos.	6.00				
B5.12		Supply and installation of traffic signal with pedestrian push buttons including foundation works, erection, cabling, conduits, accessories all complete						
a.		Cross-Junction	nos.	2.00				
B5.13		Kerb ramp crossing at major junctions	nos.	52.00				
B5.14		Kerb ramp crossing at mid-block crossing	nos.	142.00				

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Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
B5.15		Providing and filling earth in traffic island, medians, etc.	cum	49,068.42				
Bus Stop Shelters (Specification No. 1513)								
Small Bus Stop Shelters (35 nos.)								
B5.16	2000	Provide and place machine mixed M15/20 grade concrete including compaction, curing, testing etc., all complete.	cum	8.92				
B5.17	1804, 1805	Providing , Preparing and Installing formwork including necessary supports and removing after completion for foundation and footings. (Class F1 Finish) Using Timber (soft wood)	sqm	193.88				
B5.18	1403	Providing and laying flat bricks over 60 mm thick sand bed including excavation, sand bedding, etc. complete.	sqm	64.74				
B5.19	2000	Provide and place machine mixed M20/20 grade concrete including compaction, curing, testing etc., all complete.	cum	20.32				
B5.20	2000	Providing and laying Reinforcement bar including cutting, bending, binding, fixing in position, all complete.	t	0.38				
B5.21		Providing and fixing 4" black metal pipe including painting all complete	kg.	22,321.60				
B5.22		Providing and fabrication of metal angles of different sizes including painting all complete.	kg.	6,141.17				
B5.23		Providing and fixing UPVC roof all complete.	sqm	430.25				
B5.24	1501	Road Sign posts	nos.	35.00				
B5.25	1502	Thermoplastic Road marking paint	sqm	308.00				
B5.26		Wooden 50 mm thick seat	sqm	157.50				
B5.27		Unbreakable Glass 8 mm thick	sqm	700.00				
B5.28		Aluminium facing panel	sqm	315.00				
B5.29		50 mm dia stainless steel handrail pipe	rm	175.00				
B5.30		Enamel painting on kerb	sqm	175.00				
Large Bus Stop Shelters (8 nos.)								
B5.31	2000	Provide and place machine mixed M15/20 grade concrete including compaction, curing, testing etc., all complete.	cum	18.54				

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Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs.)	Remarks
					In Figures	In Words		
B5.32	1804, 1805	Providing , Preparing and Installing formwork including necessary supports and removing after completion for foundation and footings. (Class F1 Finish) Using Timber (soft wood)	sqm	125.91				
B5.33	1403	Providing and laying flat bricks over 60 mm thick sand bed including excavation, sand bedding, etc. complete.	sqm	124.80				
B5.34	2000	Provide and place machine mixed M20/20 grade concrete including compaction, curing, testing etc., all complete.	cum	4.64				
B5.35	2000	Providing and laying Reinforcement bar including cutting, bending, binding, fixing in position, all complete.	t	0.09				
B5.36		Providing and fixing 4" black metal pipe including painting all complete	kg.	4,126.08				
B5.37		Providing and fixing UPVC roof all complete.	sqm	144.00				
B5.38	1501	Road Sign posts	nos.	8.00				
B5.39	1502	Thermoplastic Road marking paint	sqm	70.40				
B5.40		Enamel painting on kerb	sqm	40.00				
B5.41		Wooden 50 mm thick seat	sqm	79.20				
B5.42		Unbreakable Glass 8 mm thick	sqm	192.00				
B5.43		Aluminium facing panel	sqm	86.40				
B5.44		Brick Masonry (1:4)	cum	32.40				
Total of Bill B5 - Carried to Summary :								
Bill 6 Environmental Mitigation Works and Bio-engineering								
B6.01	109	Provision of safety clothing and equipment, first aid / medical facilities and other safety measure for labour and Contractor's employees including Consultant's and Employer's personnel and visitors.	Mon	36.00				
B6.02		Bio-engineering works						
a.	2800	Slope preparation for bio-engineering works.	sqm	31,784.83				
b.	2800	Supply and planting rooted grass slips at spacing of 100 mm in row and 250 mm spacing between two rows.	sqm	28,606.50				
c.	2800	Planting single node culm cutting of grass on fill slopes < 45° and embankment slopes in plain areas etc. all complete.	nos.	3,973.00				

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Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
d.	2800	Supply and planting trees with tree guards as specified.	nos.	3,822.00				
e.	2800	Brush layering.	rm	3,973.29				
f.	2800	Supply, preparation and planting of live cuttings of selected species fascines of minimum 1 m length to 0.5 m and pegs spaced at 5 cm centers within rows.	rm	3,178.70				
g.	2800	Supply, Preparation and planting of live cuttings of selected species palisade of minimum 1 m length to 0.5 m into and pegs spaced at 5 cm centers within rows, with 5-20 cm between rows.	rm	1,589.53				
h.	2800	Supply and broadcasting grass seeds @ 25 gms / m ² .	sqm	31,784.83				
i.	2800	Supply and laying grass turfing on the various slope with cutting, watering and transportation etc. including in median	sqm	393,037.01				
j.	2800	Supply and planting large bamboos.	nos.	895.00				
k.	2800	Construct live check-dams	rm	731.50				
l.	2400	Provide and Laying of 200 mm thick of dry stone rip rap.	sqm	3,716.57				
m.	2800	Supply and planting Tree in Median.	nos.	3,496.00				
n.	2800	Supply and planting Median Shrubs	nos.	13,983.00				
Total of Bill B6 - Carried to Summary :								
Total of Part B - Carried to Summary:								
PART C: BRIDGE WORKS								
C1		General Items						
C1.01	124	Diversion of river flow for excavation and other works including dewatering and construction of coffer dam	nr	25.00				
C1.02	1501	Supplying and placing of bridge name plate, as specified by the DOR traffic sign manual	nr	70.00				
C1.03	203	Site clearance works including cutting bushes and removing (before and after Completion of works)	sum	1.00				
Total of Bill C1 - Carried to Summary :								

SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
C2		Foundation Works						
C2.01	900	Excavation for foundation for abutments and piers in all types of soil including dewatering etc., all complete	cu m	16,912.00				
C2.02	1600	Boring for cast-in-situ RCC pile of specified diameter Excluding reinforcing bar and concrete using Bentonite as per specification and drawing etc. all complete.						
a.		For Pile, 0.80 m dia.	m	208.00				
b.		For Pile, 1.00 m dia.	m	5,890.00				
c.		For Pile, 1.20 m dia.	m	3,805.00				
C2.03	2000	Providing and placing machine mixed cement concrete M10/40 for levelling course including compaction, curing, testing etc. all complete as per specification and drawing.	cu m	572.00				
C2.04	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M25/40 for footings/piles including compaction, curing, testing etc. all complete as per specification and drawing.	cu m	2,066.00				
C2.05	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M30/20 for piles, caps, abutment including compaction, curing, testing etc. all complete as per specification and drawing.	cu m	11,520.00				
C2.06	2000	Providing and laying Reinforcing Steel Bar including cutting, bending, fixing in position etc. all complete as per specification and drawing.	t	1,961.11				
C2.07	1800	Providing, Preparing and Installing Form Work (F1 Finish) including necessary supports and removing after completion all complete as per specification and drawing	sq m	3,248.58				
C2.08	3113	Providing and Installation of 32 mm dia HDPE Pipe (6 kg/cm ²) for pressure grouting in the pile including all necessary fittings, all complete as shown in drawings.	m	10,336.00				
C2.09	2709	Pressure grouting works (6 kg/cm ² pressure) with cement grout including suitable admixture material in pile including other set-up as necessary to perform the work as per specification. (for max of 0.06 m ³ of grouting material or 100 kg. of cement)	nr	477.00				

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
C2.10	2709	Rate per kg for under or over use of grouting material (cement -admixes) in pile based on actual consumption	kg.	-				
Total of Bill C2 - Carried to Summary :								
C3		Sub-Structure Works						
C3.01	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M25/20 for the approach slabs, anchorage block including compaction, curing, testing etc. all complete	cu m	2,018.00				
C3.02	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M30/20 for the abutment, pier, pier cap, stoppers, wing walls etc. including compaction, curing, testing etc. all complete.	cu m	5,753.00				
C3.03	2100A	Providing and installing of Anchorage Cable of dia 26 mm , all complete as per specification and drawing	m	4,928.00				
C3.04	1800	Providing, preparing and installation of Formworks (F2 finish) for substructures including necessary supports and removing after completion (false work included), all complete	sq m	21,816.02				
C3.05	2000	Providing and laying Reinforcing Steel Bar including cutting, bending, binding, fixing in position etc. all complete as shown in drawings	t	976.60				
C3.06	2400, 3110	Providing , laying and fixing of geotextile (filter fabrics)	sq m	21.23				
C3.07	3110	Backfilling with graded filter materials in layer with necessary watering and compaction, all complete	cu m	41.97				
C3.08	3109	Provide and installation of Weep Hole with 100 mm HDPE pipe in abutment, all complete	m	375.00				
C3.09	3400	Supply, transport and erect Reinforce Soil Structure all complete including excavation, foundation concrete, concrete facial element, reinforcing element, fasteners, filter media, drainage layer, drainpipe, coping beam and other accessories as per design and as directed by the Engineer all complete	sqm	19,978.00				
C3.10	3400	Supply, place and compact granular material to gain the strength of the foundation of Ramp as per design and specification, all complete.	cum	7,520.00				

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
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Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
C3.11	3400	Supply, place and compact reinforced structural soil backfill in Ramp as per design and specification, all complete.	cum	63,075.20				
Total of Bill C3 - Carried to Summary :								
C4		Super-Structure Works						
C4.01	2100, 2100A	Supply of precast, pre-stressed Box Girder including transportation of Girder from fabrication yard to construction site, all complete as shown in drawings and specification						
a.		Girder length: 15.68 m	nr	96.00				
b.		Girder length: 20.88 m	nr	120.00				
c.		Girder length: 23.48 m	nr	104.00				
d.		Girder length: 26.06 m	nr	160.00				
e.		Girder length: 32.68 m	nr	56.00				
C4.02	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M25/20 for deck slab, Diaphragms etc. including compaction, curing, testing etc. and necessary lead all complete	cu m	3,661.79				
C4.03	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M25/10 for wearing course in deck slab including compaction, curing, testing etc. and necessary lead all complete	cu m	1,307.32				
C4.04	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M30/20 for crash barriers etc. including compaction, curing, testing etc. all complete	cu m	2,594.43				
C4.05	2000	Providing and placing machine mixed cement concrete (Batch-Mix) M35/20 for crash barriers etc. including compaction, curing, testing etc. all complete	cu m	730.00				
C4.06	1800	Providing, preparing and installation of Formworks (F2 finish) for deck slab, Diaphragms, Crash Barriers etc. and removing after completion (false work included), all complete	sq m	29,489.68				
C4.07	2000	Providing and laying reinforcing steel bar including cutting, bending, binding, fixing in position, all complete	t	1,025.00				

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
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Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
C4.08	2100	Lifting and placing in position precast box girder with suitable equipment including erection, shifting and removal of the erecting equipment & its accessories, all complete as shown in drawing	nr	540.00				
C4.09	1901	Providing and installing the expansion joints as shown in the drawings and specifications including all necessary axillary and incidental works etc. all complete.	m	1,200.00				
C4.10	1902	Providing and installing elastomeric bearing including design of the bearings with provided data and necessary axillary and incidental works etc. all complete.	nr	2,190.00				
C4.11	3105	Providing and fixing in position GI pipes including fixing in position in handrail and crash barrier as shown in drawing, all complete						
a.		50 mm dia GI pipes	m	7,159.74				
b.		75 mm dia GI pipes	m	6,868.36				
c.		100 mm dia GI pipes	m	1,141.00				
C4.12	3114	Providing and fixing in position Galvanised Steel Plate including steel bolts for pedestrian handrails and crash barriers rails as shown in the drawings, all complete	kg.	4,180.00				
C4.13	3107	Providing and fixing in position GI drainage spout including GI pipe as shown in the drawings, all complete	nr	1,120.00				
C4.14	3108	Providing and fixing in position Bracket for Utility as shown in the drawings, all complete	nr	680.00				
C4.15	3115	Prepare and apply reflectorized enamel paint Zebra type, black & yellow on Crash barriers in two coats in addition to one base coat as per DoR Traffic Sign Manual	sq m	2,293.00				
C4.16		Provide and laying HDPE pipe of 250 mm dia (pressure 2.5 kg/cm ²) for collection of rainwater from drainage spouts of bridge and divert to the drain as instructed by the Engineer, all complete	m	416.00				
Total of Bill C4 - Carried to Summary :								

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs.)	Remarks
					In Figures	In Words		
C5		River Training and Protection Works						
C5.01	900, 1003	Formation of embankment from approved borrowing material including watering, compacting in a layer not exceeding of 150 mm compacted depth as per the specification, all complete	cum	47,029.87				
C5.02	900	Foundation Excavation in all types of soil including shoring, dewatering, all complete	cu m	17,429.00				
C5.03	2600	Providing and laying Random Rubble Stone Masonry works in cement sand mortar MM 7.5 including scaffolding, curing, preparing cement mortar, pointing etc., all complete	cu m	5,194.00				
C5.04	2000	Providing and placing machine mixed cement concrete M10/40 for levelling course in CRRM including compaction, curing, testing etc. all complete as per specification and drawing.	cu m	317.00				
C5.05	2400	Supply and assemble of Machine Made mechanically salvaged Gabion and Mattresses produced from double twisted heavy coated GI wire, of hexagonal mesh size 100 mm x 120 mm, with mesh wire 3 mm, selvedge wire 3.9 mm, lacing wire 2.4 mm and stone filling in gabions including transport and fixing of gabions in position, all complete.	cu m	15,930.00				
C5.06	2400	Providing and laying of 300 mm thick grouted stone pitching works in protection works with stones and cement sand mortar (1:3) including curing, all complete	sq m	4,730.00				
C5.07	2400, 3110	Providing, laying and fixing of geotextile (filter fabrics), all complete	sq m	11,398.00				
C5.08	3110	Backfilling with graded filter materials in layer with necessary watering and compaction as shown in drawing, all complete	cu m	972.00				
C5.09	3109	Provide and laying PVC pipe of 90 mm dia (pressure 2.5 kg/cm ²) for weep holes as instructed by the Engineer, all complete	m	5,545.00				
		Total of Bill C5 - Carried to Summary :						

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
C6		Testing Works						
C6.01	1600	Pile Load Test, one in each bridge or more as instructed by the Engineer	no.	27.00				
C6.02	1600	Conducting PDA test on working piles including analysis and reporting one pile test per foundation all complete as instructed by the Engineer	no.	91.00				
C6.03	1600	Pile Integrity Test, analysis and reporting using low strain waves as per ASTM D5882 with one report per bridge as directed by the Engineer, all complete.	no.	495.00				
C6.04	3000	Soil Investigation and preparation of report by rotary drilling to determine the load capacity of the pile (min. 35 m depth)	no.	4.00				
C6.05	IRC SP: 51	Bridge Load Test (Proof Load) as per Indian Road Congress' Special publication No 51 (Guidelines for Load Testing of Bridge) and as directed by the Engineer, all complete.	no.	1.00				
		Total of Bill C6 - Carried to Summary :						
		Total of Part C - Carried to Summary:						
PART D: PERFORMANCE BASED MAINTENANCE WORKS AND SERVICES								
D1.01	3300	Performance based maintenance works and services including all activities as per Specification except emergency works. (5 years period)	km-mon	2,844.16				
		Total of Part D - Carried to Summary:						
PART E: SCHEDULE OF DAY WORKS DURING CONSTRUCTION WORKS, PBM WORKS AND SERVICES								
E1.01		Labour						
a.		Skilled labour (Mason, Carpenter, Mechanics etc.)	man-day	437.00				
b.		Unskilled labour (Including Unskilled, helpers, assistant, operators etc.)	man-day	874.00				
E1.02		Equipment						
a.		Tipper/truck > 5 Cu m capacity	hr.	437.00				
b.		Loader > 1 Cum. Capacity	hr.	437.00				
c.		Excavator >0.75 Cum. Capacity	hr.	437.00				
d.		Motor grader (> 135 HP)	hr.	437.00				
e.		Vibratory roller (> above 10 ton capacity)	hr.	437.00				
f.		Plate Vibrator	hr.	437.00				

**SASEC Highway Improvement Project
Kanchanpur-Kamala Road (Section -2)
Km 189+300 to Km 236+703
Contract No.:SHIP/OCB/KK/02**

Bill of Quantities

Item No.	Spec. Clause Ref.	Item Description	Unit	Quantity	Rate (NRs)		Amount (NRs..)	Remarks
					In Figures	In Words		
E1.03		Material						
a.	700	Concrete NP3 Pipe 450 mm Diameter	rm	1,300.00				
b.	700	Concrete NP3 Pipe 600 mm Diameter	rm	1,300.00				
c.	700	Concrete NP3 Pipe 900 mm Diameter	rm	400.00				
d.	700	HDPE 4 kg/cm ² Pipe 300 mm diameter	rm	3,000.00				
e.	600	Boulders	cum	1,400.00				
f.	600	Cement	t	200.00				
g.	600	Sand	cum	1,200.00				
h.	600	Aggregate	cum	1,500.00				
i.	2400	Supply of machine made mechanically selvedged gabion crates of various sizes including binding wire, all complete	sqm	7,000.00				
		Total of Part E - Carried to Summary:						
PART F: PROVISIONAL SUM								
F1.01	103	Relocation of utilities/services along the roadside	PS	1.00	429,524,997.00	Four Hundred Twenty-Nine Million Five Hundred Twenty-Four Thousand Nine Hundred Ninety-Seven	429,524,997.00	
F1.02		Environmental mitigation works as instructed by the Engineer (EMP)	PS	1.00	9,522,875.00	Nine Million Five Hundred Twenty-Two Thousand Eight Hundred Seventy-Five	9,522,875.00	
F1.03		Payment of Electricity charges of the street lights within the DLP and PBM periods. (150 watts bulbs with spacing @ 40 m c/c)	PS	1.00	13,731,300.00	Thirteen Million Seven Hundred Thirty-One Thousand Three Hundred	13,731,300.00	
F1.04		Social compliance and safe guards as instructed by the Engineer	PS	1.00	5,460,000.00	Five Million Four Hundred Sixty Thousand	5,460,000.00	
F1.05		Additional testing of materials or works as required by the Engineer.	PS	1.00	1,365,000.00	One Million Three Hundred Sixty-Five Thousand	1,365,000.00	
F1.06	3300	Emergency fund for PBM Works and Services	PS	1.00	53,235,000.00	Fifty-Three Million Two Hundred Thirty-Five Thousand	53,235,000.00	
		Total of Part F - Carried to Summary:					512,839,172.00	
		Total of Part A to Part F:						
		VAT 13%						
		Total						

Section 5 - Eligible Countries

This Section contains the list of eligible countries.

Regional Members

1.	AFG	Afghanistan	25.	FSM	Micronesia, Federated States of
2.	ARM	Armenia	26.	MON	Mongolia
3.	AUS	Australia	27.	MYA	Myanmar
4.	AZE	Azerbaijan	28.	NAU	Nauru
5.	BAN	Bangladesh	29.	NEP	Nepal
6.	BHU	Bhutan	30.	NZL	New Zealand
7.	BRU	Brunei Darussalam	31.	PAK	Pakistan
8.	CAM	Cambodia	32.	PAL	Palau
9.	PRC	China, People's Republic of	33.	PNG	Papua New Guinea
10.	COO	Cook Islands	34.	PHI	Philippines
11.	FIJ	Fiji	35.	SAM	Samoa
12.	GEO	Georgia	36.	SIN	Singapore
13.	HKG	Hong Kong, China	37.	SOL	Solomon Islands
14.	IND	India	38.	SRI	Sri Lanka
15.	INO	Indonesia	39.	TAP	Taipei, China
16.	JPN	Japan	40.	TAJ	Tajikistan
17.	KAZ	Kazakhstan	41.	THA	Thailand
18.	KIR	Kiribati	42.	TIM	Timor-Leste
19.	KOR	Korea, Republic of	43.	TON	Tonga
20.	KGZ	Kyrgyz Republic	44.	TKM	Turkmenistan
21.	LAO	Lao PDR	45.	TUV	Tuvalu
22.	MAL	Malaysia	46.	UZB	Uzbekistan
23.	MLD	Maldives	47.	VAN	Vanuatu
24.	RMI	Marshall Islands	48.	VIE	Viet Nam

Non-regional Members

1.	AUT	Austria	11.	NET	The Netherlands
2.	BEL	Belgium	12.	NOR	Norway
3.	CA	Canada	13.	POR	Portugal
4.	DEN	Denmark	14.	SPA	Spain
5.	FIN	Finland	15.	SWE	Sweden
6.	FRA	France	16.	SWI	Switzerland
7.	GER	Germany	17.	TUR	Turkey
8.	IRE	Ireland	18.	UKG	United Kingdom
9.	ITA	Italy	19.	USA	United States
10.	LUX	Luxembourg			

Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Project Directorate (ADB)
Kathmandu, Nepal

SASEC Highway Improvement Project (SHIP)
(ADB Loan No. 52097 - 001)

Kanchanpur – Kamala Road (Section – 2)
From Km 189+300 to km 236+703)

Contract No. SHIP/OCB/KK/02

Phase 1: Upgrading Works

(Upgrading of existing road from 2-Lanes to 4 Lanes and Service Lanes, Structures, Bridges, etc. including Defect Notification Period)

Phase 2: Performance Based Maintenance Works

(Maintenance works consisting of all activities to be carried out to achieve and keep the road assets as defined in the PBM Specifications)

Bidding Document

Part II Employer's Requirements

Section 6A	Summary of Description of Works
Section 6B	Standard Specifications
Section 6C	Special Provisions to Standard Specifications
Section 6D	Drawings (In Separate Volume)
Section 6E	Personnel Requirements
Section 6F	Equipment Requirements

August, 2018

Preface

This Bidding Document for the Procurement of Works (Single Stage – Two Envelope) has been prepared by the Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB) and is based on the Standard Bidding Document issued by the Asian Development Bank dated May 2018.

ADB's SBD Works has the structure and the provisions of the Master Procurement Document entitled "Bidding Documents for the Procurement of Works", prepared by multilateral development banks and other public international financial institutions, except where ADB-specific considerations have required a change.

FOR REFERENCE ONLY

Table of Contents - Summary Description

PART I BIDDINGPROCEDURES

Section 1 - Instructions to Bidders (ITB)----- 1-1

This Section specifies the procedures to be followed by Bidders in the preparation and submission of their Bids. Information is also provided on the submission, opening, and evaluation of bids and on the award of contract.

Section 2 - Bid Data Sheet (BDS)----- 2-1

This Section consists of provisions that are specific to each procurement and supplement the information or requirements included in Section 1 - Instructions to Bidders.

Section 3 - Evaluation and Qualification Criteria (EQC)----- 3-1

This Section contains the criteria to determine the lowest evaluated bid and the qualifications of the Bidder to perform the contract.

Section 4 – Bidding Forms (BDF)----- 4-1

This Section contains the forms which are to be completed by the Bidder and submitted as part of his Bid.

Section 5 – Eligible Countries (ELC)----- 5-1

This Section contains the list of eligible countries.

PART II EMPLOYERS REQUIREMENTS

Section 6 - Employer's Requirements (ERQ)----- 6-1

This Section contains the Specifications, Drawings, and Supplementary Information that describe the Works to be procured, Personnel Requirements, and Equipment Requirements.

Section 6A – Summary of Description of Works

This Section contains the summary list of main works to be executed under the contract. Specification, Special provisions and, the Drawings, that describe the Works to be procured.

Section 6B – Standard Specifications

This document has been issued under the authority of the Government of Nepal, Ministry of Physical Planning and Works, Department of Roads (July 2001), it can be purchased from the Central Road Laboratory, Kupandole, Lalitpur.

Section 6C – Special Provisions

This section contains amendments, supplements, etc. to the standard specifications to suit the specific requirements of the project, including sections regarding Minor Bridges and PBM works.

Section 6D – Drawings

The drawings are presented in a separate volume.

Section 6E – Personnel Requirements

This section provides the information on Personnel Requirements.

Section 6F – Equipment Requirements

This section provides the information on Equipment Requirements.

PARTIII CONDITIONS OF CONTRACT AND CONTRACTFORMS

Section 7 - General Conditions of Contract (GCC)----- 7-1

This Section contains the general clauses that govern the Contract. These General Conditions shall be the Conditions of Contract for Construction, Multilateral Development Bank Harmonized Edition, prepared by the Fédération Internationale des Ingénieurs- Conseil (FIDIC June 2010 MDB version). These Conditions are subject to the variations and additions set out in Section 8 (Particular Conditions of Contract).

Section 8 - Particular Conditions of Contract (PCC)----- 8-1

This Section contains provisions which are specific to each contract and which modify or supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Section 9 – Contract Forms (COF)----- 9-1

This Section contains forms, which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Part II - Employers Requirements

This Section contains the Summary of Description of Works, Specifications and Drawings that describe the Works to be procured.

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Section 6A: Summary of Description of Works

Kanchanpur- Kamala Road is a National Highway (H-01) under strategic road networks of Nepal and lies in Saptari and Siraha districts of Sagarmatha Zone (state no 2) of Eastern Development Region of the Country.

The road starts from Kanchanpur (Km 149+880) of Saptari district and ends at Eastern side of Kamala river (Km 236+703) of Siraha district. The road has been split into two (2) sections for procurement of works, (i) Section - 1 from Km 149+880 to Km 189+300 and (ii) Section - 2 from Km 189+300 to Km 236+703.

The Works under this Contract consist of Phase 1: Upgrading Works; with Upgrading of existing road from 2-Lanes to 4 Lanes and Service Lanes, Structures and Construction of Bridges, etc. including Defect Notification Period and Phase 2: Performance Based Maintenance Works; with Maintenance works consisting of all activities to be carried out to achieve and keep the road assets as defined in the PBM Specifications on upgraded 4-Lane Kanchanpur- Kamala Road.

The Detail Drawings related to the improvement works have been included as Section 6D and provided in a separate volume. The estimated quantities of individual work items are contained in the Bill of Quantities. Description of works, materials, and workmanship, methods of testing and requirement and criteria for acceptance of Works etc. are detailed in the Standard Specifications and Special Provisions to the Standard Specifications in Sections 6B and 6C respectively.

The Summary Description of the main works, however, is as follows:

- i) Traffic management provisions during construction including the construction of diversions roads and bridges;
- ii) Roadway excavation and formation of embankment for widening of road section and for geometric improvement of road;
- iii) Construction of side drains, retaining structures;
- iv) Construction of cross-drainage structures;
- v) Construction of sub-base, base and bituminous pavement;
- vi) Supply, erection and installation of road safety measures,
- vii) Construction of bridges and their elements;
- viii) Dismantling of existing RCC bridges;
- ix) Performance based maintenance works to achieve and keep the road assets as defined in the PBM Specifications, etc.

Section 6B: Standard Specifications

Standard Specifications for this contract shall be the "Standard Specifications for Road and Bridge Works" issued under the authority of the Government of Nepal, Ministry of Physical Planning and Works, Department of Roads (Ashad, 2058 / July, 2001)

The Standard Specifications may be purchased from the Departments of Roads, Central Road Laboratory, Kupondole, Lalitpur.

FOR REFERENCE ONLY

Section 6C: Special Provisions to the Standard Specifications

The Standard Specifications for Road and Bridge Works issued by the Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads together with these Special Provisions shall be used to specify the construction of the Works.

The Special Provisions contained herein shall be read in conjunction with the Standard Specifications and shall supplement, replace or supersede the Standard Specifications as appropriate. Where there is any ambiguity or discrepancy between the Standard Specifications and the Special Provisions; the Special Provisions shall have preference and shall govern.

FOR REFERENCE ONLY

Section 100 - General

Delete Clause 101 in its entirety and substitute with the following:

101 Office, Accommodation, Vehicles, Survey Equipment and Site Laboratory

101.01 Provision of Office and Accommodation with Furnishing/ Equipment, Operation and Maintenance

A. General Requirements

The Contractor shall provide office and accommodation with the furniture, furnishing, equipment, consumables, operation and maintenance for the Employer and his staff as described below.

Office shall be with the facilities as shown in Appendix - 2 and the accommodation shall be with the facilities as shown in Appendix - 3. The office and accommodation provisions shall include the construction of new buildings on the land provided by the Employer within the DOR premises at located place with the facilities and maintenance. It also includes the clearance of site, access roads, parking facilities and other necessary appurtenances such as power mains connection, water supply mains, drainage systems, fences, utilities, area development etc.

After providing the office and accommodation with the facilities the Contractor shall also maintain.

B. Sole Use of Office and Accommodation

The office and accommodation facilities shall be for the sole use of the Employer.

C. Land for Offices and Accommodation

The Contractor shall construct the office and accommodation buildings on the land provided by the Employer within the DoR premises at located place. The office and accommodation buildings, equipment and furniture etc will remain the property of the Employer at completion of the contract.

D. Services

The Contractor shall arrange for the connection of water mains, drainage and sewerage and electricity mains to the office and accommodation which facilities shall be functional at all times. The Contractor shall ensure that these facilities of adequate power, supply of potable water and sewage disposal etc. conform in full to the requirements mentioned in the Conditions of Contract and in this Specification. A standby generator, with fuel, of appropriate capacity shall be provided to each office and accommodation for use during periods of load shedding and power failure.

Telephone services including at least one direct line shall be provided for each office and accommodation.

E. Office and Accommodation Buildings

Office Building Structure:

The Contractor shall construct complete office building (Pre-Fab Structure, Single Storey with 230mm brick wall in cement-sand mortar in the outer face) in accordance with the Specifications and that is acceptable to the Employer. Room requirements for the Office shall be with the plinth area of approximately 150 sq m with four (4) rooms plus meeting hall, pantry and toilet bathroom.

1. General description

The total area for the proposed building as per the proposed plan is 150 sq.m.

2. Building description

The proposed building is designed following the frame structure for the structural member of the building. For the curtaining of the building the material that will be used are brick, cement and sand. The sill band and lintel band will be used at the opening of the curtain members of the building, whereas for the solid walls multiple RCC bands will be provided for the as per the design requirement.

For the opening of the building aluminium windows will be used and for the doors the frame will be of timber and the shutter will be of pre-fabricated plywood door boards.

3. Finishing of the building

As this is the accommodation building, this will have many required components. But the essential components will be the furnitures, false ceiling, paints, and light fixtures. The floor finish that can be used will be carpets, parquets, tiles, PVC flooring tiles, marble, granite, etc. The toilet built will be of high standards. The tile will be laid from floor to the ceiling height in every toilet. The staircase and the lobby finish will have granite finish. The emulsion paints will be used for the exterior and interior of the building.

The building shall include all sanitary fixtures and electrical wiring and lighting with the units required and four Nos. of appropriate capacity HVAC installed.

The selection of the different materials, units and the brands and the design will be made by the Engineer based on the high quality products.

Accommodation Building Structure:

The Accommodation building shall be constructed in RCC framed structure with brick masonry walls. The walls shall be of minimum thickness 230 mm with cement plaster works on inside and outside.

Roofs shall be constructed of RCC slab. The whole structure shall comply with local regulations regarding earthquake resistance and shall in any case incorporate a continuous system of reinforced concrete columns and beams. External wall surfaces shall be finished with two coats of weather resistant paint. Internal wall surfaces shall be finished with two coats of plastic emulsion. The building shall be of two stories. Room requirements for Accommodation shall be with plinth area of approximately 200 sq m total in two stories with the provisions of three (3) rooms plus kitchen, dining and toilet bathroom in each floor.

1. General description

The total area of the proposed building is 205.228 Sq.m (i.e. 2209 sq. ft.) however, the final design will not exceed 200 sq.m. The office building will be of two floors including ground floor.

2. Building description

The proposed building is designed following the RCC frame structure for the structural member of the building. For the curtaining of the building the material that will be used are brick, cement and sand. The sill band and lintel band will be used at the opening of the curtain members of the building, whereas for the solid walls multiple RCC bands will be provided for the as per the design requirement.

For the opening of the building aluminum windows will be used and for the doors the frame will be of timber and the shutter will be of pre-fabricated plywood door boards.

3. Finishing of the building

As this is the public office building, this will have many required components. But the must essential components will be the furniture's, false ceiling, paints, and light fixtures. The floor

finish that can be used will be carpets, parquets, tiles, PVC flooring tiles, marble, granite, etc. The toilet built will be of high standards. The tile will be laid from floor to the ceiling height in every toilet. The staircase and the lobby finish will have granite finish. The emulsion paints will be used for the exterior and interior of the building.

The building shall include all works of sanitary fixtures and electrical wiring and lighting fixtures and four nos. of HVAC of appropriate capacity installed.

The selection of the different materials, units and the brands and the design will be made by the Engineer based on the high quality products.

Ancillary Works:

The buildings shall be constructed on concrete foundations with concrete floor slab. Concrete floor slabs shall have continuous damp-proof course material below the slab. The foundation area shall be built up as necessary to ensure that the level of the underside of the floor slab is at least 300 mm above surrounding ground level and at least 300 mm over the highest recorded flood level.

Internal headroom shall be 3.4 m throughout. The building shall be surrounded with a covered concrete verandah or walkway on all sides having a covered width not less than 1 m and set at a level 100 mm below the interior floor level.

Rooms shall open off a central or main corridor having a width of at least 1.30 m throughout and opening onto front and back doors. All rooms shall have secure lockable doors onto the main corridor and shall have windows opening to the outside secured with burglar proof grills.

Floors shall be covered with linoleum / PVC tiles throughout. All wood work shall be sanded smooth and finished with one coat primer, two coats of oil based undercoat and one coat of oil based top coat. Door and windows shall be of approved hardwood or else as approved by the Engineer and the Employer.

Other Requirements:

All structural and layout drawings shall be approved by the Engineer before construction commences. All paints and floor finishes shall be approved by the Engineer before painting or flooring work commences.

Covered parking space shall be provided for the Employer's vehicles and this covered area shall be connected to the office building by a covered concrete walkway having a minimum covered width of 1.5 m.

The whole compound shall be fenced and gated with chain link fence at least 1.5 m in height.

Each room shall be provided with sufficient power outlet and light fittings. Additional table lamps shall be provided as required. External lighting shall be provided to give adequate illumination of the whole area surrounding the buildings and covered parking spaces.

Each toilet shall be fitted with a wash basin with running water. All toilets shall be of western type.

The construction and finishing of the office and accommodation buildings including fittings, furnishings and equipment shall be completed within 16 weeks from the date of the Engineer's Notice to Commence the Works.

Typical drawings of the office and accommodation buildings shall be provided to the Contractor. The Contractor shall require preparing and submitting the working drawings for the Engineer's approval before starting the construction works.

Office and Accommodation buildings along with the facilities in accordance with this Clause shall become the property of the Employer on the completion of the Contract.

F. Provision of Temporary Office and Accommodation Facilities

The Contractor shall provide temporary office and accommodation facilities along with the furniture/furnishing, equipment, consumables, operation and maintenance etc for the period from the date of the Notice to Commence the Works until the completion of the permanent office and accommodation facilities.

If the Contractor fails to provide the temporary and permanent office and accommodation facilities within the stipulated time the Employer will arrange suitable office and accommodation for his use and the full costs of doing so will be deducted by the Employer from any monies due to the Contractor.

No separate payment shall be made for the provision of the temporary office and accommodation facilities. The Contractor shall include his cost for the provision of temporary office and accommodation facilities within the price quoted for the permanent office and accommodation facilities in the respective items of the Bill of Quantities.

G. Furnishings and Equipment

The fittings, furnishings and equipment to be provided in office and accommodation are described in the Appendices - 2 and Appendix - 3 respectively, and shall become the property of the Employer on completion of the Works.

H. Maintain and Run Office and Accommodation and Provision of Supplies

The Contractor shall maintain the buildings and the contents thereof supplied under the Contract in good working order. The Contractor shall be responsible for supplying all power, water and telephone services to the office and accommodation, and shall meet all costs for these services, except for the cost of any overseas calls. A standby generator of specified capacity is required at both office and accommodation to provide a continuous supply of power during the period of load shedding and power failure.

The Maintenance of the Employer's office and accommodation shall include daily cleaning to the satisfaction of the Employer and including the manpower and materials required for. The Contractor shall maintain all grounds and gardens that surround the building to the satisfaction of the Employer.

The Contractor shall maintain in good condition, provide services regularly and repair or replace all items of furniture, fittings and equipment supplied and installed in the buildings as required.

The Contractor shall provide adequate security to guard and secure the buildings on a 24 hours per day basis.

The Contractor shall provide stationery for the Employer as required and duly requisitioned by personnel authorized by the Employer. Stationery shall include all consumable office items and shall include paper, writing materials, printing materials (e.g. printer cartridges, printer ribbons, copier toner etc.) and all general office requisites. Likewise the Contractor shall supply all other consumables for office and accommodation as required and provisioned in the Contract.

A wireless internet facility shall be provided at both office and accommodation in order to facilitate the transmission of project data and information.

I. Measurement

Construction of office building (Pre-Fab Structure, Single Story) and accommodation

building (RCC Structure, two stories) including electrical, plumbing and sanitary works all complete as per the Drawings and the Specifications and to the satisfaction of the Employer shall be measured as a Lump Sum item as provisioned in the respective items in the Bill of Quantities.

Maintaining and operating the Employer's office and accommodation at site including supply of consumables etc., all complete as per the Specifications and to the satisfaction of the Employer shall be measured on a monthly basis as provisioned in the in the respective items of the Bill of Quantities.

Provision of furniture, furnishings and equipment, etc for the office and accommodation of the Employer as detailed in these Specifications and to the satisfaction of the Employer shall be measured on a Lump Sum basis as provisioned in the respective items of the Bill of Quantities.

The measurement of all the items described above shall commence from the date of the Employer's occupation of the permanent office and accommodation facilities. No separate measurement shall be made for temporary provisions.

J. Payment

Payment of the construction of office building (Pre-Fab Structure, Single Story) and accommodation building (RCC Structure, two stories) including electrical, plumbing and sanitary works all complete shall be made against the respective items of the Bill of Quantities upon the completion of the Works to the satisfaction of the Engineer and the Employer.

Payment for maintaining and operating the Employer's office and accommodation at site including supply of consumables etc., all complete shall be made against the respective items of the Bill of Quantities.

Payment for the provision of furniture, furnishings and equipment, etc for the office and accommodation of the Employer shall be made against the respective items of the Bill of Quantities upon the supply and installation of these facilities to the satisfaction of the Engineer and the Employer.

The payment shall represent full and final payment for the contract items and the Contractor shall not be entitled to any further compensation. The Contractor shall provide such facilities during the extended time period as long as the Employer may require.

In the event the Contractor fails to maintain, repair or replace any defective or inadequate office, or equipment item, the Employer shall effect such maintenance, repairs or replacement and shall deduct the cost from any monies due to the Contractor.

The rate quoted by the Contractor for the lump sum pay items shall deem to cover the full contract period including any Extensions of Time (EOT). No additional payment shall be made for the period of any Extension of Time (EoT) for such items.

101.02 Vehicles for the Employer

A. General Requirements

The Contractor shall provide new plain-coloured motor vehicle as described in the Appendix-4 for the exclusive use of the Employer, for any purpose in connection with the Works. The Contractor shall obtain approval from the Employer before supplying the vehicle. The vehicle shall be licensed and insured for use on the public highway with comprehensive insurance cover for any qualified driver, together with any authorised passengers and the carriage of goods or samples.

The Contractor shall provide a competent and qualified driver holding a valid driver's

license having an experience of minimum 5 years as a driver of similar vehicle types. The Contractor shall provide fuel, oil and maintenance in conformity with the vehicle manufacture's recommendations.

The Contractor shall provide a suitable replacement for any vehicle that is out of service for more than 24 hours. Vehicles shall be provided and maintained in accordance with the above for as long as they are required by the Employer. Vehicles shall be reverted to the Contractor when no longer required by the Employer.

B. Measurement

Provisions of the vehicles for the Employer shall be measured as the number of months the vehicles are provided and maintained. Measurement shall be made during the total period the vehicle is in use by the Employer. Vehicle not provided for the full 24 hour day will be measured for payment on pro- rata basis of the actual hours available out of the 24 hour day.

C. Payment

Payment for vehicles shall be made at the unit price per vehicle month for each vehicle as contained in the Bill of Quantities. Payment shall include the supply of the vehicle and driver, fuel, oil, insurance, license, maintenance, spares, repairs and all other running and maintenance costs.

101.03 Provision of Site Laboratory

A. General Requirements

The Contractor shall provide, operate and maintain an adequately equipped site Laboratory complete with all utilities, services apparatus and fittings as set out in Appendix - 6 and Appendix - 7 to undertake the required testing to ensure the quality of the materials and the works. The Contractor shall also supply and provide, at the laboratory the standards listed and set out in Appendix - 1. The laboratory space including lab office and lab arrangement shall be with plinth area of approximately 120 sq m with two (2) rooms plus one additional large hall, outside covered veranda and toilet bathroom.

The Site Laboratory shall be located within 500 m of the site and the lab building may be located at the rented building or newly constructed on rented land. The laboratory shall be available up to the end of the project.

The complete laboratory facilities shall include the provision of land, site grading, access roads, covered parking facilities for vehicles, construction of building and all necessary appurtenance such as electricity, drainage systems, fences and utilities etc.

The contractor shall supply furniture, fittings, equipment, vehicle, manpower and materials to provide fully functional site laboratory.

The site laboratory shall be ready to use within 10 weeks from the date of the Engineer's notice to commence the Works. Alternative arrangement for testing shall be made by the date of commencement of works.

The Contractor shall be fully responsible for the equipment including:-

- Maintaining, calibrating and servicing equipment as required.
- Repairing all defects including accidental damage as required.
- Replacing any lost or stolen items.
- Effecting insurance of the equipment against damage or loss.
- The tests which cannot be performed at site shall be carried out off the site at renowned laboratory acceptable to the Engineer.

The site lab shall be made available for testing as long as it is required including any period after the Completion of construction during which it is required for final measurement purposes.

At the completion of the project, the furniture and equipment shall be the property of the Contractor.

B. Measurement

Providing laboratory space, maintaining and operating the material testing laboratory at site, etc., all complete, shall be measured on monthly basis as provided in the Bill of Quantities. It includes establishing the site laboratory which includes construction/renting of lab building, required consumables, maintenance and operation of the site laboratory and supply of laboratory personnel and staff at laboratory for day to day works and testing etc.

Providing furniture and equipment etc., all complete for the material testing laboratory at site shall be measured on Lump Sum basis as provided in the Bill of Quantities. It includes supply and fixing of a complete set of equipment, furniture and other requisite items, etc, detailed in the Appendices.

C. Payment

Payment for providing laboratory space, maintaining and operating the material testing laboratory at site, etc. all complete shall be made against the respective item of the Bill of Quantities.

Payment for providing furniture and equipment etc., all complete for the material testing laboratory at site shall be made in the respective Lump Sum item as provisioned in the Bill of Quantities. The Lump sum payment shall be made in two installments. First installment of 70% of item rate shall be made upon the completion of supply and installation of the equipment and furniture to the satisfaction of the Engineer. The remaining second 30% of the item rate shall be made upon the completion of 75% of the Works.

Payment shall represent full and final payment for the Contract Items and the Contractor shall not be entitled to any further compensation. The Contractor shall provide such facilities during the extended time period as long as the Employer may require.

In the event the Contractor fails to maintain, repair or replace any equipment item, the Employer shall carryout such maintenance, repairs or replacement and the Employer shall deduct the cost from any monies due to the Contractor.

The rate quoted by the Contractor for the lump sum pay items shall deem to cover the full contract period including any Extensions of Time (EOT). No additional payment shall be made for the period of any Extension of Time (EoT) for such items.

101.04 Survey Equipment

A. General Requirements

The Contractor shall be equipped with the minimum survey equipment as detailed in Appendix - 5.

These equipment shall be in the possession of the Contractor at Site within 10 weeks from the date of Engineer's notice to commence the Works. The Contractor shall at all-times be responsible for:

- Maintaining, calibrating and servicing equipment as required.
- Repairing all defects including accidental damage as required.

- Replacing any lost or stolen items.
- Effecting insurance of the equipment against damage or loss.

The Contractor shall maintain the survey equipment at site for as long as it is required including any period after the Completion of Works during which it is required for final measurement purposes.

The Contractor shall ensure that the Engineer and his staff have full access to this equipment at all times during the course of the execution of works.

B. Measurement and Payment

No separate measurement and payment shall be made for the provision of survey equipment and the costs associated with the provision of the survey equipment shall be considered to be included in the rates for other items of the works.

102 Accommodation of Traffic

Delete Clause 102 in its entirety and substitute with the following:

Change heading of Clause 102 Accommodation of Traffic to Clause 102 Traffic Management Provisions as follows:

102 Traffic Management Provisions

(1) Scope

This Clause covers the requirements to be met by the Contractor in relation to traffic management provisions at construction sites which include management of regular traffic on existing road or proposed temporary works (diversions), management of construction traffic and traffic control and guidance schemes in order to ensure safe and reasonably efficient operation of vehicular and pedestrian traffic along the subject road corridors.

The passage over or through the Works shall be used by the public or the agents of the Employer or by public traffic or by vehicles of the Employer, whether connected with the Contract or not and that shall not constitute use or occupation by the Employer. So the Contractor shall make proper traffic management provisions at construction sites to open the traffic during construction and provide the alternate route for traffic in case of closure of a particular section.

(2) Preparation of Traffic Management Plan

The Contractor shall prepare Traffic Management Plan (TMP) based on the guidelines provided by the Engineer and submit it to the Engineer for approval prior to the commencement of construction. The Plan shall show the means and methods of operation and control of existing as well as its construction traffic during the construction works. The means and methods of managing traffic shall be suitable and adequate for ensuring safety of all road users as well as Contractor's own workers and to the satisfaction of the Engineer. The Traffic Management Plan shall include but not be limited to the following.

- i. Traffic control equipment the Contractor proposes to use for the Works;
- ii. Traffic control signage including location and sign descriptions;
- iii. How and when the Contractor proposes to use traffic control flagmen;
- iv. Traffic control means during non-working periods; and
- v. Traffic control means and devices for night and off-peak periods.
- vi. Lane closure plan, where the Contractor intends to close the road partially;
- vii. Traffic diversion plan, where the Contractor proposes to close the road fully.

The general traffic management requirements will be as given below.

(3) General Traffic Management Requirements

The following conditions shall apply in regard to traffic management:

- a) The Contractor shall keep existing roads open to traffic during the performance of the Works, provided that when approved by the Engineer the Contractor may bypass traffic over a detour. The Contractor shall at all times keep roads and footpaths, affected by his operations, free from soil and material spillage.
- b) The Contractor shall keep the length of the construction areas in such condition that traffic will be accommodated safely. Traffic control devices and services shall be provided and maintained both inside and outside the Project limits as needed to facilitate traffic guidance should this be necessary.
- c) Prior to the start of construction operations, the Contractor shall erect such signs, barricades, and other traffic control devices as may be required by the plans, specifications or as directed by the Engineer. Traffic control devices shall be operated only when they are needed and only those devices that apply to conditions actually in existence shall be operable. The Contractor shall obtain prior approval from the competent authority (Traffic Police) of the plans and specification of the proposed traffic management works before the commencement of work.
- d) Temporary fences shall be placed to provide a visual barrier between the work area and adjacent traffic or buildings and at locations directed by the Engineer.
- e) Any devices provided under this Clause that are lost, stolen, destroyed, or deemed unacceptable while their use is required on the Project shall be replaced by the Contractor without additional compensation.
- f) During non-working hours and following completion of a particular construction operation, all warning signs, except those necessary for the safety of the public, shall be removed or entirely covered with either metal or plywood sheeting so that the sign panel will not be visible.
- g) The contractor shall keep retro-reflective sheeting on signs, barricades, and other devices. The Contractor shall also promptly correct stretches, rips, and tears in the sheeting. Retro- reflective sheeting shall have a maintained retro-reflection.
- h) Night time operations, if any approved by the Engineer, shall be illuminated by a lighting system approved by the Engineer. The lighting system shall be positioned and operated to preclude glare. Incandescent lights will not be permitted.
- i) The Contractor shall take necessary care at all times during the execution of the works to ensure the existing convenience and safety of residents along and adjacent to the road, and any public highway or other facility that may be affected by the Works. Street lighting shall be relocated as necessary to maintain the same standard of lighting during the course of the works until new lighting facilities are brought into operation.
- j) The Contractor shall thoroughly acquaint himself with existing traffic conditions and understand the importance of maintaining traffic safety and the avoidance of excessive traffic delay. The Contractor shall co-operate with the pertinent agencies regarding traffic control and all details will be subject to the Engineer's approval.
- k) The Contractor shall be responsible for investigating and establishing the requirements for traffic control and safety in all work areas and shall submit all details to the Engineer.
- l) The Contractor's requirements shall include, but not be limited to, construction of detours, diversion roads, temporary bridges and approach roads, of traffic control devices and services for the control and protection of traffic through areas of construction.
- m) Any failure of the Contractor to meet these requirements will entitle the Employer to carry out such works as he deems to be necessary and to charge the Contractor with the full cost thereof plus ten percent of such cost, which sum will be deducted from any money due or which may become due to the Contractor under the Contract.
- n) Road Damage: Contractor will be responsible for all road damage that may occur from the transporting of his materials and equipment to and from the Works and will be responsible for coordinating with all concerned agencies for implementing all necessary repairs and/or restorations. The Contractor shall be required to repair to the satisfaction of the Engineer and at no cost to the Employer any damage that he

causes to the road.

- o) When construction under traffic is permitted, the Contractor shall arrange its construction program so that traffic flow is maintained through the Works in accordance with the requirements as laid out by Traffic Police or as approved by the Engineer.
- p) Vehicular access points to and from the site shall be in accordance with the requirements of the best practice design standards, guides and manuals approved by the Engineer. Acceleration and deceleration lanes and tapers shall comply with the traffic volume, speed and sight distance warrants specified in the standards and guides or as approved by the Engineer. Cross section widths for acceleration and deceleration lanes shall be a minimum of 3.2 m. The contractor shall provide traffic controllers at all entry and exit points.

(4) Temporary Road Works Requirements for Traffic Management

The following conditions shall apply in regard to temporary works:

- a) The Contractor shall furnish, maintain, and remove on completion of the work for which they are required, all temporary roads and road works such as sleeper tracks and staging over roads, access and service roads, temporary crossings of bridges over streams or unstable ground, and shall make them suitable in every respect for carrying materials for the work, for providing access for traffic for himself or others, or for any other purpose. Such temporary road works shall be constructed to the satisfaction of the Engineer, but the Contractor shall nevertheless be responsible for any damage done to or caused by such temporary road works.
- b) Before constructing temporary road works, the Contractor shall make all necessary arrangements, including payment if required, with the public authorities or landowners concerned, for the use of the land and shall obtain the approval of the Engineer. Such approval will be dependent on the Engineer being satisfied with the Contractor's proposals for items such as signing, lighting and riding quality of the temporary road together with the proposed maintenance arrangements. Such approval will not, however, relieve the Contractor of his responsibilities under the Contract. Upon completion of the works the Contractor shall clean up and restore the land to the satisfaction of the Engineer.
- c) The Contractor, when required by the Engineer, shall submit for the Engineer's approval drawings giving full details of temporary roads. Such details shall include alignment, profile, pavement construction, signing, lighting and the duration of the temporary road.
- d) The Contractor shall make all arrangements necessary to permit the passage of materials and employees.
- e) In cases where it is necessary or required by the Engineer, the Contractor shall construct and maintain temporary traffic ramps, and furnish all labour and materials required.

(5) Scope of Traffic Management Plan

The Traffic Management Plan submitted by the contractor shall

- a) Provide details of the consultative process proposed to ensure consultation with and notification to the community, business, road users and other stakeholders in advance of alterations to existing traffic conditions. The Contractor's proposed inputs into the communication process shall ensure the timely notification of the Traffic Police, relevant departments, travelling public, emergency services, adjacent landowners and businesses of impending changes to traffic conditions. This process shall take cognizance of any Department's requirements with respect to public notifications
- b) Describe traffic arrangements which provide for any necessary sequencing of the work under the Contract while minimising disruption and confusion to road users, local traffic, emergency vehicles, pedestrians and cyclists;
- c) Where required, describe how the construction work area shall be physically and visually isolated from road users;
- d) Provide details of how local access to communities and adjacent private properties and businesses will be maintained;
- e) Provide details of arrangements to be made for detouring traffic;

- f) Provide details of all road closures and/or restrictions required to undertake the work under the Contract;
- g) Detail provisions to maintain the specified number of traffic lanes in each direction at the minimum nominated operating speed between the hours stated elsewhere in the contract or as approved by the Engineer.
- h) Provide for participation of a senior member of the Contractor's site personnel on any traffic coordination committee convened by the Department or its designated representative;
- i) Include the names and contact details of the representatives nominated by the Contractor and notified to the Engineer. The Contractor shall nominate a minimum of two representatives with the authority to address traffic management issues one of whom shall be available at all times outside of the Contractor's normal working hours. The Contractor shall notify the Engineer and Department or its designated representative of the name, address and telephone number of the nominated persons. Such persons, when requested by the Engineer shall coordinate and expedite immediate repairs to and maintenance of such part of the work under the Contract as may be considered necessary by the Engineer and shall carry out such work to the satisfaction of the Engineer.
- j) If a nominated person leaves the employment of the Contractor during the period of the Contract, the Contractor shall immediately nominate another person and provide the full details of that person.
- k) Include the name of the Nominated Traffic Officer;
- l) Include a schedule of Traffic Guidance Schemes giving a general description of the relevant traffic arrangements and the date when the Traffic Guidance Scheme will be submitted.
- m) Provide details of the Contractor's organisational structure for traffic management issues including a list of the duties and responsibilities of each position nominated in that structure.

(6) Traffic Control

The following conditions shall apply in regard to traffic control:

- a) In order to facilitate traffic through or around the Works, or wherever ordered by the Engineer, the Contractor shall erect and maintain at prescribed points on the work and at the approaches to the work, traffic signs, lights, flares, barricades, rubber cones with traffic lamps and other facilities as necessary or required by the Engineer for the proper direction and control of traffic.
- b) As necessary for proper control of traffic or when/where directed by the Engineer, the Contractor shall furnish and station competent flagmen whose sole duties shall consist of directing the movement of traffic through or around the work.
- c) The Contractor shall furnish and erect, within or in the vicinity of the project area, such warning and guide signs as may be necessary or ordered by the Engineer.
- d) In order to minimize disruption to traffic flows the Contractor shall enclose the Site with temporary fence to provide a visual barrier between his work and adjacent traffic. The temporary fence shall be two meters high and the movement of men, materials and plant into and out of the barrier area shall be controlled by flagmen (traffic controller).

(7) Number of Lanes for Traffic Control

In so far as possible, the existing number of traffic lanes shall be maintained insofar as possible during the work and if diversions are provided these must be of the same traffic capacity as the original road. Notwithstanding the above, the Engineer may give approval to reductions in traffic capacity if the Contractor can show that these will not cause excessive delay to traffic. If such approval is given, the Engineer may specify the hours during the day when the reduction in capacity may be applied and it should be anticipated that these hours may not include the peak period for the traffic movement under consideration.

The Contractor shall cooperate with the pertinent agencies regarding traffic control and all details will be subject to the Engineer's approval.

(8) Half-Width Construction

The following conditions shall apply to half-width construction:

- a) Where, in the opinion of the Engineer, a detour is not feasible, construction on existing public roads shall be undertaken only over half of the full width of the roadway. The length of such half-width construction shall be kept as short as possible.
- b) Where half-width construction is necessary, work on culverts commenced in the dry season must be completed and the embankments adjacent to them must be reinstated so that at least half the full width shall be available for use by the public throughout the next rainy season.
- c) Where single-lane traffic becomes necessary over a particular length of the works or over the approaches thereto, the Contractor, in maintaining through traffic, shall provide a single lane at least three and a half meters wide on the roadway or embankment to be kept open to traffic.

The Contractor shall so conduct his operations as to offer the least possible obstruction, inconvenience, and delay to traffic and shall be responsible for the adequate control of the traffic using such lengths of single lane.

(9) Extraordinary Traffic

The Contractor shall be responsible for carrying out any necessary investigations and the obtaining of approvals, licenses, escorts and any other necessary facilities in order to enable his extraordinary traffic to be moved on the roads in the Project Area.

(10) Vertical Clearance

In general any temporary works placed over roads or diversions used by public traffic should maintain a vertical clearance of at least 4.5 meters. Where required by the Engineer the Contractor shall erect and maintain suitable approved check-gates, fitted with warning signs indicating the vertical clearance.

(11) Materials for Traffic Control Devices

Materials for traffic control devices shall conform to the requirements set forth below:

- a) Unless otherwise specified in the contract, sign panels, barricades, cones, vertical panels, and flagger paddles shall have retro-reflective sheeting meeting requirements for retro-reflective material as specified by the Engineer.
- b) Sign Panels shall be orange with black legend unless otherwise required.
- c) Sign Posts shall be fabricated from untreated softwood, metal, or other materials acceptable to the Engineer. Signs shall be capable of remaining in position during normal traffic flow and wind conditions.
- d) Barricades shall be constructed of wood, metal or plastic.
- e) Cones shall be a minimum of 75 centimeters in height with a broadened base and shall be capable of withstanding impact without damage to the cones or vehicles. All cones shall be orange/white colored and highly visible both in daylight and darkness. Cones shall be capable of remaining bright and in position during normal traffic flow and adverse weather conditions in the area where they are used. Lamps for cones shall be suitable for purpose.
- f) Temporary fencing shall be fabricated in panels with timber framework and galvanized metal panels. The panel face towards the traffic shall be painted.
- g) Vertical panels shall be constructed of wood, metal or plastic
- h) Warning lights shall be Type A (low intensity flashing), Type B (high intensity flashing), or Type C (steady burn) as approved by the Engineer.

(12) Preparation of Traffic Guidance Scheme

The Traffic Guidance Scheme shall be prepared by suitably qualified and experienced persons and shall be submitted by the Nominated Traffic Officer to the Engineer for a direction as to its suitability, at least 21 days prior to the date of the proposed traffic rearrangement.

Where any change to existing traffic arrangements is proposed or where construction conflicts with normal traffic movements, the Contractor shall prepare a Traffic Guidance Scheme which clearly details the revised traffic arrangements at all locations affected by the change or conflict. Planning of Traffic Guidance Schemes shall be undertaken in accordance with best practice road works traffic management manual or guide as approved by the Engineer.

The Traffic Guidance Scheme shall show proposed temporary signing and other traffic control device layouts (including temporary barriers, temporary pavement marking and temporary islands) to a suitable scale and be fully dimensioned and shall generally agree with the construction sequence and other requirements shown elsewhere in the Contract. The Traffic Guidance Scheme shall also state the period for which these are to be in place (time and date) and the person who is responsible for installing, maintaining and removing them. Site access arrangements shall form part of the Traffic Guidance Scheme.

Where the Traffic Guidance Scheme includes changes to regulatory signs or devices, the Contractor shall seek prior approval from the Engineer of such regulatory signs certified by the Nominated Traffic Officer with the Traffic Guidance Scheme.

The Contractor and the Engineer shall cooperate to ensure that the Traffic Guidance Scheme receives the Department's direction with respect to suitability at least 14 days prior to the proposed traffic rearrangement. Failure to comply with this requirement may result in deferring the date for traffic rearrangement so as to ensure sufficient time for public notification is maintained. Such deferment shall not be a cause for an extension of time under the Contract.

No traffic rearrangements shall be carried out until 14 days after the Engineer has advised the Contractor that the relevant Traffic Guidance Scheme has been deemed suitable by the Engineer. Engineer may direct the Contractor to consult with Area Traffic Police Officer and seek approval of the traffic guidance scheme from the officer.

(13) Implementation of Traffic Management Plan

The Contractor shall implement the Traffic Management Plan in accordance with the schedule included in the Plan. The Contractor shall provide details of the Traffic Management Plan or any changes to that Plan to any bodies nominated by the Engineer. The Contractor shall monitor the continued effectiveness of the Traffic Management Plan during the Contract and shall revise and update the Plan where necessary.

(14) Implementation of Traffic Guidance Scheme

The Contractor shall implement only those traffic management arrangements that have been deemed suitable by the Engineer. Should the Contractor wish to depart from such arrangements, an amended Traffic Guidance Scheme shall be submitted to the Engineer for determination of suitability prior to implementation of any new arrangements.

Prior to any change to existing traffic arrangements, the Contractor shall ensure that the traffic management arrangements conform to the Traffic Guidance Scheme.

In a daily basis, the Contractor shall ensure that all applicable traffic redirection and/or warning measures and safety requirements are implemented prior to proceeding with any relevant work under the Contract.

The Contractor shall monitor the effectiveness of the Traffic Guidance Scheme and revise

it in response to incidents and/or traffic disruptions. Details of a Traffic Guidance Scheme shall be provided on request to any other body nominated by the Engineer.

(15) Measurement and Payment

Compliance with Traffic Management Provisions (preparation and implementation of traffic management plan, traffic guidance schemes and traffic control scheme, traffic Marshals etc), including construction and maintenance of temporary road diversion works either in full new land length or using existing roads, irrespective of the length and extent of traffic control measures in such diversions; construction and maintenance of temporary bridge diversions; construction of access roads to bridge construction site; etc. shall be measured and paid on Lump Sum basis as provided in the Bill of Quantities. The contract lump sum rate shall be the full and final compensation for the activities to be carried out by the Contractor as per Clause 112.

The payment of this lump sum item shall be made in four (4) installments. The first installment of 25% of the item rate shall be paid after the completion of 25% of the Contract Works, the second installment of 25% of the item rate shall be paid after the completion of 50% of the Contract Works, the third installment of 25% of the item rate shall be paid after the completion of 75% of the Contract Works and the final installment of 25% of the item rate shall be paid after the completion of the Contract Works.

The rate quoted by the Contractor for this lump sum item shall deem to cover the full contract period including any Extensions of Time (EOT). No additional payment shall be made for the period of Extension of Time (EoT).

104 Survey and Setting Out

Add the following to Sub-clause (6)

"If at any time the Contractor believes that there exists a discrepancy between the location of the works as defined by the setting out and the apparent location of the works as shown in the plans he shall immediately inform the Engineer and request clarification."

Delete Sub-clause (7) and substitute the following:

"Some survey data of the project site is held by the Engineer and this survey data will be made available to the Contractor in digital format. But the existing profile and cross sections shall be checked against the survey data by the Contractor and, should any changes be found necessary in the Survey Traverse Points and Bench Marks, after the procedures required in Sub-clauses (1) & (2) above, the existing data set shall be amended accordingly. Should the Engineer consider that design modifications of the centreline and/or gradient are required or if the Contractor find that the existing survey data set is inadequate or inaccurate in any area of the Works, the Engineer shall issue detailed Instructions to the Contractor and the Contractor shall perform the necessary modifications in the field, as required, and modify the cross sections accordingly.

The final survey data set so obtained in combination with the final horizontal and vertical alignment of the road shall form the basis for the measurements and payments. Measurement shall be based on a Digital Terrain Model generated from the agreed survey data set with the final designed road horizontal and vertical alignment and road cross-section, including any widening and super-elevation, applied. The model will be used to generate cross-sections complete with cut and fill data at intervals not exceeding 10 metres in hill areas and 20 metres in Terai areas and other alignment change points as instructed by the Engineer. Measurement of volumes and areas of earthworks and pavement related items, with the Engineer's approval, shall be derived from these cross-sections.

The software currently used for the preparation of survey and design data is SW-Roads developed by Softwel (P) Ltd. of Kathmandu Nepal. Should the Contractor wish to use alternative software he may propose this to the Engineer. He will be required to

demonstrate that his proposed alternative is at least as accurate as and is functionally equivalent in all respects to SW-Roads. Should the Engineer agree to the use of alternative software, the Contractor shall be entirely responsible for the adaptation, under the supervision of the Engineer, of all input data to the alternative software requirements and for the training of the Engineer's personnel in the use of the alternative software. In the event that alternative software is approved the Contractor shall supply the Engineer with two, fully licensed, copies of the alternative for the exclusive use of the Engineer."

If required a complete set of Software shall be provided by the Contractor at his own cost for the use of the Engineer in carrying out the checking and approval of the cross sections and quantities.

Delete paragraph (c) of Sub-clause (9) in its entirety.

Add the following at the end of the Clause 104

"The joint survey, including the preparation of the drawings, calculation of the quantities and obtaining the approval from the Engineer shall be carried out by the Contractor within sixty (60) days from the commencement Date."

106 Diversion Bridges

Delete Clause 106 in its entirety and substitute with the following:

Change heading of Clause 106 Diversion Bridges to Clause 106 Construction and Maintenance of Temporary Diversion Bridges as follows:

106 Construction and Maintenance of Temporary Diversion Bridges

Temporary diversion bridges shall be provided by the Contractor at the location of the construction of minor bridges, where the existing bridges are dismantled and new bridges are required to be constructed as shown on the Drawings or instructed by the Engineer. The Contractor is required to prepare Design, Drawing and Specifications of the temporary diversion bridges. He shall submit his proposal accompanied with sufficient ground and hydraulic information to enable the Engineer to decide on the stability of the structures. The temporary diversion bridge shall be double lane crossing with the all provisions of safety arrangements facilitating free flow of two way traffic during day and night throughout the period till the new constructed bridge is opened for the use. The diversion bridge may consist of series of pipe culvert, Belly Bridge, slab culvert etc. as per the site conditions and acceptable to the Engineer.

The Contractor shall maintain the temporary bridges in a condition satisfactory to the Engineer so long as required until the completion of the construction of bridges at the river location.

On completion of the construction of bridges, the Contractor shall obtain the approval of the Engineer before removing the temporary bridges. The materials arising from the removal of the temporary diversion bridges shall become the property of the Contractor.

No separate payment shall be made for the construction and maintenance of diversion bridges for the required period. The cost shall deem to be included in the item of compliance with traffic management provisions.

107 Maintenance of the Road

Delete the fourth paragraph of Sub-clause Clause 107 (1) and substitute:

The Contractor shall perform the maintenance works as often as required to keep the carriageway, shoulders, adjoining structures and roadside slopes stable all in proper working order to the satisfaction of the Engineer. The Contractor shall strictly adhere to the

stipulations of the latest publication of the document **"Road Maintenance Manual"** published by the Department of Roads.

In the Road stretches where works supervisors and length workers are being engaged by the Department of Roads for the routine maintenance of the Road, the Contractor shall have to engage them under the same terms and conditions regarding the wages and other facilities. However, if their performance of the works is not to the satisfaction, the Contractor will have the option to replace them.

(2) Measurement and Payment

Delete the wording of Sub-clause (2) in its entirety and substitute:

"Maintenance of the existing road during both the construction period and Defect Notification Period shall be paid at the contract unit rate per km-month commencing on the date for the commencement of the works and terminating at the end of the Defect Notification period including any extension of time granted pursuant to the relevant Clause of the Conditions of Contract.

In the event the Contractor fails to perform such maintenance, the Employer shall effect such maintenance works and cost incurred shall be deducted from any payment due under this Contract Item or from any other monies due to the Contractor.

108 Notice Board

Delete the first sentence and replace with the following:

The Contractor shall erect where directed by the Engineer signboards in accordance with Appendix - 8: Project Signboard which shall be protected and maintained up to the end of Defect Notification Period.

Add the following:

Project signboards shall be measured as the number of signboards, satisfactorily provided, installed, maintained throughout the Contract period and subsequently removed.

Payment shall be made at the stated unit rate per signboard. The price shall be full compensation for all materials and labour required to perform the work described.

109 Environmental Protection Works

Delete the second paragraph and substitute:

The Contractor shall take all precautions for safeguarding the environment during the course of construction of the works. He shall abide by all prevailing laws, rules and regulations governing pollution and environmental protection. In particular, the Contractor shall fully comply with the environmental protection mitigation measures specified in the latest version of the project's specific Initial Environmental Examination or Environmental Management Action Plan, as provided by the Engineer. If any activity of the Contractor may cause damage to the environment in ways not envisaged under project-specific documents, then he shall comply with the measures specified in the latest publication of **"Environmental Management Guidelines"** published by the Department of Roads.

Delete the third paragraph and substitute:

The Contractor shall prohibit employees from any use of explosives, poaching of wildlife and cutting of trees or branches. The Contractor shall be responsible for the action of his employees.

(1) Borrow/Quarry Sites

In the first set of bullet points, delete the words "they may be environmentally unsuitable" in point (iii) and substitute:

"they may lead to general environmental or instability problems or may be environmentally unsuitable in any other way"

At the end of Sub-clause (1) add the following:

"Twenty percent (20%) of all payments due to the Contractor in respect of the construction of embankment using borrow material or which are due under any other item of the Bills of Quantities in respect of material won from borrow pits, gravel pits or quarries shall be withheld until the sites of the borrow pits, gravel pits or quarries to which such payments relate have been completely reinstated to the full satisfaction of the Engineer and in accordance with the Specification provisions."

(2) Disposal of Spoil and Construction Waste

Insert additional paragraph to Sub-clause 109 (2) Disposal of Spoil and Construction Waste, between existing first and second paragraphs

Under no circumstances whatsoever shall the Contractor allow spoil from any excavation or cut to fall or be pushed down the slope below. In any situation where this occurs by accident or on purpose, the Contractor shall, at his own cost, remove the debris to a location approved by the Engineer and make good the affected area through appropriate structures and re-vegetation as specified by the Engineer and following guidelines published in the Department of Roads' manual "**Roadside Bio- Engineering**". Failure in compliance with the Engineer's instruction in respect of spoil disposal will lead to a reduction or with-holding of payment.

Add an additional paragraph after the existing second paragraph

Any construction waste that includes bitumen products, unused cement, fuel, oil or plastics shall be disposed of in a Government-approved or municipal landfill site. If this is not practical then it may be disposed of by burial in a specially excavated pit at a site approved by the Engineer. Land compensation shall be paid by the Contractor for the area occupied by the pit as if for permanent construction. If the land is owned by the Government, then the Contractor must obtain written permission from the appropriate authority for its use in this manner, and must pay any royalties due. The pit shall be located at least 100 metres from any seasonal or permanent water course or spring. A hole shall be excavated below ground level so that, when the original surface profile is regained through backfilling, the disposed waste is covered by at least two metres of soil. Following the closure of the waste disposal site, the Contractor shall provide any structures necessary to prevent erosion and shall re-vegetate the topsoil with appropriate plants.

(3) Provision and Maintenance of Camps, Offices, Stores, Equipment Yards and Workshops

Replace the first paragraph of the Sub-clause 109 (3) with the following:

The Contractor shall provide and maintain such accommodation and amenities as necessary for all his staff and labour, employed for the purposes of or in connection with the Contract, including all fencing, water supply(both for drinking and other purposes), electricity supply, sanitation, cookhouses and other requirements in connection with such accommodation or amenities. On completion of the Contract, unless otherwise agreed with the Employer, all the temporary camps/housing provided by the Contractor shall be removed and the site(s) reinstated to its (their) original condition, all to the approval of the Engineer.

All accommodation facilities of whatsoever nature provided by the Contractor shall be

provided with adequate sewage and wastewater collection and treatment facilities to a design and of a capacity approved by the Engineer. Under no circumstances shall untreated sewage or wastewater be discharged to the natural environment.

(6) Provision of Safety Clothing and Equipment

Insert new Sub-clause 109 (6)

The Contractor shall provide all labourers, supervisors and site staff with suitable basic safety clothing manufactured to an appropriate ISO standard. This shall include but not necessarily be limited to safety helmets and boots. Gloves shall be issued when any form of hazardous material such as cement and bitumen is being handled, and when there is a risk of hand injury, for example when using hammers and chisels. Eye goggles shall be issued when there is a risk of eye injury, such as when using hammers. Breathing masks shall be issued when there are dusty or smoky conditions.

Additional safety equipment is to be provided by the Contractor to all workers and supervising staff in certain sites. In sites with moving traffic or machinery, fluorescent or brightly coloured waistcoats shall be issued. Where workers are required to venture on to slopes steeper than 40 degrees, safety belt, safety clamps, harnesses and safety ropes shall be provided.

All workers and supervisory staff when on any site shall wear the basic safety clothing specified. Where additional safety equipment is required by nature of the site, then all workers and supervisory staff when on any part of that site shall use the additional equipment in addition to the basic safety clothing specified.

The Contractor shall provide a set of safety clothing to all members of the Consultant's supervising staff and keep adequate stock for personnel visiting the project.

In hot weather the Contractor shall provide appropriate lightweight safety equipment, such as cotton gloves in place of rubber gloves and canvas boots in place of rubber boots.

The Contractor shall be responsible for ensuring that all his employees and the employees of any Subcontractor and any visitor to the site comply with the Engineer's requirement to use safety clothing and equipment at all times. Failure in compliance with the Engineer's instruction in respect of safety clothing and equipment may lead to a suspension of works and a reduction or withholding of payment until the Contractor complies.

(7) Provision of First Aid/Medical Facilities

Renumber existing Sub-clause 109 (6) to 109 (7)

Add the following after last paragraph

The Contractor shall provide information to his workers on methods of avoiding sexually transmitted diseases and infection by HIV/AIDS.

(8) Crushing Plants

Renumber existing Sub-clause 109 (7) to 109 (8)

(9) Hot Mix Plants and Batching Plants

Renumber existing Sub-clause 109 (8) to 109 (9)

(10) Hazardous Materials

Delete entire existing Sub-clause 109 (9) Hazardous Materials (all three paragraphs) and substitute Sub-clause 109 (10) Hazardous Materials

Hazardous materials are defined as cement, lime, bitumen and emulsion, paint, fuels, oils,

acid of the battery, pesticides and herbicides. The Contractor may not store hazardous materials within 100 metres of seasonal or permanent water courses or springs. They must be housed in secure weather- proof buildings and protected against attacks by vermin and accidental contact by children. Contaminated runoff from storage areas shall be captured in ditches or ponds with an oil trap at the outlet. Water Quality monitoring shall be carried out as per EMP.

Any worker handling hazardous materials must be appropriately equipped as described in Sub-clause 109 (6) above.

Any hazardous material requiring disposal must be handled as described in Sub-clause 109 (2) above.

Explosives, detonators, blasting powder and fuses are also classed as hazardous materials. The Contractor may only bring explosives on to the site with the specific written permission of the Engineer. In this event, the Contractor is responsible for alerting the appropriate security forces and ensuring that all Government regulations are fully met concerning the transport, storage and use of explosives and associated equipment.

If the Engineer instructs the use of explosives, only controlled methods shall be used as described in Clause 904 Explosives and Blasting.

(11) Air Pollution

Insert new Clause 109 (11)

The Contractor shall avoid creating any high concentration of airborne dust or smoke within 100 metres of a house or other occupied building, or in situations likely to affect people, animals, crops or natural vegetation.

Dust from moving construction plant and road traffic shall be controlled by the regular spraying of water on to road surfaces in Terai and valley bottom sites. In the hill sites, dust control may also be carried out, in addition to regular spraying of water, by the use of speed bumps to restrict traffic speeds to 30 km/h in open ground and 15 km/h within 100 metres of any occupied building. The Contractor is responsible for all water spraying and the erection and maintenance of adequate speed bumps. The Engineer may instruct additional measures at his discretion.

Where earthwork excavations cause dust to blow into areas where it causes a nuisance, the Contractor is responsible for altering the schedule of works to minimise the nuisance. This may involve restricting the timing of work to certain hours of the day or completing works and restoring a dust-free surface as rapidly as possible. The Engineer may instruct additional measures at his discretion. Air quality monitoring shall be carried out as per EMP.

(12) Noise Pollution

Insert new Clause 109 (12)

The Contractor shall take every precaution to control excessive noise resulting in disruption to the local population and to wildlife. All static plant shall be located at least 100 metres from occupied buildings and at least 800 metres from sites deemed by the Engineer to have sensitive wildlife. The Engineer may require the construction of baffles or bunds around noisy plant in order to reduce the pollution caused.

The Contractor shall ensure that no employee plays loud music in any residential camp at any time. Noise level monitoring shall be carried out as per EMP.

(13) Special Provisions for Sensitive Ecology

Add new Clause 109 (13)

In addition to the provisions of other Clauses, the Engineer may require the Contractor to undertake special provisions to protect any plant or animal deemed to be environmentally sensitive or otherwise worthy of unusual protection.

(14) Reinstatement of Environment

Renumber existing Clause 109 (10) to 109(14)

Add between existing two paragraphs:

The Contractor shall reinstate the environment of areas polluted by the use or spillage of hazardous materials as defined in Sub-clause 109 (10). All such materials and polluted soil will be removed to a safe disposal site as described in Sub-clause 109 (2) Disposal of Spoil and Construction Waste. The site will then be restored and re-vegetated as described above. This provision applies in particular to all areas affected by bitumen.

(15) Measurement and Payment

Renumber existing Clause 109 (11) to 109 (15) Measurement and Payment

Delete the paragraph and substitute with the following:

No separate measurement and payment shall be made for the works described in this Clause except for (a) provision of safety clothing & equipment and first aid/medical facilities and (b) disposal of surplus cut material at environmentally safe tipping sites.

The payment for the provision of safety clothing and equipment and first aid/medical facilities shall be in the unit of month as quoted in BOQ upon providing and maintaining those facilities to the satisfaction of the Engineer. In the event that the Contractor fails to enforce these provisions then monthly payment will not be made for such period until the requirements are met. If the Contractor does not provide them in time as per the Specifications, the Employer may procure by quotation from other sources and deduct from the Contractor's payment as per the quoted price including logistics and transportation costs, if any, for supply at site.

The payment for the disposal of surplus cut material at tipping sites shall be in the unit of cu.m.- km for haulage beyond 1 km to the environmentally safe tipping sites approved by the Engineer and satisfying the provisions of 109 (2). The payment for disposal of spoil shall be made in two instalments. First instalment 70% of the unit rate quoted in the BOQ shall be made after disposal to the site approved by the Engineer. The second instalment of remaining 30% of the unit rate quoted in BOQ shall be made after making good the affected area through appropriate minor structures and re- vegetation as per 109 (2) and to the satisfaction of the Engineer.

The above mentioned payments shall be the full and the final compensation to the contractor as per Clause 112 to complete the works in accordance with these specifications. In the event of failure to implement the above the Engineer may withhold an appropriate sum (as estimated by him) from the Contractor's payment until such time as the work has been carried out to the satisfaction of the Engineer.

111 Supply of Video Cassettes

Add the following at the end of Sub-Clause 111(1)

The video films shall be taken at the locations as instructed by the Engineer and they shall be taken prior to the actual construction, during construction and after the completion of

the construction works. The films shall be to the full satisfaction of the Engineer.

112 Notes about Measurement and Payment

In Sub-clause (1) Measurement, delete the whole of the second paragraph and substitute:

The tolerances given in these Specifications are for the evaluation of the accuracy to which work shall be constructed and for determining whether work should be accepted or rejected. The measurement of work done shall be based on the actual measured quantity of acceptable work executed except that, where the actual quantity is greater than the quantity which would have resulted from adherence to the precise designed or instructed dimensions and/or levels then the payable quantity shall be limited to the quantity determined on the basis of calculation using the designed or instructed dimensions and/or levels.

113 National Standards

Add the following:

The Contractor shall provide and / or make available the Standards as shown in the Appendices as and when requested. There shall be no separate payment for the provision of such standards and payment shall be deemed to be included in the Contractor's rates for the provision of the Laboratory. In the event of the failure of the Contractor to provide documents for the required standards the Engineer may purchase the document and deduct the cost from the payment due to the Contractor for the provision of the Laboratory.

Add the following New Clauses after Clause 116 "Programme":

117 Contractor's Establishment on Site

Office, Equipment Yard, workshops, stores etc.

It is the Contractor's responsibility to acquire land for the siting of all his offices, accommodation, stores, testing facilities, equipment yards and workshops and for all temporary works and for the reinstatement of such land on completion of the Contract to the satisfaction of the owners and of the Engineer. The Contractor shall obtain the approval of the Engineer for the siting of offices, accommodation, stores, testing facilities, equipment yards and workshops before such land is acquired and he shall indemnify the Employer against all claims and charges in respect of the occupation, use and reinstatement of the land.

The Contractor is solely responsible for the satisfactory accommodation of all his employees and for complying with all regulations and requirements in this respect.

118 Legal Relations and Responsibility to the Public

The Contractor shall take the steps necessary to comply with the terms of the Conditions of Contract, particularly in respect of the insurances and indemnities required, and he shall comply with all regulations of statutory authorities.

119 Provision of Insurances and Securities

The Contractor shall provide all necessary Insurances, Guarantees and Securities as are required and detailed in the Conditions of Contract, Bill of Quantities or this Specification.

Measurement and payment for Insurances under the Contractor's All Risks (CAR) policy shall be made on Lump Sum basis as provided in the Bill of Quantities in the following sub-headings of the Bill of Quantities:

- (a) Insurance cover for Works, Plant and Materials and the Contractor's Equipment

(b) Insurance cover for third party property and persons.

The lump sum price for Insurance under the Contractor's All Risks (CAR) policy includes all expenditures expected in providing and maintaining from Date of Commencement until the end of the Defect Notification Period an insurance of Works, Plant and Materials, the Contractor's Equipment, third party properties and personal injury or death as prescribed in the Contract document, including expenditures resulting from administration work, dealing with and reporting of claims, stamps duties, taxes, etc.

The Contractor shall also require providing insurance of his personnel, employees and labours as prescribed in the Contract document. No separate payment shall be made for the insurance of his personnel, employees and labours and are deemed included in other items of the Bill of Quantities.

No separate payment shall be made for Bank Guarantees and Securities that are required as per the Contract. The costing of such Guarantees and Securities are deemed included in other items of the Bill of Quantities.

In case of any damages to the works for which payment has been made by the Employer, it is the Contractor's obligation to reconstruct the same and claim for the payment from the insurance companies. No payment for the reconstruction of the damaged works shall be made by the Employer.

Measurement of the lump sum payment for item of the Insurance for Contractors All Risk Policy (CAR) shall be made to the Contractor under the relevant items in the Bill of Quantities upon the submission of the acceptable Performance Bond and the insurance policies with the proof of payment of insurance premiums to the insurance company from the date of commencement to the end of Defect Notification Period and after approval by the Engineer.

The payment of the quoted lump sum amount for the provision of insurance shall be made after the Contractor submits and obtains approval from the Engineer of the required insurance policies for the period covering from the date of Commencement to the end of Defect Notification Period and the submission of the proof of the payment of premiums for that period.

The payment shall be made in two installments. First installment 70% of the unit rate quoted in the BOQ shall be made after the approval of the insurance policies by the Engineer. The second installment of remaining 30% of the unit rate quoted in BOQ shall be made at the Completion of the Contract.

The rate quoted by the Contractor for these lump sum items shall deem to cover the full contract period including any Extensions of Time (EOT) as well as Defect Notification Period. No additional payment shall be made for the period of any Extension of Time (EoT).

120 Extension of Time due to Abnormal Rainfall

Extension of time due to exceptionally adverse climatic conditions as referred to in the relevant Clause of the General Conditions of Contract shall be considered only in respect of the number of days lost during each month which are in excess of the number of working days on which delays might reasonably be expected having due regard to the time of year. The Contractor shall, therefore, make due allowance in his rates for the loss of the following number of working days for each month due to the effects of rainfall as detailed below:

Month	Number of Days	Remarks
January	4	
February	4	
March	4	
April	6	
May	12	
June	20	
July	25	
August	25	
September	15	
October	5	
November	4	
December	4	

The number of days considered for Extension of Time shall be based on the full number of "rain days" occurring during the month less the number of days required to be allowed for the month as detailed above. "Rain days" shall be defined as those days on which the rainfall during the full 24 hour day exceeds 10mm and on which the Contractor is prevented from working on site for the furtherance of the major Works due solely to conditions caused by inclement weather.

The total number of days for extension of time shall be calculated on a month by month basis. Carrying over of days "not used" from one month to the next is not permitted.

For the proper application of this Clause the Contractor shall establish rain gauging stations to a design and using automatic equipment approved by the Engineer. Such stations shall be spaced along the site at intervals not exceeding 10kilometres. In the event of failure to establish such approved rain gauging stations no "rain days" will be measured and no requests for Extension of Time on the basis of inclement weather will be considered.

121 Labour Standards

The Contractor shall abide by international standards in his treatment of workers. There shall be no discrimination between individuals on the basis of race, sex, caste or belief.

(1) Rates of Wages

The Contractor shall pay rates of wages not less favourable than those approved by the Government for the various classes of labour engaged in the same district. All payments shall be in cash unless employees request, in writing, payment by cheque or other negotiable financial instrument. Payment in kind or through trade goods of any sort is prohibited. Food rations, accommodation, or any other allowances will be over and above cash wages complying with the minimum levels described. Men and women shall receive equal rates of pay for the particular grade of work, trade or skill for which they are employed.

(2) Payment of Wages

The Contractor shall pay his employees promptly and regularly at intervals of no more than two weeks, and all employees shall be paid in full and up to date before the issue of the Engineer's Maintenance Certificate.

(3) Records

The Contractor shall keep proper records of the days, dates and hours worked by every employee engaged on the contract, their gender, the class of work in which employed, whether as a casual or permanent employee, and the wages (and allowances if any), paid. These records shall be made available at any time for inspection by the Engineer or the Engineer's representative or any authorised representative of the Government.

(4) Default of Payment of Wages

In the event of default in payment of wages to petty contractors, local labour groups or any worker employed on the contract, by the Contractor or his Subcontractor, and, if a claim with satisfactory proof thereof is received by the Engineer, then the Employer may make the payment upon recommendation by the Engineer of such a claim out of the monies at any time payable under the contract, and the amount so paid shall be deemed payments to the Contractor under the Contract.

122 Safety Provisions

(1) Scope

This Clause covers the requirements to be met by the Contractor in relation to the safety provisions at construction sites which include workplace health and safety of the workers, all road users (drivers, passengers, pedestrians) and members of the community along the road corridors.

(2) Emergency Response Plan

An emergency response plan to deal with accidents and emergencies, including environmental/public health emergencies associated with hazardous material spills and similar events, shall be prepared for the approval of the Engineer.

(3) First Aid Base

A fully equipped first aid base shall be climatically controlled to maintain the temperature of the inside of the building at 20 degrees Celsius. Arrangements for emergency medical services shall be made to the satisfaction of the Engineer.

(4) On-Site Safety Publicity

The Contractor shall ensure that safety, rescue and industrial health matters are given a high degree of publicity to all persons regularly or occasionally on the site. Posters, in Nepali and English, drawing attention to site safety, rescue and industrial health regulations shall be made or obtained from the appropriate sources and shall be displayed prominently in relevant areas of the site.

(5) Safety Training Program

A Safety Training Program is required and shall consist of:

- (a) Initial Safety Induction Courses: All workmen shall be required to attend a safety induction course within their first week onsite.
- (b) Periodic Safety Training Courses: Periodic safety course shall be conducted not less than once every six months. All Contractor employees will be required to participate in relevant training courses appropriate to the nature, scale and duration of the contract works. Training courses for all workmen on the Site and at all levels of supervision and management,
- (c) Safety Meetings: Regular Safety meetings will be conducted on a monthly basis and shall require attendance by the Engineer and safety representatives of Contractors unless otherwise agreed by the Engineer. The minutes of all safety meetings will be taken and sent to the Engineer within seven (7) days of the meeting.

- (d) **Safety Inspections:** The Contractor shall regularly inspect, test and maintain all safety equipment, scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs shall be kept clear of obstructions and legible to read. Equipment which is damaged, dirty, incorrectly positioned or not in working order, shall be repaired or replaced immediately.

(6) Safety Equipment and Clothing

Safety equipment, materials and protective clothing are required to be available on the site at all times and measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing, and all construction plant and equipment used on or around the site shall be fitted with appropriate safety devices. These shall include but not be limited to:

- Effective safety catches for crane hooks and other lifting devices;
- Functioning automatic warning devices and, where applicable, an up-to-date test certificate, for cranes and hoists;
- Functioning beeping devices in all trucks and other equipment while reversing as well as operating flashing lights attached to all equipment while in motion.

(7) Requirements for Contractors' Safety Plans

The Contractor will be supplied with copies of the Environmental Management Plan (EMP) prepared by the Engineer. Provisions shall be incorporated by the contractor into all sub-contracts to ensure the compliance with the EMP at all tiers of the sub-contracting. All subcontractors shall be required to appoint a safety representative who shall be available on the site throughout the operational period of the respective sub-contract unless the Engineer's approval to the contrary is given in writing. In the event of the Engineer's approval being given, the safety representative, without prejudice to his other duties and responsibilities, shall ensure, as far as is practically possible, that employees of subcontractors are conversant with appropriate parts of the EMP.

(8) Temporary Evacuations

In the event that temporary evacuations are required due to safety or other considerations appropriate compensation will be provided to all workers.

(9) Measurement and Payment

Unless specified in the contract, no separate payment shall be made for compliance with these Safety Provisions and the costs for compliance shall be deemed to be included in the rates of the relevant Bill of Quantity items.

123 Shop Drawings of Intersections

(1) Scope

This Section covers the requirements to be met by the Contractor in relation to the survey, design, detailed layout of civil works, traffic signs and road marking of the intersections along the contract road corridors. The scope also includes the preparation of construction works traffic management plans which include management of regular traffic on existing main and side roads and management of construction traffic and traffic control and guidance schemes in order to ensure safe and acceptable level of vehicular and pedestrian traffic operation around the subject intersection and adjoin sections of roads.

A set of typical layout plans of various types of intersections are included in the drawings. The scope of this Section is to customize these typical designs to each site and produce shop drawings (plans, profile, cross sections, details, layout of traffic signs, road markings) and submit it to the Engineer for approval prior to the construction of intersection related works commence.

(2) Land Survey

The contractor shall carry out detailed topographical survey of the intersection sites showing all manmade and physical features. The survey will cover enough area required to determine all necessary elements that may have effect in the design of intersections. The survey map will also show all overhead, at grade and underground utility services and both permanent and temporary roads/ walkways.

The survey plan shall be produced at 1:500 scale with contour interval of 0.5 m or as instructed by the Engineer. Where manmade drains exist, invert levels will be shown and drainage line shown clearly on the plan.

(3) Traffic Survey

Before the commencement of construction, Contractor shall undertake 12 hours (commencing 06:00 hrs and ending 18:00 hrs) turning movement traffic counts at all intersections identified in the plans in the manner prescribed by the Engineer. Traffic counts shall be done by pedestrians, cycles/rickshaws, motorcycles, three wheeler, cars (sedan, jeep, micro bus), buses (mini and conventional) and all kinds of trucks (mini tippers, conventional trucks) and reported for the period ending each 15min.

Turning movement diagrams shall be plotted by the contractor separately for the AM and PM peak hours. Where peak hours are not distinct, contractor shall seek advice from the Engineer and turning movement diagrams for hours ending specified period shall be presented together with the tabular data of turning movements. Engineer may supply to the contractor samples of the Traffic Count Table and Diagrams for guidance. Two sets of tables and diagrams (one with type of vehicles and other with Equivalent Passenger Car Units (for vehicles) shall be produced and submitted to the Engineer for reference, record and approval.

(4) Drawings

Using the type designs of the intersections (three way median open, three way median closed, four way median open, four way median closed at sections with and without service roads for four laning sections), the contractor shall prepare shop drawings of each intersection and submit to the Engineer for review and approval. Shop drawings of four way or three way intersections with Basic Right (BAR) Turn or Basic Left (BAL) Turn or both treatments to be constructed along two lane sections of road without service roads shall also be prepared by the contractor and submitted to the Engineer for review and approval.

Shop drawings shall be prepared using appropriate CAD software. Hand sketches shall not be accepted. Four colour copies shall be submitted to the Engineer for review and approval at least 21 days prior to the date the contractor wish to commence work at the intersection site. The contractor shall not be allowed to execute any works at intersections without getting approval from the Engineer.

Shop drawings shall include but are not limited to

- Layout Plans (1:500 or larger as directed) showing all lines and levels as required to enable lay out of the intersection at site accurately
- At least nine cross sections (for three way intersections) and twelve cross sections (for four way intersections);
- Traffic Signs and road marking layout plans (separate to the lay out plans showing civil works/ electrical works);
- Profile / Longitudinal section of each leg (for a length of 40 m for each leg of side roads and 200 m along each leg from the centre of intersections);
- Any other details requested by the Engineer; and
- Traffic Management Plan as per the provision of Section 102

A set of drawings together with the traffic count tables and turning movement diagrams shall be signed and sent back to the Contractor for use in the construction site within one

week of the receipt of the same from the contractor. All shop drawings shall be to the satisfaction of Engineer.

(5) Measurement and Payment

No separate measurement and payment for the activities required and the preparation of shop drawings at intersections shall be made. The cost for the required activities and preparation of shop drawings of intersections shall be deemed to be completely covered by the respective items of work relevant to the construction of intersections.

124 Diversion of River Flow at Major Bridge Construction Site

This Clause covers the diversion of river flow, pumping of water and construction of coffer dams and other activities including the machines and accessories necessary only at those sites where the major bridges are constructed. It shall also include the reinstatement of the original flow of the river after the completion of the bridge construction works.

The diversion of river flow at major bridge construction site shall be measured in number (nr) as a lump sum item for each construction site of major bridge. The quantity measured in number (nr) as a lump sum item shall cover all the activities required for the diversion of river flow, pumping of water and construction of coffer dams, reinstatement of the original flow of the river after the completion of the bridge construction works and other activities including the machines and accessories necessary only at those sites where the major bridges are constructed.

The diversion of river flow at major bridge construction site shall be paid at its respective contract unit rate which shall be full and the final compensation to the Contractor as per Clause 112 and for the cost of all activities involved for satisfactory completion of this item.

FOR REFERENCE ONLY

Section 200 – Site Clearance

201 Clearing and Grubbing

(3) Execution of Works

a) Cutting of Trees

Delete the last line of third paragraph and replace with the following:

Cutting of such trees shall be carried out by the contractor and the timber and woods stored at designated locations as instructed by the Engineer. The Contractor shall make all necessary measures to prevent theft/loss of the timber or woods as directed by the Engineer.

(5) Payment

At the end of this Sub-clause add the following:

No payment shall be made for clearing and grubbing carried out at the sites for quarries or borrows pits, Contractor's facilities, Employer's facilities or any other area other than those areas specifically directed to be cleared and grubbed by the Engineer for the execution of the permanent works.

At the end of Clause 201 add the following additional Sub-clause:

(6) Clearing of Landslides and Debris

When instructed by the Engineer, the Contractor shall remove all debris from landslides as soon as possible after receiving instruction. The first priority will be the removal of material to maintain safe vehicular access for the public and the second to remove material in order to continue construction of the Works. The Engineer shall determine the amount of material to be removed and/or any further work which may be required to stabilize the landslide.

Where a landslide has occurred in an area where the Contractor has commenced but not completed excavation works of any nature and such excavation works have, in the opinion of the Engineer, been the direct or indirect cause of the landslide, then the responsibility for clearing and stabilizing the landslide shall rest entirely with the Contractor. Elsewhere the volume of material directed to be removed shall be measured in cubic meter.

The Contractor shall remove all debris from causeways, culverts and side drains as per the instruction of Engineer.

Landslides and debris removed as per this Specification shall be measured in cubic meter. Debris clearance from causeways, culverts and side drains shall be measured for one time only at the starting of the Contract. Afterwards, debris clearance shall be covered by the Routine Maintenance.

Payment for clearing of landslides and debris shall be paid at their respective contract unit rates which shall be full and final compensation to the Contractor as per Clause 112. No payment shall be made for the clearing of landslides and debris of less than 20 cubic metres nor for the first 20 cubic metres in any one occurrence.

202 Dismantling Culverts, Bridges, Other Structures and Pavements

(1) Scope

At the end of this Sub-clause add:

The Engineer shall designate all materials arising from dismantling as:

- (a) Scrap to be disposed of by the Contractor, or
- (b) Salvageable material to be reused in the Works, or
- (c) Salvageable material to be retained by the Employer

(2) General Para (d)

In the third line after the Words "reconstructed work" delete the comma and insert the words "and which"

(6) Measurement

Delete "(i) Dismantling brick/stone masonry/concrete (plain and reinforced)" and substitute:

(i) Dismantling brick and stone masonry

Add

(x) Dismantling concrete (plain and reinforced) cu.m

Delete "(iv) Dismantling timber structures cu.m" and substitute:

(iv) Dismantling timber structures lump sum

Delete "(viii) Dismantling pipe culverts no." and substitute:

(viii) Dismantling pipe culverts m.

(6) Payment

At the end of this paragraph add the following words:

This payment shall include for all costs of disposing of scrap materials, for all costs of reusing salvageable materials designated for reuse in the works and for all costs of transporting and stacking salvageable materials to be retained by the Employer in locations directed by the Engineer.

All scrap materials shall be disposed of in an environmentally sound manner approved by the Engineer which shall ensure that the existing environment is maintained free of all forms of contamination, including visual contamination, arising from the disposal of such materials.

Add New Sub-clause (8) as follows:

(7) Use of Construction Material from Dismantling of Existing Structures

It is envisaged that some reusable construction materials might be obtained from the dismantling of the existing structures in the project road. The Contractor shall be permitted using those construction materials if they meet the standards provisioned in these Specifications. The Contractor is advised to assess the suitability and quote his price accordingly taking into consideration of using those re-usable materials from the dismantled structures.

Add New Clause 203 "Clearing and Grubbing at Major Bridge Construction Site" as follows:

203 Clearing and Grubbing at Major Bridge Construction Site

This Clause covers the clearing and grubbing necessary for the sites where the elements of major bridges are constructed and/or fabricated. This shall be as per the Clause 201.

The clearing and grubbing at major bridge construction site shall be measured in number (nr) as a lump sum item for each construction site of major bridge. The quantity measured in number (nr) as a lump sum item shall cover all the activities required in clearing and grubbing the construction and/or fabrication sites either in the river or outside river for all the required elements of the bridge, except for the cutting and related activities of the trees of girth above 300 mm. It shall also include the clearance and reinstatement of the site to the original condition after the completion of bridge construction works.

The clearing and grubbing at major bridge construction site shall be paid at its respective contract unit rate which shall be full and the final compensation to the Contractor as per Clause 112 and for the cost of all activities involved for satisfactory completion of this item.

Section 500 – Quality Control

502 Contractor Responsible for the Quality of the Works

Delete the final two sentences of the second paragraph and substitute with the following:

This laboratory shall be for the use of the Engineer and his staff as well as for that of the Contractor. The Engineer shall at all times have free access to the laboratory, the equipment and all records of testing carried out and shall have the use of the Contractor's laboratory staff as he may require for carrying out of additional testing for the purposes of control, verification and acceptance. The laboratory facilities to be provided and the list of equipment to be purchased shall be approved by the Engineer. In designing the facilities and compiling the list of equipment the Contractor shall have due regard to the details of facilities and list of equipment given in the Appendices to these Special provisions. The details given in the Appendices are indicative of minimum requirements. In equipping the laboratory the Contractor shall make assure in meeting the need of conducting all tests required by the Specifications in regard of the works or materials itemised or implied in the drawings and the Bills of Quantities. Notwithstanding the list of equipment, furniture and other requirements in the Appendices, the Contractor shall remain responsible for the supply of all equipment of whatsoever nature and in whatsoever quantity required for carrying out all types of tests in the frequencies specified in the Specifications.

505 Testing Procedure and Set of Tests

Delete the final words of the second paragraph commencing "as per the prevalent accepted" and substitute with:

"In accordance with National Specifications stipulated by the Engineer. If no National Specifications acceptable to the Engineer exist then tests shall be carried out in accordance with the directions of the Engineer."

507 Site Trials or Trials Sections

(3) Production of Materials and Crushing Plant

In the second line of the first paragraph of this Sub-clause; after the words "to be processed using...." Insert the following:

"the initial material collection procedures,"

510 Recapitulative Schedule of Tests

Add the following after the second paragraph of the Sub-clause ending with the words "main types of works".

"The testing frequencies set forth are desirable minimums and the Engineer shall have the full authority to carry out additional tests as frequently as he may deem necessary to satisfy himself that the material and works comply with these Specifications".

511 Laboratory

*Delete this Clause and refer to **Clause 101.03** above.*

Section 600 – Materials and Testing of Materials

603 Sources of Materials

Add the following at the end of the last paragraph of this Clause:

“These provisions regarding delivery and haulage shall not apply to any material salvaged from the site of the works and the Contractor shall be entirely responsible for all haulage and costs of haulage of such salvaged material.”

604 Inspection and Acceptance of Materials

Delete the second and third paragraphs of this Clause and substitute with the following:

“A preliminary inspection of the materials may be made at the source for the convenience and accommodation of the Contractor, but neither the presence of the Engineer nor the subsequent testing of work or materials by the Engineer shall relieve the Contractor of his responsibility for furnishing work and materials complying with these Specifications.

The representative of the Engineer shall have free entry at all times to those parts of any plant which concern production of any materials for incorporation into the Works and the Contractor shall ensure that any order for materials which he places includes the necessary provisions to ensure that such free entry is available.”

613 Stone, Aggregate, Sand and Fillers

Amend Table 6.5: Tests Procedures Applicable to Stone Aggregate and Fillers as follows:

Renumber iii) Flakiness Index to read iii) a. Flakiness Test

Add iii) b. Flat and Elongated Particles for AC ASTM D4791

Add

xxi) Fine Aggregate Angularity AASHTO T 304 Method A

xxii) Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregates (CAFF) ASTM D5823

618 Bituminous Binders

(1) Sampling and Samples

Change heading (1) Sampling and Samples to (1) Sampling, Samples and Bitumen Grade

(1) Sampling, Samples and Bitumen Grade

Add after the first line of the first paragraph to read:

Sampling of Viscosity Grade Bitumen VG 10, 20, 30 or 40 as applicable shall be in accordance to IS 1201.

Add at the end of second paragraph the following:

The bitumen grade for preparing cut backs for priming, tack coat and surface dressing works shall be with 80/100 penetration grade. Similarly, the bitumen for all Asphalt Concrete works shall be with 60/70 penetration grade or VG 30 or VG 40 as indicated in the Bill of Quantities or as instructed by the Engineer.

(2) Standard Methods of Testing

(a) Straight-run Bitumen

Add the following words after the end of the opening sentence:

“and any other tests required to confirm compliance with the requirements of Table 6.14.”

(3) Requirements

(a) Straight-run Bitumen

Delete Table 6.14 and replace with the Table and notes below:

Table 6.14: Specification for Straight run Bitumen

Grade			60-70	80-100	180-200
Mandatory Properties		Test Method			
1	Penetration at 25 deg C in mm/10 range	AASHTO T49	60-70	80-100	180-200
2a	Softening Point deg C range	AASHTO T53	49-53.5	46-52.5	38-42.5
2b	Softening Point deg C range	ASTM D36	44-54	41-51	33-42
3a	Either Wax Content (DIN Method)	prEN12606	<2.2%	<2.2%	<2.2%
3b	or Dynamic Viscosity at 60 deg C Pa.s minimum		145	90	30
4	Flash Point (Cleveland) deg C	AASHTOT48	>230	>230	>220
5	Solubility in trichloroethylene % minimum	AASHTOT44	99%	99%	99%
Retained Properties after RTFOT		AASHTOT240			
6	Penetration minimum % of original	AASHTO T49	50%	46%	37%
7	Softening point deg C	AASHTOT53	44-54	41-51	33-42
Optional Properties					
1a	Either Dynamic Viscosity at 135 deg C Pa.s minimum		0.295	0.23	0.135
1b 2	or Kinematic Viscosity at 135 deg C mm ² /s minimum		295	230	135
	Ductility at 25deg C (5 cm/minute) minimum cm.	AASHTO T51	100	100	100
Retained Properties after RTFOT					
4	Increase in Softening Point deg C maximum	AASHTO T53	9	9	11
5	Ductility at 25deg C (5 cm/minute) minimum cm.	AASHTO T 51	50	70	100
6	Change of mass % maximum +/-		0.50%	0.80%	0.80%

- Notes:
1. Softening Point is specified using the AASHTO method. This does not stir the heating medium during the test and results in softening point temperatures approximately 1.5 deg C higher than would result from using IP, EN or BS tests where stirring takes place
 2. No test method is given for viscosity. Kinematic viscosity at 60 and 135 deg C can, in theory, be measured using Capillary viscometers, AASHTO test method T201. However, in practice only T 202 (dynamic viscosity by vacuum capillary) is suitable for penetration grade bitumen at 60 degC.
 3. More conveniently, dynamic viscosity can be measured using a rotating spindle type mechanical viscometer; e.g. Brookfield viscometer.
 4. Note that for bitumen acceptance purposes dynamic and kinematic viscosity may be equated. 1Pa.s = 1000mm²/s

Add the Table 6.14 (a) after Table 6.14 and its notes for Viscosity Grade (VG) paving bitumen:

Table 6.14(b): Specification for Viscosity Grade Paving Bitumen

S No.	Characteristics	Paving Grades				Method of Test
		VG 10	VG 20	VG 30	VG 40	Ref to
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Penetration at 25°C, 100 g, 5 s, 0.1 mm, Min	80	60	45	35	NS: 221:2047 (Part III)/ IS: 1203
ii)	Absolute viscosity at 60°C, Poises	800-1200	1600-2400	2400-3600	3200-4800	NS: 237:2050 (Part VIII)/ IS: 1206 -2
iii)	Kinematic viscosity at 135°C, cSt, Min	250	300	350	400	NS:237:2050 (Part VIII)/IS :1206-3
iv)	Flash point (Cleveland open cup), °C, Min	220	220	220	220	NS: 237:2049 (Part VII)/ IS: 1448-69
v)	Solubility in trichloroethylene, percent, Min	99	99	99	99	NS: 221:2047 (Part IV)/IS: 1216
vi)	Softening point (R&B), °C, Min	40	45	47	50	NS / IS: 1205.
vii)	Tests on residue from rolling thin film oven test:	Mass loss less than 1%	Mass loss less than 1%	Mass loss less than 1%	Mass loss less than 1%	AASHTO T 51
a)	Viscosity ratio at 60°C, Max	4	4	4	4	NS: 221:2046 (Part II)/ IS: 1206-2
b)	Ductility at 25°C, cm, Min	75	50	40	25	NS: 221:2046 (Part I)/ IS: 1208

Section 700 – Pipe Drains, Pipe Culverts and Concrete Channels

702 Concrete Channeling

In the heading of this Clause after the word "Concrete" add the words "and Stone Masonry"

In Sub-clause (1) Scope after the word "concrete" add the words "and stone masonry"

At the end of Sub-clause (2) Materials add the following additional paragraph:

"Channels may also be constructed of masonry where directed or shown on the drawings. Masonry channels shall be fitted with precast concrete cover slabs where directed or shown on the drawings."

In Sub-clause (3) Construction (a) Excavation and Bedding after the word "concrete" in the penultimate line add the words "or stone masonry".

At the end of Sub-clause (3) Construction add the following additional item:

(d) Stone Masonry Channels

"Stone masonry channels shall be constructed in accordance with the lines levels and dimensions for the various types of channel shown on the drawings.

They shall be constructed throughout of Random Rubble Stone Masonry set in sand cement mortar having a minimum strength of 5.0 MPa and the stone/mortar matrix shall be complete and solid throughout the whole of the structure.

The joints in the exposed faces of the channels shall be carefully pointed up to provide a neat, well- sealed surface.

Where the channel type requires the provision of a reinforced concrete cover slab these shall be manufactured in an approved casting yard in accordance with the details in the drawings or as directed by the Engineer. The upper surfaces of the channel walls where these are required to carry cover slabs shall be carefully dressed and mortared to provide a smooth, strong, accurate bearing surface."

At the end of Sub-clause (5) Measurement add the following sentence:

"Excavation for channels at or near the road edge shall be classified as general roadway excavation and shall be paid as either excavation to spoil or as formation of embankment as appropriate. In the event that channels are directed to be constructed more than 5 meters from the back of the shoulder, excavation for channels shall be paid as excavation for structures."

Section 900 – Earthworks

902 Definitions and General Requirements

Delete the final sentence of Sub-clause (8). At the end of the first sentence of Sub-clause (8) add the following:

“The surveyed points thus obtained shall be used to correct or augment the existing survey data referred to in Clause 104 above.”

903 Classification of Excavated Materials

This Clause shall be read as follows:

The classification of the excavated material shall be made in three categories and they are:

- Common Material:- The materials described in Clause 903(1), 903(2) and 903(3) shall be considered as Common Materials
- Hard Rock;- Material as described in Clause 903(4)
- Hard Rock (Blasting Prohibited): Material as described in Clause 903(5).

907 Excavation for Foundation

The title can be read as to “Excavation for

Structure” Add at the end of Sub-Clause (1):

The materials are classified as follows to excavation for structures:

- i. Common Material

Common material shall comprise all excavation that is not classified as Hard Rock.

- ii Hard Rock

Hard Rock material shall consist of excavation of material that in the opinion of the Engineer requires drilling and blasting with explosives for its removal or continuous chipping with pneumatic tools. The removal of any existing structures above existing ground level whose stone sizes are greater than one quarter of a cubic meter or are constructed of plain or reinforced concrete shall be considered as Hard Rock and paid for as such.

909 Forming of Embankment and Other Areas of Fill

Add the following additional Sub-clause:

“(11) All materials which are deposited in place prior to compaction shall be evenly spread over the whole of the designated area for the layer concerned and in such quantity that the thickness of any one layer, when measured after compaction, shall comply with the requirements specified.

Any new layer less than 75 mm in compacted thickness shall be bonded to the previous layer by scarifying the previous layer to a depth not less than 25 mm or to such greater depth so that the total compacted thickness of the new layer plus the scarified portion of the previous layer will not be less than 100 mm.”

917 Measurement

Delete the first, second and third sentences of first paragraph of Sub-clause (4) and substitute the following:

"Lead and lift of excavated materials for disposal in an approved safe tipping site irrespective of any lift and haulage distance shall not be measured separately for payment. They are deemed to be included in the quoted rates for earthworks operations"

Delete the Second and third paragraphs of Sub-clause 4.

918 Payment

At the end of Sub-clause (1) add the following:

The payment for earthwork excavation shall be made in two (2) instalments. First instalment 60% of the unit rate quoted in the Bill of Quantities shall be made after carrying out excavation works. The second instalment of remaining 40% of the unit rate quoted in the Bill of Quantities shall be made after haulage of the material at the locations approved by the Engineer.

Add new Clause 919 "Catchwater Drains" as follows:

919 Catchwater Drains

"Where directed by the Engineer the Contractor shall excavate catchwater drains to intercept water flowing towards the road alignment and divert it to the nearest watercourse or culvert.

Catchwater drains shall be of the size directed.

Unless directed to the contrary catchwater drains shall be unlined.

Where instructed by the engineer catchwater drains shall be lined with dry stone masonry or with mortared stone masonry as directed.

Where catchwater drains fall outside the limits of the general works of cut and fill i.e. beyond 5 m from the back of shoulders they shall be paid for as excavation for structure at the unit rate per cu.m. of including the volume required to be excavated for any lining, under the relevant item in the Bill of Quantities.

Where catchwater drains are directed to be lined the lining shall be paid for as dry stone masonry or mortared stone masonry as appropriate under the items for such work in the bills of quantities."

Add new Clause 920 "Excavation of Existing Road" as follows:

920 Excavation of Existing Road

"Excavation of existing road shall be carried out in accordance with these Specifications. Payment shall be for the volume excavated paid under a single item and shall include all costs of setting aside re-useable material and of disposing of surplus material. Costs of reusing material set aside as sub- base or capping layer shall be deemed to be included in the rates for those items."

Section 1000 – Subgrades

1002 Definitions

(3) Capping Layer

Delete the definition and replace with:

Capping layers (also known as selected fill or selected or improved subgrade) are layers of specified materials laid and compacted generally over weaker materials either to aid the passage of construction traffic or to improve the condition of the layer immediately below the subbase or base layer. Such improvements may be made through the addition of imported material or by the mechanical or chemical stabilisation of the existing material.

1003 Preparation and Surface Treatment of Formation

In the opening paragraph delete the words of the first sentence following “the sub-base or...” to the end of the sentence and replace with “any embankment or pavement layer”.

Add the following immediately after the opening paragraph:

“Preparation of formation shall also apply to the preparation of the base of embankment and shall include scarification, spreading and compaction of material across the full width of the layer or area. Such preparation shall not be measured twice at any one location.

If instructed by the Engineer, any processing of in-situ material that meets the Specification for subgrade will include scarification to a depth not less than 150 mm or to a depth as agreed with the Engineer, watering, shaping and compaction of the material. Measurement and payment for this processing shall be for the cubic metre of material so processed in accordance with the provisions in this sub-section. In this case the measurement for preparation of formation shall be deemed to be included in the rate for the provision of the layer concerned and no separate payment for preparation of formation will be made.”

(1) Formation of Loose Untreated Materials

In the first sentence delete the words “particles larger than 60 mm” and replace with “particles larger than 75 mm”.

Add the following after the first paragraph:

The Contractor shall arrange the provision of materials for embankment construction such that out of the suitable material, better quality materials are reserved for the subgrade and lesser quality materials are used in other embankment layers.

In the second paragraph delete the words “in the layers of 150 mm compacted depth” and replace with

“in layers not exceeding 200 mm compacted depth. Greater thicknesses of layer may be compacted provided the contractor can demonstrate that the required compaction throughout the whole layer may be obtained with the proposed equipment.

Add after first sentence in the second paragraph ending with words “150 mm compacted depth” the following:

Where the new formation is to abut an existing embankment as part of road widening, the Contractor shall ensure that any new layer of fill shall be benched into the old embankment for formation in a manner that comply with Clause 912 of these Specifications.

At the end of Clause 1003 add the following additional Sub-clauses:

(7) Widening to Embankment and Use of Existing Pavement Material

Widening of the road embankment, where required, shall proceed from the formation in the following manner:

- a) Scarify the existing sub-grade up to a depth of 300 mm and recompact it as described in Sub-clause 1003(1).
- b) If the sub-grade is very weak, the sub-grade shall be strengthened by capping layer (Clause 1004) or by blending the scarified sub-grade material with granular material pursuant to Clause 1002 (5) Mechanical Stabilization as per the instruction of the Engineer.
- c) The mechanical stabilization with granular material shall be to ensure a minimum CBR of 8.

No separate payment shall be made for works carried out under Sub-clause 1003 (7) (a). Measurement for the subgrade layer shall be in accordance with the relevant Clauses of the Specification. Providing and laying of capping layer shall be measured and paid as per Clause 1004.

Providing, blending and laying of granular material for mechanical stabilization of sub-grade pursuant to Sub-clause 1003 (7) (b) and (c) will be measured in cubic meter and paid for granular material only.

The contractor may use existing pavement material for the construction of the road pavement layers providing the material so used meets the required Specification for the layer in which the material is used. When this material is used it shall be spread across the full width of the layer. No separate measurement or payment shall be made for this operation.

(8) Scarifying Existing Pavement Surface, Adding Sub-base Material, Re-profiling and Compacting

The Contractor shall scarify the existing pavement surface with appropriate equipment and re-profile and compact it pursuant to preceding Sub-clause (7) using scarified sub-base and base material. The compacted layer shall meet the standard of Clause 1201 and brought up it to the line and level of the Sub-base surface as shown in the Drawings or as instructed by the Engineer. The resulting surface shall then be watered if required to bring the moisture content close to the optimum and thoroughly compacted to achieve the density specified in Clause 1201.

Scarification of the existing pavement surface shall be measured and paid in square meters. The supply and addition of new material of sub-base standard including re-profiling and compaction shall be measured separately in cubic meters of material and paid under the respective BoQ item of sub- base course.

The work shall be paid at the unit rate entered in the contract which shall be full and final compensation for making arrangements for traffic, carrying out the work in only a part of the roadway width, leaving the rest of the width for the passage of traffic whenever directed and all labours, equipment and incidentals required to complete the work as per the Specifications.

1004 Capping Layer

Delete the first sentence and replace with:

Where shown on the drawings a Capping (Selected Sub Grade - SSG) Layer (either type 1 or type 2) shall be placed at, or on, the top of the subgrade to a thickness as indicated on the drawings. The materials for this layer may be either from cut or from borrow pits or

may be in-situ material if this material meets the Specification, or may be in-situ material mechanically stabilised to meet the Specification. The Contractor shall demonstrate that in-situ materials, treated or otherwise, are suitable for the purpose. Any use of in-situ material shall be subject to the Engineer's approval.

If instructed by the Engineer any processing of in-situ material that meets the Specification for the capping layer will include scarification to a depth not less than the specified thickness of capping layer or to a depth as agreed with the Engineer, watering, shaping and compaction of the material.

Measurement and payment for this processing shall be for the cubic metre of material so processed in accordance with the provisions in this sub-section. In this case no separate payment for preparation of formation will be made.

(2) Material Requirements

Delete the contents and replace with the following requirements:

Material and Testing Requirements for Capping Layers

Test No.	Parameter	Capping Layer	
		Type 1	Type 2
1	Maximum Size of Particles	75 mm	100 mm
2	% Passing 0.075mm sieve	≤ 15%	≤ 15%
3	Plasticity Index	≤ 12%	≤ 6%
4	Uniformity Coefficient	-	≥ 5
5	CBR at 95% MDD (4 day soaked)	≥ 15%	≥ 30%
6	Swell	≤ 1%	≤ 1%
7	In-situ CBR measured by DCP	≥ 16%	≥ 32%
8	Field Dry Density	≥ 70% of Rel. Density	≥ 70% of Rel. Density

The minimum frequency of testing shall be as follows:

- For test numbers 1 to 6 every change of source and every 2000m² of each pavement layer constructed
- For test numbers 7 & 8 every 500 m² of each layer constructed.

1005 Mechanical Stabilisation

(1) General

Delete the first and second paragraphs and replace with:

The extent of mechanical stabilisation shall be at the Contractor's discretion

(2) Material Requirement

(a) Stabiliser

Delete and replace with:

The Contractor is at liberty to mechanically stabilise any material, whether in-situ or imported, to provide any pavement layer material, provided that the resulting material is in conformity with the Specification.

The type and amount of stabiliser used shall be such that when mixed with the in-situ or imported material the specified requirements for the layer material are achieved.

(b) Stabilised Material Requirements

Delete this sub-section:

(3) Amount of Stabiliser to be added

Delete this sub-section

1007 Measurement

In Sub-clause (1) in the second line delete the words "taking cross sections at intervals of 10 metres" and substitute:

"generating cross sections from the original and augmented survey data and digital terrain model at intervals of 20 metres in Terai roads and 10 metres in hill roads and other alignment change points as instructed by the Engineer. "

In the same sentence delete the words "in the original position before the work starts and after its completion"

Delete the whole of Sub-clause (4) after the opening sentence.

In the opening sentence replace the word "exclusive" and replace with "inclusive"

FOR REFERENCE ONLY

Section 1100 – Road Works Overall Requirements

1101 Horizontal Alignments, Surface Levels and Surface regularity of Pavement Courses

Add the following:

(3) (e) Remedial Work

When upon examination by the Engineer any part of the Works or any plant fails to conform to the Specification requirements, or is at any stage before final acceptance damaged so that it no longer conforms to the requirements of the Specifications, the Engineer shall instruct its complete removal and replacement, at the Contractor's expense, with satisfactory work, plant or material. In special cases the Engineer may instruct the Contractor to apply remedial measures in order to make good any such defects or damage.

The actual remedial measures taken shall be entirely at the Contractor's own cost but subject to the Engineer's approval regarding the details thereof.

In particular remedial measures shall ensure that the final product is in full compliance with the Specifications, shall not endanger or damage any other part of the Works and shall be carefully controlled and submitted to the Engineer for examination when completed or at any intermediate stage as may be required.

For the guidance of the Contractor an indication about what may be required in the more common cases of defects or damage is given below, but the Engineer will in no way be bound to approve of or adhere to the measures indicated, as the actual remedial measures will be dictated by the circumstances of each particular case.

Earthworks

- i) Where a cut slope has been over-excavated, reinstatement by backfilling will not normally be permitted and the entire slope may need to be re-trimmed to obtain a uniform slope
- ii) Where the floor of a cutting has been over excavated it will normally require backfilling and re- compaction with approved material of higher quality than the cut material. All necessary measures shall be taken to drain ground water that may accumulate in backfilled sections.
- iii) Excess widths of fills will need to be trimmed to the design profile.
- iv) Where erosion has occurred on the surface of cuts or fills, the damage shall be made good by backfilling with suitable material and re-trimming. In more serious cases the slope may have to be cut back and backfilled after benching and compacted to the required standard of compaction with suitable small equipment followed by re-trimming.

Local Defects in Pavement Layers

- i) Where remedial measures are taken to make good localised defects the length and width of the area to be repaired by equipment shall be such as to accommodate the full width of the equipment used and of a reasonable length to ensure effective repair.
- ii) The depth to which material will have to be removed will depend on the defect and the type of material. Gravel layers will need to be broken up to a depth of at least 75mm and crushed stone will usually need breaking up over its full depth. Asphalt material will normally require removal for its full depth.

1104 Care of Works

Add the following at the end:

- (4) The provision of temporary drainage works such as drains, open channels, banks etc. and the furnishing and operation of temporary pumps and such other equipment as may be necessary to adequately drain, protect and de-water the Works and Temporary Works. This will be in addition to any permanent drainage works specified and installed, and in addition to any temporary drainage works specifically paid for separately.
- (5) Care shall be exercised not to allow material in borrow pits to become excessively wet, to keep all completed layers properly drained, to avoid dumps of material on completed layer work that shall inhibit surface drainage or form wet spots under and around dumps, and to protect all parts of the Works against erosion by floods and drains.
- (6) Fill and cut slopes shall be promptly repaired whenever damaged by surface water.
- (7) Excavations for pipe drains, culverts, service ducts and similar structures shall be adequately protected against possible ingress of water during rainstorms.
- (8) The Contractor shall inform the Engineer of damage or defects to any work before repair or maintenance and the Engineer shall instruct the extent and method of repair. The previously constructed layer shall be thoroughly cleaned of all foreign material and the Contractor shall request its inspection by the Engineer before construction of the following layer or application of a prime coat, surfacing or surface treatment. In the case of all bituminous work in particular the existing layer shall be thoroughly broomed and all dung, clay, and other deleterious material completely removed. Where necessary the surface shall be sprayed with water before, during and after brooming to remove all foreign material.

FOR REFERENCE ONLY

Section 1200 – Subbase, Base, Hard Shoulder and Gravel Wearing Course

1201 Mechanically Stable Subbase

(1) Scope

Add at the end "crushed or otherwise".

Add an additional paragraph at the end as follows:

The scope of works includes:

- (a) construction of new sub base in one or two layers as instructed by the Engineer over carriageway and shoulder in accordance with the stipulations laid down in Clause 1003 and relevant Sub Clauses
- (b) construction of sub base layer over shoulders or as shown in the drawing or as instructed by the Engineer utilizing the sub base and base material from the existing pavement in accordance with the stipulations laid down in Clause 1003 and relevant Sub Clauses.

(3) Material Requirement

(a) Gravel

Add to the first paragraph:

"The specific grading requirement shall be controlled before and after the material has been transported, stockpiled, mixed, spread and compacted".

(5) Laying and Compacting

Add the following at the beginning:

The sub-base shall be constructed after checking that the underlying layer conforms to the specified requirements and has been approved by the Engineer. Immediately before placing the material, the underlying layer shall be checked by the Contractor for any damage or deficiencies, which shall be made good as instructed by the Engineer.

Add the following at the end:

The Contractor shall protect and maintain the subbase at his own expense. Maintenance shall include the immediate repair of any damage or defects which may occur and shall be repeated as often as is necessary to keep the subbase continuously intact. Repairs shall be done in such a manner that will ensure restoration to an even and uniform surface and may involve scarifying, watering and re-compacting.

(9) Testing

Replace the title with;

(9) Quality Control Testing

Replace Table 12.2 with:

Table 12.2: Frequency of Testing and Requirements for Mechanically Stable Subbase

Test No.	Parameter/ Test	Materials	
		Gravel	Sands
1	Gradation	As Table 12.1	As 1201 (3) (b)
2	Plasticity Index (PI)	< 6%	> 5% < 12%
3	MDD & OMC	As per ASTM D1557-70 or its IS equivalent	
4	CBR @ (Field) Dry Density (4 day soak)	≥ 30%	≥ 30%
5	(Field) Dry Density and Field OMC	≥ 95% MDD ≥ 75% of Rel. Density Field OMC within ± 10% of OMC as per Test No.3	≥ 95% MDD ≥ 75% of Rel. Density
Construction Tolerances			
Surface Levels		One test (full width) every 20 metres	
Thickness		One test (full width) every 20 metres	
Width		One Test every 200 metres	

The minimum frequency of testing shall be as follows;

- For Test Nos. 1to3 every change of source and every 1,000 m² of constructed pavement layer
- For TestNos.4 every change of source and every 2,000 m² of constructed pavement layer
- For TestNo.5 every 500 m² of constructed pavement layer

1202 Graded Crushed Stone Base and Subbase

(1) Scope and Definition

Delete the third paragraph "The class ofBill of Quantities" entirely.

(3) Material Requirement

Amend Table 12.3 to read as follows:

Table 12.3: Physical Requirement of Graded Crushed Stone

Tests	Base
LAA Max%	< 40%
AIV%	< 30%
FI% Max.	25%
CBR Min.%	80% at 98% of IS 2720
CR%	>80%
PI Max	NR

Amend Table 12.4 to read as follows:

Table 12.4: Grading Envelope for Graded Crushed Stone

Sieve Size (mm) or equivalent	Percentage Passing by Weight
37.5	100
28	84 - 94
20	72 - 84
10	51 - 67
4.75	36 - 53
1.18	18 - 33
0.30	11 - 21
0.075	8 - 12

(7) Laying and Compacting

Add the following at the beginning:

Where the base course is laid over the prepared subbase, the surface shall be brushed free of dust and extraneous matter and, when instructed by the Engineer, watered before laying the base course.

Where the base course is laid over an existing bituminous pavement, the surface shall be lightly scarified and/or punctured to permit drainage through the surface where the surface shape is not adequately crowned in the opinion of the Engineer, and cleaned of any scarified material before laying the base course. During this operation the Contractor shall not damage the underlying pavement layer. Any damage to the existing underlying layer which results due to careless scarification shall be rectified forthwith by the Contractor to the approval of the Engineer at the Contractor's own cost.

Delete the third paragraph and replace with:

The aggregate shall be spread uniformly and without segregation over the prepared surface of an underlying layer which complies with the specified requirements for the layer concerned, or over the surfacing of an existing pavement, and in quantities sufficient to ensure that after compaction the completed layer will comply with all requirements of layer thickness, levels, cross section and density.

Aggregate shall be spread such that the minimum thickness of each layer after compaction

shall be not less than 100 mm. The maximum thickness will depend on the type of compaction equipment used and on the specified layer thickness but shall not normally exceed 200 mm compacted thickness unless otherwise agreed or instructed by the Engineer.

The wet mixed crusher-run base course shall be comprising of the crushed stone base material as specified in the Table No. 12.4 of the Standard Specifications.

In order to minimize segregation, the material shall be kept wet during transport and spreading. The dumps of material shall be spread out to a flat-surfaced layer with a thickness suitable for mixing by loader. Thereafter, the required amount of water shall be added and the material be thoroughly mixed using a suitable approved means until a uniform homogenous mixture is achieved. The required amount of water and the moisture content shall be determined by carrying out field trials but shall normally be within 2% of the predetermined optimum moisture content at the time of compaction.

The material deposited on the prepared existing surface may be spread and shaped by the method which will not cause the segregation of coarse and fine particles, but producing a uniform / homogenous mix of base course material. The produced base course material mix is loaded on to the paver using the loader. The wet mix base course material shall be laid at site using a paving machine to achieve the specified thickness with due allowance made for decrease in thickness due to compaction such that after compaction, the surface of the aggregate base is within the specified level tolerance. All areas of segregated coarse and fine materials shall be corrected by re-mixing and/or removing and replacing with well graded material to the approval of the Engineer.

The material shall then be thoroughly compacted by means of approved equipment so that the specified density is obtained through the whole layer. The Contractor shall ensure that the joints in the consecutive pavement layers do not coincide. The base material shall be compacted using approved vibratory compacting equipment whose vibrators shall function correctly in accordance with the manufacturer's instructions. The laid and compacted base course need to be of the specified thickness and be within the specified tolerance and producing an even and uniform surface acceptable to the Engineer.

The rolling shall be carried out by a series of over lapping longitudinal passes working from the edge towards the centre, except on super elevated sections where the rolling shall proceed from the lower edge to the higher edge.

The finally compacted layer shall be firm and stable with a closely knit mosaic like surface texture of exposed aggregate free from surface laminations, portions exhibiting segregation of the fine and coarse aggregates, corrugations or other defects that may be detrimental to the performance of the layer. The surface shall be brushed to ensure a surface free from excess fines and loose aggregate.

Where, in the opinion of the Engineer, the completed surface of the base is unacceptable, the surface shall be rectified in a manner approved by the Engineer.

The Contractor shall protect and maintain the completed base layer at his own expense until the surfacing is applied. Maintenance shall include the immediate repair of any damage or defects which may occur and shall be repeated as often as is necessary to keep the layer continuously intact and in good condition. Repairs shall be done in such a manner that will ensure restoration to an even and uniform surface. Traffic shall not be allowed directly on any unprimed base layer unless instructed or authorized by the Engineer.

The completed base shall be primed as soon as possible after approval from the Engineer.

Replace:

(10) Testing

with:

(10) Quality Control Testing

Replace Table 12.5 with:

Table 12.5: Frequency of Testing and Requirements for Crushed Stone Base

Test No.	Parameter/ Test	Materials
		Crushed Stone Base
1	Gradation	As Table 12.4
2	Plasticity Index (PI)	NP
3	MDD and OMC	
4	Flakiness Index	< 25%
5	Aggregate Impact Value	< 30%
6	Los Angeles Abrasion	< 40%
7	CBR @ (Field) Dry Density (4 day soak)	≥ 80%
8	Sodium Sulphate Soundness	< 12%
9	(Field) Dry Density	≥ 98% MDD > 82% of Rel. Density
Construction Tolerances As per Clause 1100		
	Surface Levels	One test (full width) every 20 metres
	Thickness	One test every 20 metres
	Width	One test every 20 metres
	Smoothness	One test every 80 m2

The minimum frequency of testing shall be as follows:

- For test Nos.1 to 6 every change of source and every 1,000 m² of completed pavement layer
- For test Nos.7 to 8 every change of source and every 5,000 m² of completed pavement layer
- For test No.9 every 500 m² of completed pavement layer

(11) Measurement

Delete the paragraph and replace with:

The graded crushed stone base shall be measured by the cubic meters of material placed, compacted and accepted. Measurement shall be based on the cross section of the base shown in the drawings and the actual length measured horizontally along the centreline of the surface of the road, or in case of edge widening, along the centreline of the widened section.

Section 1300 – Bituminous Surface and Base Course

1301 General Requirements

(6) Cutting back of Bitumen

Add the following at the end:

In general the preparation of cutback bitumen for prime coat shall be carried out in accordance with Transport Research Laboratory TRRL Research Report RR140 "Preparation of Cutback Bitumens" (by Hitch and Steward) or relevant IS referred to in the Specifications.

(7) Adhesion Agent

Read (7) Adhesion Agent as Adhesion/Anti-Stripping Additive

Delete the existing paragraph and replace with the following:

Under normal circumstances anti stripping additive will not be required and shall not be used to correct poor aggregate/binder adhesion arising from the Contractor's failure to meet the requirements of the Specification. However, prior to the commencement of the surface dressing, the Contractor shall carry out tests under the supervision of the Engineer to determine the adhesion qualities of the aggregate and binder to be used. These tests will include, but not be limited to, the Immersion Tray Test described in Appendix 3 of TRRL-ORN 3. If, in the opinion, of the Engineer, the tests and trials indicate the need, the Engineer may instruct the use of a proprietary adhesion / anti stripping additive as admixture to the binder or to be applied to the binder film. Its rate of application shall be in accordance to the manufacturer specifications unless otherwise instructed by the Engineer and is generally prescribed as a percentage by weight of binder content added to the cut back prior to spraying.

The additive used shall be INDOSTRIP-NR-60, Addibit L101 or equivalent. Manufacturer's certificate for each batch/lot shall be submitted to the Engineer for his information. The Engineer may prescribe some additional periodic tests such as "under water coating tests", "stripping value for passive adhesive", "thermal stability" or "solubility in high speed diesel", etc. to confirm that the Adhesive additive being used performs as claimed by the manufacturer.

The anti stripping additive shall meet the following requirements:

Description	Test Method	Requirements
Appearance	Visual	Dark Brown Liquid
Specific Gravity at 27 ⁰ C	IS:1448	0.85 ± 0.1
Pour Point	IS:1448	Max 42
Flash Point	IS:1448	> 150 ⁰ C
Moisture Content	IS:1448	1.0% Max
Solubility in Diesel Oil in the Ratio 2:98 at 50 ⁰ C	IS:6241	Completely soluble
Stripping Value with Bitumen Containing 1%	IS:6241	No Stripping
Under Water Coating Test	IS:6241	95% Min
Thermal Stability at 163 ⁰ C	IS:6241	Stable

(10) Measurement and Payment

Add the following at the end of the first sentence:

“unless specified in the Bill of Quantities”.

1302 Prime Coat and Tack Coat

(2) Materials

Delete the first paragraph and replace with:

The prime coat shall consist of medium curing cutback bitumen (25% to 45% cutback) from a source approved by the Engineer. Medium curing cutback bitumen MC-30, MC-70 or MC-250 shall comply with the documents referred to in Clause 1301 (6). Cutback binder shall comprise 80/100 penetration grade bitumen blended with kerosene.

The application rate of cutback bitumen and the net bitumen content of cut back shall be established and approved by the Engineer after field trials. These field trials shall be carried out by the Contractor as instructed by and under the supervision of the Engineer and the cost there of shall be deemed to be included in the prime coat rates. The object of the trials is to achieve the optimum penetration of prime coat and the minimum rate of spread at which this penetration can be achieved.

Pending field trials, the rate of application for surface priming shall be one liter per square meter (1 lit/ m²).

Delete the fourth paragraph and replace with:

The blinding layer, if any, shall be crushed rock or river sand having a grading within the limits of the table below. The aggregate shall be clean, hard and free from excessive dust. It shall contain no clay, loam or other deleterious material.

Grading Envelope for Blinding Material/Sand for Prime Coat:

Sieve size (mm)	Percentage Passing (by mass)
4.75	100
2.36	80 - 100
1.18	60 - 95
0.6	30 - 80
0.3	20 - 55
0.075	10 - 30

When, in the opinion of the Engineer, blinding to the primed surface is required, blinding aggregate shall be spread evenly over the full width of the primed surface such that no bituminous prime material will be picked up by passing traffic. No traffic shall be allowed to pass until the primed surface has been adequately covered to prevent pick-up from vehicles. Any removal of prime caused by traffic passing shall be remedied to the satisfaction of the Engineer. In general, priming shall be carried out in half widths and the Contractor shall ensure that traffic is kept off the prime until it has adequately cured, after which it shall, where practicable, be trafficked as described below. Blinding for uncured prime coat will only be used where the Engineer agrees that this is a necessary or unavoidable measure.

Payment for blinding material shall be for the square metre of blinding applied as agreed and/or instructed by the Engineer.

Tack Coat application shall be with either 80/100 penetration grade bitumen or with MC-30 or MC 70 cut back bitumen. Kerosene shall be added to bitumen to make the cut back. Pending field trials, the rate of application of tack coat shall be 0.5 lit/m².

(4) Spraying of Prime Coat and Tack Coat

Add the following:

Spray record sheets containing details of ambient temperature, spraying temperature, areas sprayed and quantities of materials used shall be submitted by the Contractor on a daily basis for approval by the Engineer.

Following the prime coat application, the primed, un-blinded surface shall be allowed to cure for a minimum 24 hours, or for a time as agreed with the Engineer, without being disturbed so as to allow the prime coat to fully penetrate the surface unless full penetration and curing has taken place in the opinion of the Engineer in a shorter period. If after this period the prime coat has not sufficiently cured to permit trafficking without being picked up, and the Contractor wishes to open the section to traffic, the Engineer shall either instruct that the area be left for a further period until the prime coat has fully penetrated and aired to allow traffic to pass or shall permit the Contractor to place mineral aggregate for blinding, at his own cost, applied at a rate and in the places instructed to blot up the excess bitumen. Where the Engineer agrees that blinding is necessary in limited areas to permit the unavoidable movement of traffic, at locations such as road junctions, the Contractor shall place mineral aggregate for blinding applied at a rate and in the places agreed and shall be paid for this work at the rate in the Bills of Quantities.

As soon as the primed surface has cured sufficiently or sufficient mineral aggregate for blinding has been applied to allow traffic to pass over the road without the prime coat being picked up, the road shall, where practicable, be opened to public traffic for a period of 14 days or less if agreed by the Engineer. During this period the primed area under traffic shall be maintained and all damage caused by traffic shall be repaired as instructed by the Engineer at no extra cost. Thereafter the contractor shall maintain the primed surface and shall protect the surface until the application of surfacing by taking suitable precautions including for example supplying and spreading a protective layer of sand at no extra cost.

(7) Testing

Add the following at the beginning:

Samples of the bituminous material that the Contractor proposes to use, together with a statement as to their source and character shall be submitted and approved before use of such material. The Contractor shall require the manufacturer or producer of the material to furnish material subject to this and all other pertinent requirements. Only satisfactory materials, so demonstrated by service tests, shall be acceptable.

The Contractor shall furnish vendor's certified test reports for each consignment of bituminous material supplied. The reports shall be delivered to the Engineer before permission is granted for use of the material. The furnishing of the vendor's reports shall not be interpreted as basis for final acceptance. All such test reports shall be subject to verification by testing samples of materials received.

1303 Surface Dressing

(1) Scope and Definitions

Add the following:

Surface Dressing shall be the process of spraying the surface to be dressed with bituminous binder, covering the binder with natural or crushed stone cover aggregate and rolling the resulting surface. The Contractor shall familiarise himself with the contents of the UK Transport & Road Research Laboratory Overseas Road Note 3 - "A Guide to Surface Dressing in Tropical and Sub-Tropical Countries" - hereinafter referred to as TRRL-ORN 3. Much of the Specification for Seal Coat Treatment is based on TRRL-ORN 3, including the design of the surface dressing and knowledge of the principles of the Surface Dressing Process is essential to the Contractor.

The requirement for a single or double surface dressing shall be specified on the Drawings or as instructed by the Engineer.

(2) Materials

(a) Binder

Add the following:

The bitumen binder shall consist of 80/100 Penetration grade bitumen or MC 3000 or MC 800 cutback bitumen with or without additives such as INDOSTRIP-NR-60, Addibit L101 or as specified in the relevant item of the Bill of Quantities.

Cutback bitumen binder shall comprise penetration grade 80/100 bitumen and cutter which shall be kerosene prepared on Site. The type and proportion of cutter if required shall be instructed by the Engineer on Site, in the range 1% to 10% after design of the surface dressing in accordance with the procedures set out in Chapter 5 of TRRL-ORN 3. The preparation of cutback bitumen shall be carried out in accordance with TRRL Research Report RR104 "Preparation of Cutback Bitumen" (Hitch and Stewart).

Approval of the source of supply of bitumen shall be obtained from the Engineer prior to delivery of the material. The Engineer will require test certificates to confirm compliance with the specified requirements and may require samples for independent testing prior to issue of such approval. No bituminous material other than that represented by samples and test certificates submitted shall be used by the Contractor except with the written consent of the Engineer and the material shall comply in all respects with the requirements herein. Blending of bituminous materials from different refineries shall not be permitted without the knowledge and approval of the Engineer.

Problems have been experienced with bitumen in some parts of Asia that relate to bitumen chemistry, in particular to undesirably high paraffin wax contents. Some penetration grade bitumens may comply with standard Specification requirements but perform badly in service due to high paraffin wax content or some other compositional factor. Bitumen proposed for use shall be tested at source to establish the following:

- Viscosity characteristics at 60 and 135 degrees centigrade
- Rolling Thin Film Oven Test (RTFOT results indicate the resistance of bitumen to hardening under the influence of heat and air)
- Paraffin wax content (DIN test procedure)

(b) Chippings

(i) Hardness, Soundness and Cleanliness

Delete the first and second paragraph and replace with:

Cover aggregate specified in the relevant items of the Bill of Quantities shall be obtained from a source approved by the Engineer and shall be natural screened gravel clean and free from adhering dust, achieved by washing and drying, or any other detrimental substance that could impair the adhesion of bitumen and shall conform to the requirements of Table 13.5 as follows.

Table 13.5: Physical Requirement of Chippings

Properties of Chipping	Acceptable Range or Criteria
LAA. Max	35
AIV Max	27
Flakiness Index Max	25

(ii) **Grading**

Delete Table 13.6: Grading Requirements of Chippings and replace with the table below.

Table 13.6: Grading Requirements of Chippings

Sieve Size mm	Percentage Passing by Weight			
	Nominal size			
	20 mm	14 mm	10 mm	6 mm
25	100			
20	85 - 100	100		
14	0 - 25	85 - 100	100	
10	0 - 7	0 - 25	85 - 100	100
6.3		0 - 7	0 - 20	85 - 100
4.75			0 - 10	
4.0				0 - 20
2.80	0 - 2	0 - 2	0 - 2	0 - 10
0.075	0 - 1.0	0 - 1.0	0 - 1.0	0 - 1.0

The nominal size of the chippings shall be as specified in the relevant item in the Bill of Quantities.

(4) Crushing, Screening, Washing and Stockpiling Chippings

Add the following:

Stockpiling of aggregates will be permitted only at locations approved by the Engineer. A separate stockpile shall be made for each nominal size of aggregate at each location.

The site of the stockpile shall be cleared of all vegetation and debris, graded and drained, and where the Engineer deems it necessary, the area shall be surfaced with a 100 mm compacted layer of approved material to prevent contamination of the lower layer of cover aggregate.

Unless otherwise approved by the Engineer each stockpile shall be built at least two metres high by tipping in layers not more than one metre deep over the whole area of the stockpile. The Contractor shall supply planking or other material required in connection with movement of vehicles over and about the stockpiles.

The bottom 50 mm layer of cover aggregate or any contaminated aggregate shall not be used in the work.

Stockpiles shall be kept dry from rainfall or ingress of water by covering with approved waterproof membranes and maintaining ground drainage to avoid seepage of ground water into stockpile.

(6) Construction Equipment for Pavement Works

(a) Bitumen Distributors

Delete this sub-section and replace with:

Operation

Distributors shall be of constant volume or preferably constant pressure type, self-propelled, equipped with pneumatic tyres and have a minimum binder capacity of 4,000 litres and each machine shall require the approval in writing of the Engineer for use in constructing the Works.

Approval will depend on fulfilling the following requirements:

Distributors shall be equipped with low range speedometer (fifth wheel) in good working condition, so located to be visible to the driver to enable him to maintain accurately the constant speed for spraying binder at the uniform specified rate. They shall be fitted with either a calibrated pressure gauge which accurately records the pressure of the bitumen at the spray bar for constant pressure distributors, or a binder pump delivery meter for constant volume distributors. Binder pumps shall be capable of maintaining constant pressure or constant volume during spray runs.

Distributors shall be fitted with burners in combination with a circulating pump capable of maintaining the bitumen without overheating within the specified temperature range and an accurately calibrated thermometer for indicating the spraying temperature of the bitumen.

The spray bar shall be capable of applying bitumen binder to a minimum width of 2.30 meters with provision for application of lesser widths by closing jets. The spray bar shall have the capability of being raised and lowered to specified heights above the road and of being adjusted so that it is parallel with the road surface. The distributors shall be so designed to allow the circulation of hot binder through the spray bar when not spraying.

Spray bars shall be fitted with either slotted spray jets or preferably whirling spray jets, whose essential features are the ability to spray binder uniformly at the specified rate of spray, such that the speed of the distributor can be matched by the following chipping spreader during its normal chip spreading operation. If whirling spray jets are fitted the spray bar shall be protected by a hood to reduce wind interference. Distributors shall be fitted with hand-lances with nozzle spray attachments for spraying small, inaccessible areas and to correct deficiencies in the spray rate.

Prior to surface dressing operations, distributors shall be checked for leakages from spray jets and any other sources and these shall be eliminated. Distributors shall then be calibrated by a method approved by the Engineer and under his supervision, to establish uniformity of lateral spray of bitumen to within $\pm 10\%$ permitted variation at any point on the surface from the mean spray rate. This calibration includes setting the spray bar height above the surface to be sprayed, in accordance with the manufacturer's instructions, so as to ensure that the designed overlap of jets is achieved. All spray jets shall be functioning so that each jet requirement has been achieved. Calibration shall be undertaken in accordance with the manufacturer's instructions or in accordance with TRRL-ORN 3 - Section 6.3 Distributor Speed Control and Calibration - to establish the relationship between spray rate and road speed for constant pressure distributor and in addition, bitumen pump delivery rate and spray bar width for constant volume distributors. The distributors shall be capable of achieving a mean spray rate measured by the TRRL-ORN 3 Method B, which shall not vary by more than $\pm 5\%$ from the specified spray rate.

Safety and Maintenance

Bitumen heating, pumping and spraying operations shall be entrusted only to personnel who have been adequately trained and who are competent in the use of the equipment. Unauthorised personnel shall not be allowed to remain in the vicinity during the above operations. Authorised personnel shall be provided with, and be required to wear, suitable protective clothing, i.e. overalls, heat-proof gloves, boots, helmets and goggles.

Special care is needed when changing the type of binder being used in the distributor. When changing from hot binders to bitumen emulsions, all residual binder in the tank and spraying system shall be drained completely and the spraying system flushed using diesel. When changing from emulsions to hot binders, all emulsion shall be drained/flushed from the distributor in order to avoid foaming when hot binder is loaded. When it is necessary to load hot binder after using the distributor for spraying cutback bitumen, the cutback bitumen shall be drained completely and the manhole left open for some time to allow solvent vapour to escape.

The spray bar shall be emptied of binder by blowing with air, or by diesel flushing when spraying is suspended for lengthy periods and at the end of each day's work.

The binder shall be introduced into the distributor at a temperature equal to or just above the spraying temperature after preheating in separate tanks fitted with burners and circulating pumps for this purpose. The capacity of the decanters/preheating tank shall be sufficient to preheat the binder required for the full day's work.

The distributor burners shall be used only to make relatively small adjustments to the binder temperature and shall not be used to raise the binder from ambient to spraying temperature. Under no circumstances shall distributor burners be operated during the spraying operation, or when the level of binder in the tank is less than 150 mm over the top of the flues, or when the distributor is moving. The need for end of day maintenance of the distributor is emphasised to reduce fire risk and to ensure its adequate performance when next used for binder application.

Maintenance of all equipment for the surface dressing operation shall be under the control of a competent senior mechanic, approved by the Engineer and fully experienced in the maintenance of all equipment and in the calibration of the bitumen distributor.

The Contractor shall provide all necessary traffic control equipment and shall inform the engineer at least 14 days before commencing the surface dressing Work, of his detailed arrangements for traffic control. After review the Engineer will inform the Contractor in writing of his approval, subject to any modifications to the Contractor's arrangements which he requires for traffic and convenience of the public.

(8) Application of Surface Dressing

Delete and replace with:

Application of Binder

The specified bitumen binder, cut back if instructed by the Engineer, its application rate and spraying temperature shall be instructed by the Engineer on Site after design of the surface dressing, in accordance with the procedures set out in Chapter 5 of TRRL-ORN 3. The range of spraying temperature for binders is given in TRRL-ORN 3, and is normally within the range 140°C to 200°C.

The Contractor shall present his detailed programme and arrangements and methods for the planning and execution of the surface dressing process to the Engineer for approval at least 28 days before he intends to commence this Work. The Contractor's authorised representative shall be responsible for preparation of the programmes and arrangements and the Contractor shall not commence surface dressing until the Engineer has approved

his programme.

The Contractor shall base his programme on TRRL-ORN 3 - Section 7. The Surface Dressing Process, Sub-Section 7.1 Planning and 7.2 The Surface Dressing Operation - by selecting the activities appropriate to his particular Work Programme. The Contractor shall appoint a surface dressing overseer approved by the Engineer who shall be fully competent to organise and implement the surface dressing operation with experience in operating all essential equipment.

All operations associated with the surface dressing process shall be described in the Contractor's arrangements and shall include but not be limited to:

- method of bitumen supply, decanting, cutting back where required, heating and storing, transfer to distributor including lists of equipment and capacities;
- location and method of production of cover aggregates and pre-coating with type and output of equipment, including crushers where appropriate; and
- method of performing the surface dressing process including type and capacity/weight of all main and ancillary items of equipment along with workforce details.

The Contractor shall provide, one day in advance, his following day's surface dressing Work Programme, including his expected spray lengths and widths for each run with details of the quantity of cover aggregate available in approved chip spreaders standing by at the commencement of the spray run. Spraying shall not commence until sufficient cover aggregate is in this position to cover the area programmed for spraying.

The distributor shall be filled with preheated bitumen binder on the same day, shortly before start of binder application. The distributor spray bar and jets shall be preheated by circulating hot binder and the jets operated for at least 10 seconds for testing. This operation shall be carried out before each spray run, off-road onto trays, or at a location where no environmental damage will be created. Jets shall be inspected by the Engineer for shape, direction, blockage or any other defects which shall be corrected before spraying is permitted. At the end of each spray run the distributor shall be driven off- road to avoid binder drippage on the pavement surface. Binder drippage from any location which may contaminate the road surface shall be sufficient for the Engineer to order removal of the offending source from the roadway until repairs are completed.

As emergency/temporary measures, drip protection of the pavement surface shall be provided by use of buckets/trays etc. These shall be available for use at all times, along with equipment for removal of binder spillages on the pavement surface, to the approval of the Engineer.

The Contractor shall carry out a trial section of surface dressing at a location instructed by the Engineer to demonstrate to the Engineer that his surface dressing operation is capable of constructing the surface dressing in accordance with the Specification. The trial length shall be minimum 200 meters using full spray bar width with full width application of cover aggregate. If the trial section of surface dressing complies with the Specification, the Contractor shall receive payment for the Work in accordance with the Contract as if it were Permanent Work. If the trial section of surface dressing fails to comply with the Specification, the Contractor shall carry out further trials until his surface dressing operation complies with the Specification. No payment will be made for trial sections that do not comply with the Specification.

When the Engineer is satisfied that the Contractor is capable of constructing surface dressing that complies with the Specification after trial section or sections, the Contractor will receive permission to commence surface dressing as permanent Work on the road pavement.

Application of binder shall only be undertaken when the surface is dry or slightly damp, but

in no circumstances when wet. If in the opinion of the Engineer rainfall is likely before the application of binder or cover aggregate or the temperature of the pavement surface has time to fall below the specified minimum temperature of 15°C, the Engineer will instruct the Contractor to delay surface dressing work until weather conditions are satisfactory. Areas damaged by rainfall shall be rectified by the Contractor without additional payment, in a manner instructed by the Engineer.

If in the opinion of the Engineer the ambient temperature is too cold for surface dressing, the Contractor shall delay this operation until the temperature increases to the specified minimum level of 15°C.

Building paper or other approved protective material shall be used at the start and finish of each spray run of sufficient width (not less than 600mm) to enable the distributor to reach its calibrated road speed with spray jets open before discharging binder onto the pavement under treatment. Ends of previous surface treatment runs shall be trimmed back to clean, straight transverse edges and these shall form the start point for subsequent runs, with completed work suitably protected as described above. Spray runs will be limited to 300 metres length initially until the Contractor demonstrates his ability to plan and execute longer lengths. Spray widths shall be calculated allowing for 150mm longitudinal overlap with adjoining passes and for the width that the following chipping spreader is able to cover. Longitudinal sprayed butt joints will not be permitted. The Contractor shall submit his spray width and length proposals to the Engineer for approval.

During spraying all passing traffic shall be stopped. If spray jets block, or the chipping spreader stops, or any other event occurs which may affect the surface treatment process, then the spray bar operator immediately shall stop spraying. When the defective equipment or operation is rectified, spraying may restart with the Engineer's approval.

The distributor shall be dipped and the binder temperature recorded before and after each spray run and spray length and width recorded on approved Record Sheets. The hot application rate shall be calculated and recorded and checked against the specified rate. The calculated actual rate shall not vary by more than $\pm 5\%$ from the specified rate. The actual quantity of binder sprayed corrected to 15.6°C shall be calculated.

At least eight clean pre-weighed metal spray trays shall be available for sampling the spray rate for each spray run, to be used in accordance with TRRL-ORN 3 - Section 6.3 Method B - if so instructed by the Engineer.

To ensure that the spray runs are parallel with the road pavement the road centreline or edge line shall be marked every 25 metres and a string line laid out for the distributor driver to follow with the guide bar attached to his side of the cab.

Where a second surface dressing is specified, the first surface dressing shall be left open to traffic for a minimum period of 21 days and preferably a longer period before applying the second surface dressing unless special approval is obtained from the Engineer for a shorter period. Surplus chippings shall be removed by firm hand-brooming or power-brooming before applying the second surface dressing.

The spraying widths shall be so selected that the centreline joint of the second surface dressing is offset from that in the first surface dressing by a minimum 300 mm.

Hand-pouring pots or hand-lances shall be used to touch up carefully any parts of the first surface missed by the distributor/chipping spreader, or for the treatment of areas in which the distributor cannot operate and in this case only, chippings may be applied by an approved manual method.

Areas damaged by excess bitumen or spillages of diesel or other deleterious material shall be repaired by careful cutting out and removal followed by careful hand-poured or hand-lance application of binder and chipping in a manner approved by the Engineer.

The second surface dressing shall be undertaken when the first surface has been approved by the Engineer after all surplus chippings are removed, repairs carried out and the surface thoroughly cleaned as specified. The procedures to be followed are those specified for Surface Dressing in this Specification.

Application of Cover Aggregate

The cover aggregate shall be applied at the rate instructed by the Engineer on Site in square metres of coverage per cubic metre of loose aggregate after design of the surface dressing, in accordance with procedures set out in Chapter 5 of TRRL-ORN 3.

The cover aggregate shall be applied immediately after the binder is applied and with the approval of the Engineer may be applied slightly damp if not pre-coated to depress dust and help adhesion. Aggregate applied to sprayed bitumen emulsion shall, however, be dry.

The cover aggregate shall be applied using approved mechanical spreaders, which shall be tailgate mounted on tipper trucks, pushed spreaders or self-propelled spreaders, specifically manufactured for the purpose and they shall preferably be metered. They shall be capable of uniformly spreading cover aggregate at the instructed rate such that they can deliver the rate specified whilst travelling at the same speed as the binder distributors during spraying.

The bitumen binder surface shall be covered with cover aggregate closely packed in one layer so that adjacent chippings are touching and no bitumen binder is left uncovered.

A sufficient number of loaded spreaders shall be available at the start of binder application to provide cover aggregate over the whole area programmed for spraying. The Contractor shall not commence spraying unless sufficient loaded spreaders are in place. Aggregate spreading by manual methods will not be permitted except in circumstances where:

- mechanical spreaders cannot operate effectively or safely;
- additional aggregate (back-up work) is required;
- breakdown of mechanical spreaders occurs during the spreading operations before stoppage of spraying;
- minor surface repairs are instructed.

The spreader shall follow the distributor at an interval not exceeding 10m for hot binder work and not exceeding 5m when using bitumen emulsion binder. A back-up vehicle or other approved means shall be constantly in attendance during surface dressing, from which additional aggregate may be hand-applied to ensure complete and rapid coverage.

Where an adjoining pass of the distributor is required, no aggregate shall be applied to the binder over a 150 - 200 mm strip so as to permit subsequent overlap.

Under no circumstances will general brooming of the chipped surface be permitted. Aggregate spillage shall be removed with care and excess aggregates may be brushed off carefully after a minimum of 3 days under traffic, after approval of the Engineer.

The cover aggregate shall be rolled with pneumatic multi - tyred power rollers. Pneumatic - tyred rollers shall have a wheel load in the 1000-2000kg range. Tyre pressures and sizes shall be in accordance with the manufacture's recommendations and shall be the same on each axle and tyres shall be smooth and in good condition to provide uniform rolling of chippings. The roller shall follow directly behind the spreader and shall continue to roll at a speed of approximately 8-10kph, so as to provide minimum 6 passes over the entire treated area. Each pass shall overlap the previous pass by minimum half width of roller rolling shall be continued until all cover aggregate particles are firmly bedded. Tyres shall be in good condition and be kept clean and smooth to avoid pick-up of bitumen and chippings.

(13) Measurement

Delete paragraphs 4 including (a) and (b) and 5 starting with "Chippings of each....." and ending with ".....to rectify at his own cost." And Replace with the following:

"Chippings of each nominal size shall be measured in square meter. The application of the chippings shall be to cover fully the sprayed binder surface to the satisfaction of the Engineer. Any additional quantity of chippings to meet the specified quality of works shall be supplied and applied by the Contractor at his own cost to the satisfaction of the Engineer."

Add at the end following:

Anti-stripping additive shall be measured in kilogram, which shall be the actual mass of the additive used as instructed by the Engineer.

(14) Payment

Add at the end following:

The Anti-stripping additive shall be paid as per the unit contract unit rate which shall be full and final compensation for the cost incurred in compliance with the stipulations of Clause 1301 and 1303 of these Specifications.

FOR REFERENCE ONLY

1307 General requirements for Asphalt concrete, Sand Asphalt, Emulsion Aggregate Mix and Cold asphalt

(2) Construction Plant (b) Mixing Plant

Add at the end of the second paragraph:

The Contractor shall also ensure that the number and capacity of the plant are or is compatible to the interim or final milestones for completion of AC works set elsewhere in the Contract. The minimum capacity of any plant shall, however, not be less than 100 tons per hour.

(3) Preparation of Surface

Delete the third paragraph and substitute:

"Tack coat shall be provided wherever new asphaltic concrete is laid over existing pavement and wherever a first course of new asphaltic concrete has been exposed to traffic or left to weather to such an extent that the Engineer considers it necessary to provide tack coat in the interests of satisfactory adhesion between the courses. In general tack coat will be required wherever a period of more than 14 days is allowed between successive courses; this period may be substantially reduced if the surface of the underlying course is exposed to excessive traffic. Provision of tack coat will not be the subject of any separate payment and is considered to be included in the rate of asphaltic concrete."

(4) Design and Working Mixes

Add at the end of the first paragraph after the word Specification

as follows: "as outlined in Clause 1308 (4)".

Delete third paragraph and replace with:

The minimum and maximum lift thickness for wearing course shall be 3 to 5 times the nominal size of aggregates and 4 to 5 times the nominal size of aggregates for binder course unless otherwise approved by the Engineer.

Delete 4th paragraph entirely and replace it with the following:

The Contractor shall carry out mix design in the laboratory for the wearing and binder course of asphalt concrete in order to propose the proportion of each constituent of the initial mixes to be used for site trials to be carried out in accordance with Sub clause 1307 (5). The procedure for conducting such mix design shall be in accordance to the MS-2, MS-4 of Asphalt Institute or Superpave Volumetric Design. Important steps starting with assembly to testing of mix design samples are broadly outlined below;

- a. conduct sieve analysis of various aggregate gradation and blend the aggregate to arrive at the desired aggregate design blend for use in the asphalt mixture. The following additional information may be required for the above, depending on the procedure followed:
 - bulk specific gravity of each aggregate
 - chosen unit weight of each aggregate
 - rodded unit weight of each aggregate
 - blend by volume of the coarse aggregate
 - blend by volume of fine aggregate
 - amount of 0.075mm down material desired in the combined blend if mineral fillers or bag house fines are used
- b. prepare trial mixes for various aggregate blends to determine the optimum bitumen content to obtain the minimum stability and flow without crossing the threshold limits

on contents of air voids set between 3% to 5%.

- c. get approval from the Engineer of the selected trial mix for site trial.

(5) Site Trials

Delete the first paragraph and replace it with the following:

Site trials shall be carried out in the presence of the Engineer at a location approved by him. These trials shall be carried out after the approval of the Contractor's laboratory mix design.

The Contractor shall produce trial batches with an aggregate blend approximating the laboratory mix design. When the Contractor is satisfied that his Plant is producing a consistent mix, he shall propose laying a trial area for the Engineer's approval to establish that the properties of the mix produced by the Plant are within the limits laid down in Clause 1308 and elsewhere in these Specifications and that his other asphalt finishing equipment is capable of laying the mix to the specified thickness without dragging or other imperfections and that the compaction plant is capable of compacting the mix uniformly to the required density.

The required density from the field trials, assessed by a minimum of three (3) cores of 150 mm shall not be less than 99% density of Marshall Specimens made from the same mix. At least six (6) sample Marshall Specimens shall be made and tested to satisfy the Engineer that the requirements of Clause 1308 have been complied with.

Samples for Marshall Specimens during field trials shall be taken from the vehicle conveying the asphalt concrete mix from the Plant to the job site. Remaining sample mix after producing the six Marshall specimens shall be quartered and analyzed for gradation, and binder content as per AASHTO T 164.

Temperature of the bitumen at the time of mixing shall range between 130° to 160°C while that of the aggregate shall be between 130° to 155°C. In no instances shall the difference of temperature between the binder and aggregate exceed 15°C.

Similarly, the temperature of the asphalt concrete mix when placed in a position for laying shall be within $\pm 10^\circ\text{C}$ of specified mixing temperature and shall be such that the kinematic viscosity of the asphalt cement is 280 ± 20 centistokes just prior to initial break down rolling.

The Contractor will be allowed to proceed with the construction of permanent asphalt concrete pavement works only after the trial section has been satisfactorily laid and finished in accordance with these Specifications to the full satisfaction of the Engineer.

Delete the second, fifth including (a) to (h), sixth and seventh paragraphs of (5)

Site Trials. Add before the deleted seventh paragraph of (5) Site Trials:

When the Engineer is satisfied with the outcome from the site trials, the Contractor shall supply to the Engineer with the mix proportions, batch weight, aggregate grading and Marshall Properties as tested. Thereafter, the mix shall be known as the Approved Job Mix and subsequent Plant mixes produced shall conform to the Approved Job Mix within the following tolerances:

Properties	Binder Course	Wearing Course
Aggregate Retained on a No.4 Sieve	±5%	±4%
Aggregate passing a 4.75 mm sieve but retained on 0.180 mm sieve	±4%	±3%
Aggregate passing a 0.180 mm sieve but retained on 0.075 mm sieve	±2%	±1.5%
Aggregate passing a 0.075 mm sieve	±1.5%	±1.5%
Binder Content	±0.25%	±0.25%
For Air Void in Total Mix in the range of 3%-5%	±1%	±1%
Voids Filled with Binder	±5%	±5%
Voids in Mineral Aggregates 13%-15% for Binder Course and 14%-16% for Wearing Course	±1.0%	±1.0%

Any variation to the limits in the Approved Job Mix lasting more than one (1) day shall be addressed by suspending the works, investigating and adjusting or making modifications by checking all aggregate, Plant and material. Mixing and other construction activities shall commence only after mixes produced comply with these requirements.

If there is change in the supply or source of the aggregates or if variations in quality or grading of aggregate or bitumen become necessary for reasons outside the control of the Contractor, the Contractor shall readjust or redesign the Approved Job Mix as may be necessary to satisfy the Engineer that the Plant can consistently produce mixes within tolerances as specified above. Thereafter the adjusted or new mix shall become the Approved Job Mix.

(13) Tolerances

Delete second paragraph including (a) Bitumen Content and (b) Aggregate entirely and replace it with the following:

Tolerance for bitumen content, aggregate gradation and void contents shall be as outlined in 1307 (5) and relevant sub clauses of 1308.

1308 Asphalt concrete

(3) Materials

(a) Penetration Grade Bitumen

Delete the text and substitute with:

"Bitumen shall be 60/70 penetration grade or VG 30 or VG 40 as specified in Section 600 and as indicated in the Bill of Quantities or as instructed by the Engineer."

(b) Aggregates

Modify Table 13.17 to read

Table 13.17: Requirement of Coarse Aggregates

Coarse Aggregate (retained on 4.75 mm sieve)	
LAA Max	35 max. for both Wearing and Binder Course
ACV Max	25 max. for both Wearing and Binder Course
SSS Max	12% max
Flakiness Index Max	25 max. for both Wearing and Binder Course
Coarse Aggregate Fractured Face (ASTM D 5821)	Wearing Course: 85% to 95% / 80% to 90% for one and two fractured faces Binder Course: Minimum 80% / Minimum 75% for one and two fractured faces
Clay Content (AASHTO 176)	Minimum Sand Equivalency Value of 45%
Flat and Long Elongation Particles (ASTM D479)	Max 45%
Fine Aggregate Angularity Requirement (AASHTO 304 Method A)	Minimum 45%

The coarse aggregate shall have an affinity for bitumen when coated and shall pass the stripping test in accordance with AASHTO T-182.

Modify second line of the last paragraph to read:

It shall.....having a Los Angeles Abrasion of not more than 40 for the binder course and 35 for the wearing course."

(c) Mineral Filler

Delete the whole paragraph and replace it with the following:

Filler shall consist of fine alkaline material such as cement, crushed limestone, rock dust and shall exclude clay minerals, chlorides, sulphates and other deleterious material. At the time of use, it shall be dry and free flowing without agglomerations. Filler shall conform to the requirement of AASHTO M17 and shall have the following grading:

Sieve Size (mm)	Percent Passing by Weight
0.600	100
0.300	95-100
0.150	90-100
0.075	75-100

(4) Grading Requirement

Modify Table 13.18 to read as follows:

Table 13.18: Provisional Grading Requirements for Binder Course and Wearing Course

Sieve Size (mm)	Percentage Passing	
	Binder Course*	Wearing Course**
25	100	-
19	95-100	
12.5	65-85	95-100
9.5	30-65	70-95
4.75	38-46	55-70
2.36	28-42	39-45
1.18	-	30-45
0.3	7-21	15-30
0.075	2-8	3-7

Note: * For Binder Course, max. % passing 4.75 mm sieve should not exceed 46%

** For wearing course, the minimum fraction passing 2.36 mm sieve should not be less than 39%.

(5) Requirements for Asphalt Concrete

Modify Table 13.19 to read as follows:

Table 13.19: Requirements for Asphalt Concrete

Parameter	Binder Course	Wearing Course
Number of blows at each end	75	75
Marshall Stability (kN)	7	7
Flow Value (mm)	2-4	2-4
Air Voids in total mix (%)	3-5	3-5
Bitumen Content by Mass of Total Mix	Minimum 5%	Minimum 5.5%

Add the following at the end of the last paragraph:

The bitumen content for the job mix shall be determined on the basis of laboratory Marshall Tests, using the procedure described in the Asphalt Institute publication MS-2 or as in Superpave system of mix design considering the following:

- maximum density
- maximum stability
- mid specification air voids
- mid specification voids filled with bitumen
- the flow value and voids in the mineral aggregates corresponds to the optimum asphalt cement content which shall be checked for compliance with these Specifications

Compression tests before and after immersion in accordance with AASHTO T 165 shall be carried out on both binder and wearing course mixes. The resulting % of retained strength shall be as below:

Binder Course	Wearing Course
not less than 65%	not less than 75%

(7) Compaction

In the second paragraph delete the reference to "(50 blows)" and replace with "(75 blows)"

(8) Testing (b) Process Control

In Table 13.20 in the minimum number of tests for Quality of Binder delete the words "in addition, one set of tests for each 50,000 liters or part of it of supply of binder" and substitute:

"In addition, one set of tests for each tanker load of bitumen delivered to site; in the event that bitumen is delivered to the site in drums additional tests shall be made at the frequency stipulated by the Engineer but not less than one set per 10tons of bitumen"

(9) Measurement

At the end of the paragraph add:

"However, in no circumstances shall the volume of asphalt certified for payment exceed the volume calculated as the actual volume laid and accepted for payment on the basis of actual measurements of length, width and thickness made in the field."

(11) Adjustment in Contract Unit Rate

Delete the whole of the text of this item and substitute:

"The rate of asphalt concrete will not be adjusted. The rate given for asphalt concrete in the Bills of Quantities shall be the rate using the percentage of bitumen specified in the Bills. When the actual percentage used has been determined the additional bitumen required or the amount of bitumen saved shall be calculated in kilograms and either paid to the Contractor or credited back to the Employer as appropriate through the Bill item provided for this purpose. The provision of a mechanism for payment for under or over usage shall not in any way alter or reduce the Contractor's responsibility to produce asphaltic material with the correct bitumen content in accordance with these Specifications."

Section 1400 – Kerbs and Footpaths

Add new "Clause 1406: Precast Concrete Property Access Slabs" after "Clause 1405: Cycle Tracks" as follows:

1406 Precast Concrete Property Access Slabs

The Contractor shall provide and install precast concrete slabs in accordance with the detail shown in the drawings to permit access across lined and unlined side drains wherever directed by the Engineer.

The materials and workmanship used in the fabrication of these slabs shall be entirely in accordance with the requirements of the relevant Clauses of this Specification governing concrete, reinforcement and formwork. Formwork for the slabs shall be such as to provide a class F2 finish throughout.

The measurement of precast concrete property access slabs shall be in numbers of each type of slab fabricated, transported and placed in accordance with the Drawings and these Specifications.

The quantities measured as provided above shall be paid at the respective contract unit rates for each type of slab. The contract unit rates shall be the full and the final compensation to the Contractor for installation where and as directed and shall include for fabrication of the slabs including the concrete of specified grade, reinforcement and form works, transport to the location for installation, any necessary trimming and bedding and placing of the slabs in their final position.

Add new "Clause 1407: Precast Reinforced Cement Concrete (RCC) Covered Drain" after "Clause 1406: Precast Concrete Property Access Slabs" as follows:

1407 Precast Reinforced Cement Concrete (RCC) Covered Drain

The Contractor shall provide and install precast Reinforced Cement Concrete (RCC) covered drains in accordance with the details shown in the drawings along the road side wherever directed by the Engineer.

The materials and workmanship used in the fabrication of RCC covered drain shall be entirely in accordance with the requirements of the relevant Clauses of this Specification governing concrete, reinforcement and formwork. Formwork for works shall be such as to provide a class F3 finish throughout.

The measurement of precast Reinforced Cement Concrete (RCC) covered drains shall be in meter of each type of RCC covered drain fabricated, transported and placed in accordance with the Drawings and these Specifications.

The quantities measured shall be paid at the respective contract unit rates for each type of Reinforced Cement Concrete (RCC) covered drains. The contract unit rates shall be the full and final compensation to the Contractor for installation where and as directed and shall include for fabrication of the Reinforced Cement Concrete (RCC) covered drains including the concrete of specified grade, reinforcement and form works, transport to the location for installation, any necessary trimming, bedding and placing in their final position, use of cement sand mortar at joints etc to meet the requirements of the drawings and these Specifications and to the satisfaction of the Engineer.

Section 1500 – Traffic Signs, Road Marking, Road Marker Stones and Delineators

1501 Permanent Traffic Signs

(11) Payment

Add the following additional paragraph at the end of this Sub-clause:

“The Bills of Quantities provide for two classes of sign for payment purposes:

- i) Single post
- ii) Double or more posts

All signs supported by a single post shall be classed as “single post”

“All signs supported by two or more posts shall be classified as “double post or more posts”.

1502 Road Markings

Change the heading to read “1502 A: Road Markings using Road Paint”

At the end of Clause 1502A insert the following new Clause:

1502 B: Road Markings Using Thermoplastic Road Marking Material

(1) Scope

This Clause covers the provision of permanent road markings using reflectorised thermoplastic road marking material.

(2) Material

a) General

The material to be used for road marking and striping shall be a reflectorised thermoplastic type of material specifically produced for the purpose. The material shall be applied to the pavement in a molten state by mechanical means.

Upon cooling to normal pavement temperature, it shall produce an adherent reflectorised stripe of specified thickness and width capable of resisting deformation by traffic.

b) Thermoplastic Material

Thermoplastic material shall be a high quality, elastic type with mix-in of 20% by weight of reflecting beads. The beads shall be ballotini, or similar approved and shall be reasonably spherical and free from flaws and of a size suitable for this type of Reflectorisation. Ballotini shall comply with the requirements of BS 6088 Class A.

The raw thermoplastic material shall be composed of the pigment, the reflecting beads and the filler uniformly dispersed in the resin. It may be supplied in bags, ready mixed as powder, which shall be heated and stirred prior to application in accordance with the manufacturer's recommendations.

Thermoplastic Road Marking Material shall comply with the requirements of BS 3262.

c) Colour

The thermoplastic material shall be available in yellow and white colour.

(i) White

The colour of white markings shall match the colour No.00E55 of BS 4800. Pigment shall be Titanium Dioxide complying with Bs1851.

(ii) Yellow

The colour of yellow markings shall match the colour No. 08E51 of BS 4800.

d) Test Certificates

The Contractor shall submit, for each consignment of thermoplastic material delivered to site, the Manufacturer's certificate to show that the materials comply in all respects with the relevant product Specifications.

(3) Application of Thermoplastic Road Markings

(a) Weather Limitations

Road marking material shall not be applied to a damp surface or when the relative humidity exceeds 80%, or at temperature slower than 10°C, or when in the opinion of the Engineer, wind strength is such that it may adversely affect the application operations.

(b) Mechanical Equipment for Application

The equipment shall consist of a suitable apparatus to clean the road surface, a melting pot of minimum 250 litre capacity, an automatic, self-propelled thermoplastic laying machine and all additional hand operated equipment necessary to complete the work.

The laying machine shall be capable of laying road markings of different widths in the range of 50-500 mm.

(c) Surface Preparation

Traffic markings shall be applied to bituminous surfaces only after sufficient time has elapsed to ensure that damage will not be caused to the surface by volatile substances evaporating from the bituminous surfacing. In no case shall traffic paint markings be applied until at least 48 hours after the completion of the bituminous surfacing or any longer period required by the Engineer.

Before the material is applied, the surface shall be clean and dry and completely free from soil, grease, oil, acid or any other material which will be detrimental to the bond between the marking material and the surface. The portions of the surface where the marking is to be applied shall be properly cleaned by means of watering, brooming or compressed air if required.

Where road markings are to be applied on a concrete pavement, all laitance and loose curing compound shall be removed. Particular care shall be taken to expose a surface of fresh concrete on all areas where road studs are to be fixed.

(d) Setting Out of Road Markings

The lines, symbols, figures or marks shall be set out by means of paint spots of the same colour as that of the proposed final lines and marks. These spot marks shall be at such intervals as will ensure that the traffic markings can be accurately applied, and in no case shall they be more than 1.5 m from each other. Normally, spots of approximately 10 mm in diameter should be sufficient.

The dimensions and positions of traffic marking shall be as shown on the Drawings or as specified in the national regulations for traffic signs and markings.

After spotting, the positions of the proposed road marking such as dotted lines and starting and finishing points of barrier lines are to be indicated on the road. These pre-markings must be approved by the Engineer prior to the commencement of any marking operations.

The positions and outlines of special markings are to be produced in chalk on the finished road and must be approved by the Engineer before they are applied. The use of approved templates will be permissible on condition that the positioning of the marking is approved by the Engineer before application is commenced.

The position of road studs shall be marked out on the road and shall be approved by the Engineer before they are fixed in position.

The Contractor shall be responsible for all setting out of road marking as agreed with the Engineer.

(4) Construction Requirement

The road marking material shall be applied as figures, signs, letters, symbols, broken or unbroken lines or other marks, as shown on the Drawings or directed by the Engineer.

Where the marking material is applied by means of a machine, it shall be applied in one layer. Before the road marking machine is used on the permanent works, the satisfactory working of the machine shall be demonstrated on a suitable site which is not part of the permanent works. Adjustment to the machine shall be followed by further testing. Only when the machine has been correctly adjusted and approved by the Engineer may the machine be used on the permanent work. The operator shall be experienced in the use of the machine. The rate of application shall be checked and adjusted if necessary before application on a large scale is commenced and thereafter daily.

Where two or three lines are required next to each other, the lines shall be applied simultaneously by the same machine. The marking material shall be treated before application, in accordance with the manufacturer's instructions.

Thermoplastic road marking material shall be applied at a nominal rate of 5 kg/m² on asphalt concrete and 6 kg/m² on surface dressing.

Road marking shall be completed before a particular section is opened to traffic. Each layer of marking shall be continuous over the whole area being marked.

Continuous lines of thermoplastic material shall be broken by a 100 mm gap for every 10 m continuous line.

(5) Protection

After the application, the traffic markings shall be protected against damage by traffic or other causes. The Contractor is responsible for the erection, placing and removal of all warning boards, flags, cones, barricades and other protection measures which may be necessary.

(6) Tolerances

Road traffic markings shall be applied with an accuracy complying with the tolerances given below:

(a) Width

The width of lines and other markings shall not deviate from the specified width by more than 5%.

(b) Position

The position of lines, letters, figures, arrows, retro-reflective road studs and other markings shall not deviate from the true position specified by more than 20 mm.

(c) Alignment of Markings

The alignment of any edge of a longitudinal line shall not deviate from the true alignment by more than 10 mm in 15 m.

(d) Broken Lines

The length of segments of broken longitudinal lines shall not deviate from the specified length by more than 150 mm.

In broken lines, the length of segments and the gap between segments shall be as indicated on the Drawings or as directed by the Engineer. Lines and curves, whether broken or unbroken, shall not consist of chords but shall follow the correct radius.

(7) Faulty Workmanship or Materials

If any materials not complying with the requirements are delivered to the Site or used in the Works, or if any sub-standard work is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer, at the Contractor's own cost. Rejected traffic markings and paint or marking material that has been splashed or has dripped onto the surfacing, kerbs, structures or other such surfaces shall be removed by the Contractor at his own cost, in such a way that the markings or spilt paint will not show up again later and the under lying bituminous surfacing is not damaged in anyway.

(8) Measurement and Payment

Road marking lines shall be measured by the square meter. The rates for road marking lines shall include for the cost of a priming coat of approved material complying with the manufacturers Specifications if instructed, thermoplastic material including application, balloting, stencils, setting out, temporary signs, barriers, all traffic control and making good.

1503 Road Marker Stones

(3) Construction (b) Placing and Painting of Marker Stones

Insert the following additional paragraph at the end of this Sub-clause:

The concrete bedding for marker stones shall have a minimum volume below ground level of 0.25 cu.m. for 5th kilometer marker stones and of 0.125 cu.m. for standard marker stones. In addition, the actual volume of concrete used shall be sufficient to ensure the secured and permanent bedding of the marker stones in position to the satisfaction of the Engineer having due regard to the soil and slope conditions and to the size of the initial excavation. Excavation for foundation pits for marker stones shall be wholly backfilled with concrete including the backfilling of any over excavation which may have taken place.

1504 Delineator Posts

(4) Erection and Painting

Delete last sentence of first paragraph and substitute with

"Delineator Posts shall be bedded into ground with concrete foundation of grade M10/40 as shown on the drawings".

Delete last word "element" of the last paragraph and substitute with "paint"

Add new Clause "1505 Metal Beam Crash Barrier" after Clause "1504 Delineator Posts"

1505 Metal Beam Crash Barrier

(1) General

This work shall consist of furnishing and erection of metal beam crash barrier of dimensions and at locations as shown on the drawing(s) or as directed by the Engineer.

Metal beam crash barrier shall generally be located on approaches to bridge structures at locations where embankment height is more than 3 metres and at horizontal curves.

(2) Materials

The design materials to be used and the location of metal beam crash barrier shall confirm to relevant drawings or as otherwise directed by the Engineer.

Metal beam is a "W" profiled corrugated beam in single or double row and single or double faced as specified in the drawing made out of cold roll forming from steel strip of 3 mm thick using steel of Fe 410 grade or ST 42 grade confirming to IS:5986 with hot dip galvanized 550 gm per square meter.

The beam after forming shall have formed width of 312 mm and depth of 83 mm and shall have punched holes for fixing as specified in drawings.

The metal crash barrier posts & spacer shall consist 'C' channel section made out of 5 mm thick sheet by cold roll forming process of steel confirming to ST 42 grade with hot dip galvanized 550 gm per square meter.

All bolt, nuts and washers as specified in drawings shall confirm to IS: 1367 & IS: 1364 unless otherwise specified and are hot dip galvanized 550 gm per square meter.

The Guard rail reflector shall be made of material and placed in position as shown in drawings. It shall be hot dip galvanized 550 gm per square meter.

Beams to be erected on a radius of 50 m or less shall be shop curved to the appropriate curvature of the installation.

The mechanical properties of the base metal for Beam shall confirm to the following requirements:

- i) Yield point, minimum 345MPa
- ii) Tensile strength, minimum 483 MPa and
- iii) Elongation, in 50 mm, minimum 12percent

Test specimens for mechanical properties and coating shall be prepared and tested as specified in relevant IS codes.

Steel beam elements and terminal sections shall be galvanized (zinc coated, 0.55 kg per square meter, minimum single spot) unless otherwise specified. The galvanizing on all other steel parts shall confirm to the relevant IS Specifications. All fittings (bolts, nuts, washers) shall conform to the IS; 1367 and IS: 1364. All galvanizing shall be done after fabrication.

Concrete for bedding and anchor assembly shall confirm to section 2000 of these Specifications. The size of the concrete foundation block for embedding guard posts and grade of concrete shall be as shown in the drawing.

(3) Construction Operations

1505.3.1. The line and grade of railing shall be true to that shown on the plans. The railing shall be carefully adjusted prior to fixing in place, to ensure proper matching at abutting joints and correct alignment and camber throughout their length. Holes for field connections shall be drilled with the railing in place in the structure at proper grade and alignment.

1505.3.2. Unless otherwise specified on the drawing, railing steel posts shall be given one shop coat of paint (primer) and three coats of paint on structural steel after erection, if the sections are not galvanized. Any part of assembly below ground shall be painted with three coats of red lead paint.

Splices and end connections shall be of the type and designs specified or shown on the plans and shall be of such strength as to develop full design strength of the rail elements.

(4) Installation of Posts

The guard posts shall be embedded in the concrete footing of size and grade of concrete along with the depth of the embedment of post or as indicated in the drawing.

Posts and the end section for metal beam guardrails on bridges shall be bolted to the structure as detailed on the plans. The anchor bolts shall be set to proper location and elevation with templates and carefully checked.

(5) Erection

All guardrail anchors shall be set and attachments made and placed as indicated on the plans or as directed by the Engineer.

All bolts or clips used for fastening the guardrail or fittings to the posts shall be drawn up tightly. Each bolt shall have sufficient length to extend at least 6 mm through and beyond the full nut, except where such extensions might interfere with or endanger traffic in which case the bolts shall be cut off flush with the nut.

All railings shall be erected, drawn and adjusted so that the longitudinal tension will be uniform throughout the entire length of the rail. The guard rail reflector shall be bolted replacing splice washer at every 10th posts interval.

(6) Tolerance

The posts shall be vertical with a tolerance not exceeding 6 mm in a length of 3 metre. The railing barrier shall be erected true to line and grade.

(7) Measurement

Metal beam railing barriers (single or double row) as shown on the drawings or as instructed by the engineer will be measured by linear metre of completed length and accepted in place.

No separate measurement for payment shall be made for Terminals/Anchors of various types required for work and the delineator to replace washer as specified in drawing. The cost of these elements will be deemed to be included in the rate quoted by the Contractor. Furnishing and placing anchor bolts and/or devices for guardrail posts on bridges shall be considered incidental to the construction and the costs thereof shall be included in the price for other items of construction.

No measurement for payment will be made for excavation and concreting performed in connection with this construction.

(8) Payment

Payment shall be made as per the contract unit rate and shall include full compensation for furnishing of labour, materials, tools, equipment and incidental costs necessary for doing all the work involved in connection with the metal beam railing barrier complete in place in all respects as per these Specifications and drawings.

Add new Clause "1506 Reflective Pavement Markers (Road Studs)" after Clause "1505 Metal Beam Crash Barrier"

1506 Reflective Pavement Markers (Road Studs)

(1) General

Reflective pavement marker (RPM) or road stud is a device, which is bonded to or anchored within the road surface for lane marking & delineation for night time visibility. It reflects incident light in directions close to the direction from which it came.

(2) Definition

Description of terms specific to this standard is as follows:

Coefficient of luminous intensity (CIL) or specific intensity: The ratio of luminous intensity of the retro reflector in the direction of observation to illuminance at the retro reflector on a plane perpendicular to the direction of the incident light expressed in terms of millicandelas per incident lux (mcd/ lx).

Horizontal entrance angle: The angle in the horizontal plane between the direction of incident light & the normal to the leading edge of the marker.

Observation angle: The angle at the reflector between the illumination axis & the observation axis.

Retro-reflection: Reflection in which the radiation is returned in direction close to the direction from which it came, this property being maintained over wide variations of the direction of incident radiation.

Head: That part of the road stud, which is above the road surface when the road stud is fixed in position in the road.

Upper Surface: That part of the external surface of the road stud which is visible when the road stud is fixed in position in the road.

Anchorage: That parts of a road stud that is below the road surface when the road stud is fixed in position in the road.

(3) Material

Plastic body of RPM/road stud shall be moulded from ASA (Acrylic Strene Acrylonitrile) or HIPS (High- Impact Polystyrene) or ABS or any other suitable material approved by the Engineer in charge. The marker shall support a load of 13635 kg tested in accordance with ASTM D4280.

Reflective panels shall consist of number of lenses containing single or dual prismatic cube capable of providing total internal reflection of the light entering the lens face. Lenses shall be moulded of methyl methacrylate conforming to ASTM D788 or equivalent.

(4) Design

The slope or retro reflecting surface shall preferably be 35 ± 5 degree to base.
The area of each retro reflecting surface shall not be less than 13.0 sq cm.

(5) Optical performance

(a) Unidirectional

Each reflector or combination of reflectors on each face of the stud shall have a CIL not less than that given in table below.

Minimum CIL value for stud

Entrance angle	Observation angle	CIL in mcd/ lx
		White
0o U 5o L&R	0.3o	220
0oU 10o L&R	0.5o	120

Note: - The entrance angle of 0o U corresponds to the normal aspects of the reflectors when the reflecting road stud is installed in horizontal road surface.

(b) Tests

Co-efficient of luminance intensity can be measured by procedure described in ASTM E809 "Practice For Measuring Photometric Characteristics" or as recommended in BS: 873 Part IV – 1973.

Under test conditions, a stud shall not be considered to fail the photometric requirements if the measured CIL at any one position of measurement is less than the values specified in table provided that

- (i) The value is not less than 80% of the specified minimum, and
- (ii) The average of the left & right measurements for the specific angle is greater than the specified minimum.

(6) Fixing of reflective markers

(a) Requirements

The enveloping profile of the head of the stud shall be smooth & the studs shall not present any sharp edges to traffic.

The reflecting portions of the stud shall be free from crevices or ledges where dirt might accumulate. All road studs shall be legibly marked with the name, trade mark or other means of identification of the manufacturer.

Marker height shall not exceed 20mm.

Marker width shall not exceed 130mm & shall not be less than 100mm.

The base of the marker shall be flat within 1.3mm. If the bottom of the marker is configured, the outer most faces of the configuration shall not deviate more than 1.3mm from a flat surface.

(b) Placement

The reflective marker shall be fixed to the road surface using the adhesives & the procedures recommended by the manufacturer. No nails shall be used to affix the marker as nails are hazardous for the roads.

Regardless of the type of adhesive used, the markers shall not be fixed if the pavement is not surface dry & on new asphalt concrete surfacing until the surfacing has been open to traffic for a period of not less than 14 days.

The portions of the highway surface, to which the marker is to be bonded by the adhesive,

shall be free of dirt, curing compound, grease, oil, moisture, loose or unsound layers, paint & any other material which would adversely affect the bond of adhesives.

Use a wire brush, if necessary to loosen & remove dirt, then brush or blow clean.

The adhesive shall be placed uniformly on the cleaned pavement surface or on the bottom of the marker in a quantity sufficient to result in complete coverage of the area of contact of the marker with no voids present and a slight excess after the marker has been lightly pressed in place.

For epoxy installations, excess adhesive around the edge of the marker excess adhesive on the pavement and adhesive on the exposed surfaces of the markers shall be immediately removed. Soft rags moistened with mineral spirits or kerosene may be used if necessary to remove adhesive from exposed faces of pavement markers.

(7) Measurement

The measurement of reflective road markers shall be in numbers of markers supplied and fixed.

(8) Payment

Payment made at the contract unit rate for reflective road markers shall be payment in full compensation for furnishing all labour, material, tools, equipment including all incidental costs necessary for carrying out the work at site conforming to the specifications as per approved drawings or as directed by the Engineer.

Add new Clause "1507 Gabion Safety Barrier" after Clause "1506 Reflective Pavement Markers (Road Studs)"

1507 Gabion Safety Barrier

(1) General

This work shall consist of furnishing and erection of stone filled wire crates (Machine Made Gabion) to function as barrier of dimensions and at locations as shown on the drawing (s) or as directed by the Engineer in the same way as the Gabions as described under Clause 2401.

The measurement and payment shall also be as per the same clause.

Add new Clause "1508 Stone Masonry Safety Barrier" after Clause "1507 Gabion Safety Barriers"

1508 Stone Masonry Safety Barrier

(1) General

This work shall consist of furnishing and erection of random rubble stone masonry walls to function as barrier of dimensions and at locations as shown on the drawing (s) or as directed by the Engineer in the same way as the Masonry for Structures as described under Clause 2600.

The measurement and payment shall also be as per the same clause.

Add new Clause "1509 Plum Concrete Safety Barrier" after Clause "1508 Stone Masonry Safety Barrier"

1509 Plum Concrete Safety Barrier

(1) General

This work shall consist of furnishing and erection of plum concrete walls to function as barrier of dimensions and at locations as shown on the drawing (s) or as directed by the Engineer in the same way as the plum concrete as described under Clause 2019.

The measurement and payment shall also be as per the same clause.

Add new Clause "1510 Confidence Blocks" after Clause "1509 Plum Concrete Safety Barrier"

1510 Confidence Blocks

(1) General

This work shall consist of furnishing and erection of confidence blocks with the respective materials on the respective types of structures to function as barrier of dimensions and at locations as shown on the drawing (s) or as directed by the Engineer in the same way as the type of structures as described under the respective Clauses of the Specifications.

The measurement and payment shall also be as per the respective Clause of the Specifications.

Add new Clause "1511 Precast New Jersey Barriers" after Clause "1510 Confidence Blocks"

1511 Precast New Jersey Barriers

(1) Scope

This Section covers the requirements to be met by the Contractor in relation to the materials, fabrication, transportation and installation of Precast New Jersey (NJ) Barriers along the roads. The purpose of NJ barriers is to reduce the risk of an out-of-control vehicle crossing the main road and colliding with the traffic on service roads or vice versa. These can also be used for barricading construction site from moving traffic during road construction to increase the safety of road workers. NJ Barriers also reduce the risk of a vehicle deflecting back into the traffic stream after colliding with the barriers by allowing the errant vehicles decelerate within tolerable limits and by directing traffic in a prescribed manner.

(2) Applicable Standards

RCC NJ barriers shall comply with the requirements of ASTM 825: Standard Specification for Precast Concrete Barriers or its equivalent IS or NS (where available). If required by the Engineer, the contractor shall demonstrate the functioning of crash barriers employing the standard procedure for safety performance evaluation recommended by the Manual for Assessing Safety Hardware (MASH), previous (NCHRP – 350).

Concrete strength shall be tested in accordance with ASTM C39 or equivalent and average strength values for daily testing shall be equal to or greater than the specified design strength. Cross-sectional and longitudinal dimensions, locations and positioning of anchoring devices and reinforcement shall be acceptable to the Engineer.

Two cubes for each 20 cum of concrete or a minimum of 2 cubes per day's production shall be tested in accordance with ASTM C31 or equivalent procedure. These cubes shall have compression strength required for M25 Grade concrete.

(3) Materials

Cement, aggregates, admixtures and steel reinforcement shall conform to applicable ASTM Specifications or to the relevant Clauses of the Specifications as applicable for the materials used for other similar RCC structures in Clause 2000 of these Specifications.

(4) Manufacture

Concrete mixture shall be proportioned and mixed to meet the minimum strength level and cured as per the methods outlined in Section 7 of the ASTM C 825 specification. Formwork used shall be sufficiently rigid to maintain dimensional parameters. All casting surfaces shall be of smooth and tidy finishes free from honeycombs, porous materials or cement sand plasters. Concrete design strength shall be for M25 in 28 days. Air entrainment shall have air content of $5 \frac{1}{2} \pm 1\%$ as measured by ASTM test method C 173 or C 231 or equivalent applicable standards.

Concrete surfaces shall be finished at the option of the manufacturer (contractor) but these should be comparable to the steel form finish and be uniform for all sections in the contract lot.

Steel Reinforcement shall be provided as shown in the drawing or as designated by the Engineer. Reinforcement shall be designed by the producer or contractor (as the case may be) and be sufficient to permit handling delivery and placement of sections without damage. Minimum concrete cover is 50 mm, except for end sections where cover may be less. See applicable project or ASTM specifications for specific details.

Barriers shall be assembled as a cage with sufficient mat and bar to maintain shape during casting. Reinforcement design for the ends of barrier sections should be in accordance with the publication "Concrete Median Barrier Research," Volume 2, Research Report, prepared by the Southwest Research Institute for the FHA, to prevent fracture at the joints. Laps, welds and splicing shall be acceptable to the Engineer and develop full strength of reinforcement.

Cross sectional dimensions shall not vary from design by more than 6 mm. Vertical centerline shall not be out of plumb by more than 6 mm. Longitudinal dimensions shall not vary from design by more than 6 mm in 3 m long barriers and not exceed 20 mm per section.

(5) Handling and Transport

Unless otherwise specified, the minimum length of each barrier section will be 3 m long. For straight sections, Engineer may ask the contractor to provide NJ barriers of 6 m long or more (up to 10 m).

Lifting devices (hooks etc) shall not be cast into the side surfaces of the barriers. Anchorage to prevent lateral movement of the barrier shall consist of dowels and keyway joints on interlocking devices shall be as specified by the Engineer. Location of anchoring shall be as specified by the Engineer.

(6) Measurement and Payment

Erection of NJ barriers shall be measured by the linear meter in place and paid under the Bill of Quantity Item. The rate shall include for the manufacture / supply / transportation of new precast barriers (loading, handling, unloading, excavation, foundation preparation (sand pad, leveling, concreting), preparation of surface, laying in the position, fixing correctly to the lines and levels as per drawings or as directed by the Engineer. No separate payment for concrete or reinforcing steel or formworks etc shall be paid. Any barriers that have edges broken, concrete chipped away during transportation shall not be paid not plastering would be allowed to make surface look good.

Add new Clause "1512 r Street Lighting System" after Clause "1511 Precast New Jersey Barriers"

1512 Street Lighting Systems

1512A Solar Street Lighting Systems

(1) Definition

A standalone solar photovoltaic (SPV) street lighting system (SLS) is an outdoor lighting unit used for illuminating a street or an open area. It consists of photovoltaic (PV) module(s), compact fluorescent lamp (CFL), lead acid battery, control electronics, inter-connecting wires/cables, module mounting Pole including hardware and battery box. The CFL is fixed inside a luminaire which is mounted on the pole. The PV module is placed at the top of the pole at an angle to maximize incident solar radiation, and a battery is placed in a box attached to the pole. The module is mounted facing south, so that it receives solar radiation throughout the day, without any shadow falling on it. Electricity generated by the PV module will charge the battery during the day time. This system operates from dusk to dawn.

(2) Scope

This section covers the requirements to be met by the Contractor in relation to the materials, fabrication, installation, testing and commissioning of solar street lighting systems. The street light system consists of the specified electrical hardware, mast arm poles, and footing which includes excavation, breaking of concrete or any other hard surface such as road pavement, concreting, erecting poles to lines and levels and curing the concrete and re-instatement of the surface to its original condition and disposal of excess spoil materials: on an all complete net basis.

The solar street lighting system shall be provided along the sections of road passing through built up areas, on areas of high pedestrian activity and at all pedestrian zebra crossings and intersections as shown in the drawings or as directed by the Engineer. Electric poles along the bridges shall be anchored as shown in the bridge drawings or as directed by the Engineer. The Contractor shall be required to submit shop drawings of the anchorage details for Engineer's approval.

(3) Specifications of the Solar Street Lighting System

(A) Duty Cycle

The system should automatically switch ON at dusk, operate throughout the night and automatically switch OFF at dawn.

(B) PV Modules(s)

- (a) Both crystalline and thin film technology modules are allowed in the system. The PV module should have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 or IEC 61646 for crystalline and thin film PV modules respectively. The certificate should be from an NABL or IECQ accredited Laboratory.
- (b) The power output of the module(s) under STC should be a minimum of 74 Wp. either two modules of minimum 37 Wp output each or one module of 74 Wp output should be used. In case of thin film technology PV modules, the specified values refer to the stabilized power output after the initial degradation. The module efficiency should not be less than 12%.
- (c) The operating voltage corresponding to the power output mentioned above should be $16.4 \pm 0.2V$.
- (d) The open circuit voltage of the PV modules under STC should be at least 21.0Volts.
- (e) The terminal box on the module should have a provision for opening for replacing the cable, if required.

- (f) Each PV module must use a RF identification tag (RFID), which must contain the following information:
 - (i) Name of the manufacturer of PV Module.
 - (ii) Model or Type Number
 - (iii) Serial Number
 - (iv) Month and year of the manufacture
 - (v) I-V curve for the module
 - (vi) Peak Wattage of the module at 16.4volts
 - (vii) I_m , V_m and FF for the module
 - (viii) Unique Serial No and Model No of the module Until March 2013, the RFID can be inside or outside the module laminate, but must be able to withstand harsh environmental conditions.
- (g) A distinctive serial number starting with NSM will be engraved on the frame of the module. The distinctive number starting NSM will also be screen printed on the tedlar sheet of the module.

(C) Battery

- (i) Lead Acid, tubular positive plate flooded electrolyte or Gel or VRLA Type.
- (ii) The battery will have a minimum rating of 12V, 75 Ah (at C/10 discharge rate).
- (iii) 75 % of the rated capacity of the battery should be between fully charged and load cut off conditions.

(D) Lamp

- (i) The lamp should be 11 Watt compact fluorescent lamp (CFL) with 4 pins along with proper pre- heating circuit.
- (ii) The light output from the lamps should be around 900 ± 5 % lumens (for 11 WCFL).
- (iii) The lamp should be housed in an assembly suitable for outdoor use, with a reflector on its back.
- (iv) No blackening or reduction in the lumen output by more than 10%, should be observed after 1000 ON/OFF cycles (two minutes ON followed by four minutes OFF is one cycle).

(E) Electronics

- (i) The inverter should be of quasi sine wave/ sine wave type, with frequency in the range of 20 - 30 KHz. Half-wave operation is not acceptable.
- (ii) The total electronic efficiency should be not less than 85%.
- (iii) The idle current consumption should not be more than 10mA.
- (iv) The PV module itself should be used to sense the ambient light level for switching ON and OFF the lamp.

(F) Electronic Protections

- (i) Adequate protection is to be incorporated under no load conditions e.g. when the lamp is removed and the system is switched ON.
- (ii) The system should have protection against battery overcharge and deep discharge conditions.
- (iii) Fuses should be provided to protect against short circuit conditions.
- (iv) Protection for reverse flow of current through the PV module(s) should be provided.
- (v) Electronics should have temperature compensation for proper charging of the battery throughout the year.

(G) Mechanical Hardware

- (i) A metallic frame structure (with corrosion resistance paint) is to be fixed on the pole to hold the SPV module(s). The frame structure should have provision to adjust its angle of inclination to the horizontal between 0 and 45, so that the module(s) can be oriented at the specified tilt angle.

- (ii) The pole should be made of mild steel pipe with a height 6m above the ground level, after grouting and final installation. The pole should have the provision to hold the weather proof lamp housing. It should be painted with a corrosion resistant paint.

All poles will be of slip base type. This type of special purpose Street Lighting Pole addresses the universal problem of high-speed road accidents (over 60km/h) involving roadside collisions with light poles. These poles shall comply with Australian Standards 1158.1.3 or equivalent Indian Standards. Slip Base Poles differ in design which features the two base plates bolted together with the facility of freely coming apart if a crash occurs. This separation lessens resistance and mitigates the overall effects of the impact (and subsequent damage to the vehicle or injury to its occupants).

All poles shall be tapered round of specified diameter and consist of standard base-plate mounted with either in-ground section or connection spool on rag bolts, bolts, slip washer and rectangular washers. All poles shall be hot dip galvanized to Australian Standards 4680:2006 or equivalent Indian Standards and shall be either powder coated or painted as approved by the Engineer. The slip base poles shall be in a single and double outreach arm arrangement, curved or straight as approved by the Engineer. Poles shall have security or tamper proof screws for access door covers.

- (iii) A vented, acid proof and corrosion resistant painted metallic box for outdoor use should be provided for housing the battery with a provision of lock and key.

(H) Other Features

- (i) The system should be provided with 2 LED indicators: a green light to indicate charging in progress and a red LED to indicate deep discharge condition of the battery.
- (ii) There will be a Name Plate on the system, which will give: (a) Name of the Manufacturer or Distinctive Logo. (b) Serial Number.
- (iii) Components and parts used in the solar street lighting systems should conform to the latest BIS specifications, wherever such specifications are available and applicable.
- (iv) The PV module(s) will be warranted for a minimum period of 25 years from the date of supply and the street lighting system (including the battery) will be warranted for a period of two years from the date of supply. PV modules used in Solar Street Lighting System must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Twelve (12) years and 80% at the end of Twenty five (25) years. The Warranty Card to be supplied with the system must contain the details of the system.
- (v) Necessary lengths of wires/cables and fuses should be provided.
- (vi) An Operation, Instruction and Maintenance Manual, in English should be provided with the Solar Street Lighting System. The following minimum details must be provided in the Manual: basic principles of photovoltaics; a small write-up (with a block diagram) on the Solar Street Lighting System – describing its components (PV module, battery, electronics and luminaire) and their expected performance; a section on charging and significance of indicators; together with clear instructions about erection of poles and mounting of PV module (s) and lamp housing assembly on the pole.

(5) Measurement and Payment

The solar street lighting system including all the PV modules, battery, lamp, electronics and electronics protection, mechanical hardware including solar light pole and other features for the complete functioning of the solar street lighting system shall be measured in number (n) and paid as per contract price on lump sum basis. The contract price and/or rates shall be the full and the final compensation to the Contractor as per Clause 112.

1512B Grid Supported Street Lighting Systems

1. Scope

The scope of work covered by this specification shall include supply and installation at site as per drawings, and instruction from the Engineer, of all electrical equipment and materials including testing and commissioning.

The successful bidder shall carryout the installation as per the arrangement and details shown in the construction drawing, standard and instructions given by the Engineer.

Any variation or changes to be carried out of site shall be done with the approval of the Engineer.

The scope or work shall include, but not being limited to the supply, storing installation, testing and commissioning of the following:

- Supply and installation of 11 m height Steel tubular poles along with all connection units, and accessories as per drawings and specifications (Steel Tubular Poles) described below, and instruction from the Engineer.
- the transformers of 100 KV capacity, (with one transformer supporting only upto 1500m length) of street lighting system.
- Miniature Circuit Breaker Distribution Boards for lighting distribution boards and power distribution boards, miniature breakers and earth leakage circuit breaker.
- 11 KV grade (for connections only) and 0.4 KV Grade aluminium conductor XLPE/armored insulated and sheathed armoured / Unarmoured power /control cables (95sqmm) and cable termination accessories like glands, lugs, ferrules etc.
- Luminaries and Street Lamps (120 watt LED type) and accessories.
- Switch socket boxes, junction boxes and pull boxes.
- Switches sockets and accessories.
- PVS insulated multi stranded wires of various colours and sizes
- Cable laying in trenches and backfilling for underground cables.
- Miscellaneous works other than the above as stipulated in specification and BOQ.
- All other installation materials hardware and consumables. 110mm dia HDPE pipe for conduits.
- 120 Watt SMD LED Street lamps with accessories all complete.
- All tools, tackles, ladders etc. and the contractor shall provide all testing and measuring instruments as required for complete commissioning of all equipments.

All equipment to be supplied shall be subject to inspection by the Engineer. Such inspection shall however not relieve the contractor of his obligations under the contract.

All necessary scaffolding for working at various heights shall be the responsibility of the Contractor. The contractor shall be responsible for compensation in case of any accident to his workmen or others at site. The contractor shall fulfill and bear all statutory charges for their workmen. i.e. bidder shall indemnify consultant of any such charges as compensation.

The contractor shall supply all necessary hardware and consumable required for the entire installation.

The Contractor shall consult drawings, bill of quantities, and specifications all together, which gives the total scope of the work.

2. Rates

- a. The rates given in the electrical installation scheme are all inclusive of labour, materials, equipment and units required: breaking brick work, concrete work, and earth work in excavation etc., as and where required for carrying out the implementation of the complete electrical installation scheme.

- b. The rates given in the electrical installation scheme are all inclusive of any labour and materials required for reinstating general civil works with all finishes and trench filling in the exterior inclusive of levelling to approved level and distribution or removal of surplus soil, or according to specifications.
- c. The rates are also inclusive of painting work of all exposed parts of the installation consisting of one or two coats of anti-corrosive paints on any metal part plus 2 or more coats of approved finishing / paint in colours to be instructed by the Consultants.
- d. The rate quoted in the tender shall include all charges for scaffoldings, centring materials, water and electricity charges, tools and equipment, sheds for material, transferring all materials from place of availability to the site of work, etc. The tender rates shall also include Contractor's temporary establishment and services he may require for the successful completion of the work. The rates shall be inclusive of sales tax / value added tax, or any other fees or duty levied by any government or public bodies.

3. Quantities

The calculations made by the Bidder should be based upon probable quantities of the several items of work which are furnished for the Bidder's convenience in schedule of probable quantities, but it must be clearly understood that the schedule of quantities is liable to alteration by omission, deletion or addition at the discretion of the Engineer without vitiating the contract and the contract is not a lump sum contract, and neither the probable any way assure the Bidder or guarantee that the said probable quantities are correct or that the quantity of work would correspond thereto.

4. Drawings

- a. It is the intent of the specifications, along with bill of quantities and accompanying drawings to provide a complete workable facility. The drawings, specifications and bill of quantities are complimentary and what is called for by one shall be as bidding as if called for by all. Items shown on the drawings or bill of quantities are not necessarily included in the specification.
- b. The drawings provided are design drawings and generally are diagrammatic. They do not show offsets, bends, elbows, or junction boxes which may be required for the installation in the space provided. The Contractor shall follow the drawings as closely as is practicable to do so and shall install bends, offsets, junction boxes, pull boxes, etc. where required, by local conditions from measurements taken at the building, subject to approval and without additional cost.
- c. The contract drawings shall serve as working drawings for the general layout of lighting, outlets, cables, and various items of equipment. The Contractor shall prepare and submit for approval [up to 5 sets or as required]. The preparation and submission of detailed as built in drawings after completion of the works, shall be the responsibility of the Contractor. The submission of the final as built in drawing is obligatory prior to the issuance of the Completion Certificate.

Quality of materials

All materials and equipments supplied by the contractor shall be new. They shall be of such design, size and material as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

5. Conformity to Standards

All components shall conform to relevant Indian Standard Specification wherever existing Materials with ISI/NS certification mark shall be preferred. However, for conduits, wiring cables. Modular switches and sockets outlets, ISI marked materials shall only be permitted.

6. Guarantee

The Contractor shall make good the following guarantee requirements within six months following date of final acceptance without additional cost to the Owner:-

- a. All work and apparatus shall be so built and installed as to deliver its full rated capacity at the efficiency for which it was designed.
- b. All work and apparatus shall be free from defects of material or workmanship. Any defective material due to defective manufacture, or bad workmanship, or wrong installation shall be replaced free of cost during this period.
- c. The entire electrical and mechanical apparatus shall operate at full ratings without objectionable noise or vibration.

7. Equipment Connections

Provide electrical connections as required to all equipment like light fixtures, fans, outlets etc., include all incidental wiring, materials, devices, and labour necessary for a finished working installation.

8. Safety and Disconnect Switches

Provide safety and disconnect switches as per IS / BS specifications of quick-make, quick break type, suitably rated and having electrical characteristics as required for the load served. Provide cover; interlock for switches and install required disconnect switches as per the code, whether or not specifically shown.

9. Codes, Rules, and Regulations

Unless otherwise specified, electrical equipment, materials and workmanship shall conform to the applicable current standard rules, and BS specifications. All products shall bear the mark of Indian / British Standards Institutions and acceptable to Regional Fire Insurance Council. The following Indian Standard specification will apply to the equipment to be used under this contract.

- | | |
|---------------------------------|-------------------|
| 1) Transformer | - IS 2026, 1962 |
| 6) Installation and maintenance | - IS 10118 : 1982 |

10. STANDARDS

The equipment and the installation work shall generally conform to the requirements of the IS and NS standards with its latest amendments and all International relevant standards and code of practices.

11. SAFETY

The bidders shall include and take adequate precaution to ensure safety for personnel and prevention of accidents at site. The bidder shall be responsible for compensation to their workmen /others due to accidents, if any.

12. STATUTORY REQUIREMENTS

The contractor shall obtain the approval of the NEA and other related agencies at no extra cost to employer. He shall also obtain the drawing approvals and final safety certificate if required.

Only the statutory fees payables to NEA shall be reimbursed by the owner on production of original valid vouchers.

13. INSPECTION

All the materials to be supplied shall be subject to inspection by employer /Engineer. Such inspection shall not however relieve the contractor of this obligation under the contract. Samples of all items, materials, hardware, etc., to be used on the work shall be got approved by the consultant in advance. The brands / makes and grades of items / materials shall be as directed by consultant.

14. TIME SCHEDULE

The bidder shall be responsible for timely procurement and delivery of the items, off-loading at site, safekeeping at site, transport to the place of installation, installation, testing and commissioning of all the material that are included in his scope of work. Work shall be progressed and completed as per schedule mutually agreed upon.

15. QUANTITIES

The Quantities indicated in the bill of quantities are for the guidance of the tenderer. The contractor shall supply the items based on the requirements as per Construction drawings only.

16. SCOPE OF SERVICE

1. Furnishing of all labour, skilled and unskilled, supervisory personnel, erection tools and tackles, testing equipment, implements, supplies, consumables and hardware for timely and efficient execution of the erection work.
2. The item of work to be performed on all equipment and materials shall include but not be limited to the following:
 - Assembly, erection and complete installation.
 - Necessary co-ordination between works done by the other contractors.
 - Final check-up, testing and commissioning in presence of owner's representative.
 - Trial run for seven days, rectification of defects, if any and adjustment as necessary.

Compilation and submission of test reports and Drawings, follow-ups/ liaison with the Consultant and Owner for obtaining approval on the total installation of the Electrical System.

17. GENERAL CONSTRUCTION

The cables shall be suitable for laying in pipes, trenches, ducts and conduits and for underground buried installation with uncontrolled backfill and possibility of flooding by water.

Outer sheath of all PVC and XLPE cables shall be black in colour and the minimum value of oxygen index shall be 29 + 20 c. In addition, suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.

Sequential marking of the length of the cable in meters shall be provided on the outer sheath at every one meter. The embossing shall be legible and indelible.

The overall diameter of the cables shall be strictly as per the values declared in the technical information furnished before taking up the job subject to a maximum tolerance of + 2 mm.

PVC/Rubber end caps shall be supplied free of cost for each drum. In addition, ends of the cables shall be properly sealed with caps to avoid ingress of water during transportation and storage.

18. SPECIFICATION FOR PVC CABLES

All power/ control cables for use on medium voltage systems shall be heavy duty type. 1100 V insulated, inner-sheathed, armoured and overall PVC sheathed as detailed below.

The conductors shall be stranded for both aluminum and copper cables. Conductors of nominal area less than 25 sq. mm shall be circular only. Conductors of nominal area 25 sq. mm and above may be circular or shaped.

Cables with reduced neutral conductor shall have sizes as per Tables. 1 of IS 1554 (Part-I).

The core insulation shall be with PVC compound applied over the conductor by extrusion and shall conform to the requirements of type 'A' compound as per IS: 5831. The thickness of insulation and the tolerance on thickness of insulation shall as per table 2 of IS: 1554 Part-I. Control cables having 6 cores and above shall be identified with prominent and indelible Arabic numerals on the outer surface of the insulation. Color of the numbers shall contrast with the color of insulation with a spacing of maximum 50 mm between two consecutive numbers. Color coding for Cables upto 5 cores shall be as per Indian Standard.

The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC conforming to the requirements of TYPE ST-1 PVC compound as per IS: 5831. The minimum thickness of inner sheath shall be as per Table 4 of IS: 1554-Part-I.

Armouring for multi-cores cables shall be by single round galvanized steel wires where the calculated diameter below armouring does not exceed 13 mm and by galvanized steel strips where this dimension is greater than 13 mm. Requirement and methods of tests for armour material and uniformity of galvanization shall be as per IS:3975 and IS:2633. The dimensions of armour shall be as per table 5 of IS-1554 (Part-I). Armouring for single core cable shall be with H4 grade hard drawn aluminum round wire of 2.5 sq. mm diameter.

The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirements of type ST-1 compound as per IS: 5831. The minimum thickness of outer sheath shall be as per column-3 for both armored and unarmored cables.

19. SPECIFICATION FOR XLPE CABLES

The conductor shall be stranded and compacted circular for all cables.

All cables rated 1.1 KV and above shall be provided with both conductor screening and insulation screening. The conductors shall be provided with non-metallic extruded semi conducting shielding.

The core insulation shall be with cross-linked polyethylene insulating compound applied by extrusion. It shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions. It shall conform to the properties given in Table-I of IS: 7098 (Part-II).

The insulating shielding shall consist of non-metallic extruded semiconducting compound in combination, with a non-magnetic screening of copper screen, it shall be capable of carrying the insulation shielding, it shall consist of non-metallic extruded semi-conducting compound in combination with a non-single, line to ground fault current.

The conductor screen, XLPE insulation and insulation screen shall be extruded in one operation by 'Triple Extrusion' process to ensure perfect bonding between the layers. The core identification shall be by coloured strips or by printed numerals.

The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST-2 compound of IS: 5831. The extruded inner sheath shall be of uniform thickness. For multicore cables, the armouring shall be by galvanized steel strips. If armouring is specified for single core cables in the data sheet, the same shall be with H grade hard drawn aluminium round wire of 2.5 sq.mm diameter.

20. UNDER GROUND CABLE INSTALLATIONS

General conditions	All water pipes, sewage lines or other structures which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them.
	Any telephone or other cables coming in the way are to be properly shielded as directed by Consultant.
	Route of the cables shall be decided with the Engineer-in-Charge. While shortest practicable route shall be preferred, cable runs shall preferably follow roads, footpaths etc with proper off-sets so that future maintenance and identification are rendered easy.
	The LV/MV cables shall be laid further from the kerb line than HV cables
Trench width	Single cable minimum width 350 mm. Multiple cables in horizontal formation maintain inter-axial spacing between the cables minimum 200 mm Minimum clearance of 150 mm between axis of the end cables and the sides of the trench.
Trench depth	1100 volt cables Single tier formation depth minimum650 mm Multiple vertical tier additional.....300 mm per tier 11000 volt cables Multiple vertical tier additional.....300 mm per tier
Excavation of Trenches	Excavate in reasonably straight lines. For change in direction, suitable curvature of 12D/15D as above All gradients and changes in depths shall be gradual. Excavated soil shall be stacked firmly to ensure no collapse. Wherever bricks, tiles or protected covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer-in-Charge. Existing property exposed during trenching shall be temporarily supported or propped adequately as directed by the Engineer-in-Charge. The trenching in such cases shall be done in short lengths, necessary pipes laid for passing cables therein and the trench refilled as required. If there is any danger of a trench collapsing or endangering adjacent structures the sides shall be well shored up with timbering and/or sheathing as the excavation proceeds. Excavation through lawns shall be done in consultation with the consultant. Bottom of the trench shall be level and free from stone, brick, etc.
Laying of cables	The cable drum shall be properly mounted on jacks or on a cable wheel and it shall be ensured that the spindle, jack etc are strong enough to carry the weight of the drum and the spindle is horizontal in the bearings The cable shall be pulled over rollers in the trench steadily and uniformly without jerks or strains. The entire cable length shall, as far as possible, be laid in one stretch. If this is not possible the remainder of the cable shall be removed by flaking i.e. making one long loop in the reverse

	direction. After the cable is laid over the rollers it shall be lifted slightly over the rollers beginning from one end and drawn straight. The cable shall then be taken off the rollers and laid in the trench in a reasonably straight line. For short runs and cable sizes up to 50 sq mm 1.1 kV grade the alternative method of direct handling can be adopted with the prior approval of the Engineer-in-Charge.
Testing and measuring cable	When the cable has been properly straightened the cores shall be tested for continuity and insulation resistance and cable measured. Suitable moisture sealing compound/tape shall be used for sealing of the ends.
Cable protection	Trench Base Cushion 30 mm layer of clean dry sand Single tier 170 mm covering of clean dry sand above base cushion vertical multi-tier sand cushion of 300 mm after first layer of cables Each additional tiers shall have a sand cushion of 300 mm. Top most cable shall have a final sand covering not less than 170 mm Final protective cover with second class bricks of not less than 200 mm x 100 mm x 100 mm (normal size) laid breadth wise for the full length of the cable covering all the cables and projecting minimum 50 mm over the sides of the end cables. In addition bricks on edge shall be placed along the entire run on either side of the cable run.
Finishing trenches	Back filling with excavated earth free from stones or other sharp edged debris and ramming and watering in successive layers not exceeding 300 mm. Unless otherwise specified a crown of earth not less than 50 mm in the centre and tapering towards the side of the trench shall be left to allow for subsidence. Where road berms or lawns have been cut or kerb stones displaced the same shall be repaired and made good to the satisfaction of the Engineer-in-Charge and all surplus earth and rocks removed to places as specified.
Cable route markers	Cable route markers made out of 100 mm x 5 mm GI plates bolted to 35 mm x 35 mm x 6 mm x 60 cm long angle with details of cables shall be installed at intervals not exceeding 100 m in straight runs and at cable bends. Underground joints shall also be identified with markers.

21. LIGHT FITTINGS, FANS, SOCKET OUTLETS AND ACCESSORIES

LED Street Light Lamps : Square Shaped Recessed LED Down Light: Recessed Mounted LED 120 W High Brightness SMD luminaries in MS powder coated white with opal PC diffuser and inbuilt SMPS based constant current driver with THD<15% in 6000K CCT.

22. Workmanship

Good workmanship is an essential requirement to be compiled with. The entire work of manufacture/ fabrication, assembly and installation shall conform to sound engineering practice. The work shall be carried out under the direct supervision of Engineer. **Technical Specification**

TUBULAR STEEL POLE

1 Description

- 1.1 The steel tubing used in pole fabrication shall be of steel of any approved process possessing a minimum tensile strength of 42 Kg/sq. mm and a chemical composition of not more than 0.06% sulphur and not more than 0.06% phosphorous.
- 1.2 The tubing diameter and tubing wall thickness shown in Table 1 for each length of pole are the minimum size to be used in fabricating each length of pole.
- 1.3 Tubular poles shall be made of welded tubes, swagged and joined together. The upper edge of each joint shall be chamfered at an angle of about 45-degree. The steel poles shall be composed of three sections of diminishing diameters and minimum diameter thickness and lengths of pole shall be as shown in Table 1. Steel Tubular pole street lights are of three types, viz double armed, single armed and dislocated double armed.
- 1.4 All tubes forming parts of the above supports shall be made from hot insulated seamless or continuously welded steel in accordance with BS 6323 or equivalent applicable Standards.
- 1.5 The bottom section of the poles shall be galvanized with minimum coating of weight not less than 460-gm/-sq. m internally and externally. The length of the bottom section including the base plate to be galvanized shall be as follows:

11 m pole	2.5 m
9 m pole	2.25 m

The remaining portion of the pole shall be painted with one coat of red oxide primer as specified in IS 2074-1997.

- 1.6 Each pole shall be provided with a steel top plate 3-mm minimum thickness welded to the end of the section. The top plate shall not project beyond the perimeter of the top section. Each pole shall also be provided with a welded base plate welded to the bottom of the pole.
- 1.7 The size of the base plate shall be as per governing standard.

2 Tolerance

- 2.1 The following tolerances shall be maintained:

- a) Tolerance of diameter: $\pm 1\%$
- b) Tolerance on weight: $\pm 7.5\%$ on each pole.
 $\pm 5\%$ on a bulk load.
- c) Tolerance on thickness: $\pm 10\%$ on each sheet.
- d) Straightness: The finished poles shall not be out of straightness by more than $1/600$ of the height.

3 Tests

- 3.1. The following test (s) shall be performed for the pole furnished.

- a. Tensile test and chemical analysis for sulphur and phosphorous
- b. Deflection test
- c. Permanent set test
- d. Drop test

List of testing equipment available with the manufacturer for final testing of equipment specified and the test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards.

Table 1 Poles specifications

IS Designation	410SP- 52	410SP-43	410 SP-31	410SP-13
Overall Length	11 m	10 m	9 m	8 m
Planting depth. m	1.8	1.8	1.5	1.5
Sections:				
Length, m				
Top (h1)	2.7	2.4	2	1.75
Middle (h2)	2.7	2.4	2	1.75
Bottom (h3)	5.6	5.2	5	4.50
Outside Diameter, mm				
Top (h1)	114.3	114.3	114.3	88.9
Middle (h2)	139.7	139.7	139.7	114.3
Bottom (h3)	165.1	165.1	165.1	139.7
Thickness, mm				
Top (h1)	3.65	3.65	3.65	3.25
Middle (h2)	4.5	4.5	4.5	3.65
Bottom (h3)	4.5	4.5	4.5	4.5
Approximate weight, Kg	175	160	147	101
Crippling load, kgf	307	348	367	301
Application of load from top of pole, m	0.6	0.6	0.3	0.3

Must be supplied Along with standard Cross Arms and Bracings Angles,

Pole Clamps, GALVANISED STEEL BOLTS, NUTS AND MISCELLANEOUS FASTENING COMPONENTS, TRANSFORMER PLATFORMS fabricated from hot-rolled channels, angles and steel members. The steel channels and angles for transformer platform shall be fabricated in accordance with Indian Standards IS: 226-1975 and IS-808-1964 or any revision thereof or other equivalent national or international standard provided that the resulting steel stock is of equal quality and strength. The minimum tensile strength of the steel shall be 4200 kg/cm².

4 Payment

Upto 10% of the steel tubular poles of the street Lighting will be single armed and dislocated double armed swan types as shown in drawing. Rates for this reduced portion quantity of single armed poles will be proportionately reduced by 20%.

Add new Clause "1513 Bus stop shelters" after Clause "1512 Solar Street Lighting System"

1513 Bus Stop Shelters

Bus stop shelter has been provided at bus stops with an aim of a comfortable environment with some protection and basic facilities during waiting periods for the passengers seeking transport service. These structures are constructed with steel pipe posts support, UPVC roofing system, aluminum frame glass panels/walls, wooden seats for waiting passengers, and with solar lighting facility. The shelters are of two types as indicated in drawings.

a) Bus shelter Type 1 (Large)

The Type 1 bus shelter shall be constructed as per Bus Shelter Type 1 drawing.

It comprises of 4" Dia. Steel pipe posts, which support the steel pipe purlins of the roof. The roof shall be made of UPVC sheet, fixed to the steel pipe purlins as per drawings. The foundations/base for the posts to be constructed shall be of Reinforced concrete (M20/20 grade). The floor shall be of 100mm thick Plain Cement Concrete (Grade M20/20) with the class F2 finish.

On all sides of the bus shelter comprising both width sides and the long front and backside, aluminum frame panels fitted with 8mm thick unbreakable glass panel/walls shall be installed as shown in the drawing.

The seating bench base shall be made of 1st class brick masonry (1:4 c/s) and having cement plastered top. On top of the base a wooden seat/bench made of 50mm thick hardwood (Sakhuwa) strips laid and fitted intact without gaps with proper joinery. The size of seats shall be 500mm wide and back rest shall be of 400mm height. All fixtures shall be properly planed, polished and fitted at site as per drawing and instruction of the Engineer.

The bus stop area and the shelter shall be illuminated and have electric power points required for other purposes (like mobile charging). A PSC electric pole of 9m height shall be supplied with all accessories and erected at site as per drawings and specifications. This will be connected to a solar power system having a solar panel of capacity 100 Watt output and wirings and required fixtures shall be located at site as per drawing or instruction of the Engineer.

At the front and the two smaller sides of the roof 600mm high aluminum facing panels with all accessories shall be fitted at site as per drawings.

One standard single-post bus stop sign post shall be supplied and installed at site.

The construction of bus shelter shall include supply, fabrication and installation of all components, fixtures at site all complete as indicated in the drawings. Testing of solar panel, lighting system is also to be included in this item.

b) Bus shelter Type 2 (Small)

The Type 2 bus shelter shall be constructed as per Bus Shelter Type 2 drawing.

It comprises of 4" Dia. Steel pipe posts which support the steel pipe purlins of the roof. The roof shall be made of UPVC sheet, fixed to the steel pipe purlins as per drawings. The foundations/base to be constructed for the posts shall be of Reinforced concrete (M20/20 grade). The floor shall be of 100mm thick Plain Cement Concrete (Grade M20/20) with the class F2 finish.

On all sides of the bus shelter comprising both width sides and the long front and backside, aluminum frame panels fitted with 8mm thick unbreakable glass panel/walls shall be erected as shown in the drawing.

The seating bench for passengers shall be made of steel frame (ISA60x60x5 and 40x40x6) bench, connected/fitted to the bus shelter and along with installed 50mm thick, 500mm wide hardwood (Sakhuwa) strips seats and 400mm wide back rest, properly planed, polished and fitted at site as per drawing and instruction of the Engineer.

The bus stop area and the shelter shall be illuminated and have electric power points required for other purposes (like mobile charging). A PSC electric pole of 9m height shall be supplied with all accessories and erected at site as per drawings and specifications. This

will be connected to a solar power system having a solar panel of capacity 100 Watt output and wirings and required fixtures shall be located at site as per drawing or instruction of the Engineer.

At the front and the two smaller sides of the roof 600mm high aluminum facing panels with all accessories shall be fitted at site as per drawings.

One standard single post bus stop sign post shall be supplied and installed at site.

The construction of bus shelter shall include supply, fabrication and installation of all components, fixtures at site all complete as indicated in the drawings. Testing of solar panel, lighting system is also to be included in this item.

Measurement and Payment

The Bus-stop shelters will be measured in number for each Type. Payment for each unit and type shall be made after the completion and testing of unit and type with all its components.

FOR REFERENCE ONLY

Section 1600 – Piling for Structures

1612 Bored and Cast In-situ Piles

(5) Construction Methods

(c) Tolerances

Replace “100” and “1:100” in 1st and 3rd line of the Paragraph by “75” and “1:50” respectively.

Add “(d) Setting out Piles” after “(c) Tolerances” as follow:

(d) Setting out Piles

Marker pins for the pile positions shall be set out and installed by the Contractor. Immediately prior to installation of the piles, the pile positions shall be checked by the Engineer. The position and verticality/alignment of any auger, tool, casing and/or liner shall be checked by the Contractor immediately prior to installation. For piles with casings and/or liners, the Contractor shall check the position of the casing or liner during and immediately after placing.

Any checks by the Engineer shall not relieve the Contractor of his responsibility.

Add “(e) Length and Diameter of Piles” after “(d) Setting out Piles” as follow:

(e) Length and Diameter of Piles

The length of pile and its diameter are shown on drawings. The final length shall be decided by the Engineer on the basis of study of the results of initial load test on piles and on the basis of actually boring data observed on site for individual pile. Test piles shall be installed as directed by the Engineer at selected locations at each bridge site.

For uncased piles the minimum diameter of the boring shall be ± 25 mm the diameter shown in the drawings. When casing is used, the inside diameter of the casing shall be not less than the pile diameter shown in the Drawings.

(10) Removal of Obstruction

Delete both paragraphs entirely and replace with the following paragraph:

Where boulder/rock or other obstruction render, it's difficult to bore the pile. Excavation operation inside pile casing as directed by Engineer shall be carried out to remove obstructions. No additional payment shall be made for removal of such obstructions.

Add new Sub-clause (17) Telltale Rod as follows:

(17) Telltale Rod

At least 3 telltale rod arrangements shall be extended in each test pile. Each telltale shall be placed as indicated on the Drawing or to each quarter length of pile or extend to depths instructed by Engineer.

The installation of Telltale rod arrangement shall generally be those recommended in ASTM D1143_07.

1614 Pile Tests

(1) Test Piles

Add the following at the end of the Sub-clause 1614 (1):

The boring and cast in-situ test RCC pile of 1 m diameter and 16.50 m length includes reinforcement steel bar, M25/40 grade concrete, providing and installation of anchorage rods, telltale setup and grouting, using Bentonite as per these Specifications and as shown in the drawings etc. all complete. It shall be measured and paid in number (nr).

(2) Loading Tests

Delete the entire content of (b) in second paragraph and replace with the following:

- (b) The test load shall be applied in the increments as specified or approved by the Engineer. These shall generally be those recommended in ASTM D1143_07.

Add the following additional pay item at the end of the Sub-clause 1614 (2):

Static Load Test i.e. Ultimate Pile Load test on Pilot Pile for Test for test load not exceeding three

(3) times the maximum design load, which shall be paid in number against the rate quoted in the Bill of Quantities. The payment shall also include the costing of design and providing of steel girders and all other necessary arrangements to conduct this test.

Location and placing of the test piles shall be determined by the Engineer who shall instruct the Contractor accordingly.

After carrying out the above mentioned test on test piles, the Contractor may be required to review of the design of the piles and revise accordingly as per the test results as instructed by the Engineer.

(3) Other Requirements of Loading Tests

Delete entire write ups from (d) to (h) and replace with the following paragraph at the end:

"In general, all pile loads and settlement shall be measured as per the provisions of ASTM D1143_07".

Add "(4) Pile Integrity Tests" after "(3) Other Requirements of Loading Tests" as follow:

(4) Pile Integrity Tests

(a) General

Pile Integrity Testing (PIT) shall conform to the provisions of the relevant ASTM Specifications as follows:

- impulse response method conforming to ASTM C1740
- sonic echo, frequency response or transient dynamic steady state vibration method conforming to ASTM D5882

Other methods may be considered by the Engineer subject to satisfactory evidence of performance.

(b) Test Equipment

Provide a pile integrity tester (PIT) with the following minimum requirements:

- The analogue to digital resolution shall be at least 24bytes,
- The sampling frequency shall be at least 25,000Hz.

- Data shall be stored such that additional processing or further wave analysis is possible.
- Data shall be displayed in the field for evaluations of preliminary data quality and interpretation.
- The equipment shall allow attachment of a motion sensing device capable of measuring acceleration, velocity or displacement due to the impact of the pile top with a hand held hammer.

(c) Specialist Subcontractor

The field testing shall be performed by a specialist nominated Sub-contractor with a minimum of five years' experience in the field of pile integrity testing and interpretation of results pertaining to bored cast in place large diameter piles.

(d) Test Preparation

For cast in place piles, integrity testing shall not be performed until the concrete has cured for a minimum of 28 days and the head trimmed down to cut-off level, unless otherwise approved by the Engineer. The pile head shall be free from water, dirt or other debris. The concrete at the pile top surface must be relatively smooth and provide sufficient space for attaching the motion sensing device and for the hammer impact area.

(e) Result Presentation

The testing subcontractor shall present a report within 7 days after performing the field test to provide the final test results and integrity evaluation direct to the Engineer. For each pile tested, the averaged, amplified velocity versus time record shall be included in the report, with a table summarizing results and conclusions. Additional plots and analyses may be required by the Engineer

(f) Acceptance and Rejection

Shafts with no significant deviations from locations above the pile toe, will be accepted. Where no clear toe deviation is apparent, the test engineer shall state to which shaft depth the test appears to be conclusive. Where deviations from locations with significant reductions in pile area or pile material strength or stiffness above the pile toe are observed, the pile has a serious defect. If the record is complex, the results may be deemed inconclusive and the Engineer shall determine what course of action is to be followed. The Contractor shall inform the Engineer of any anomalous results within 12 hours. The decision to reject and replace any defective shaft is at the sole discretion of the Engineer.

(g) Measurement

Pile Integrity Tests shall be measured in number. The Number means a set of tests conducted in one pile as per the provisions of ASTM D 5882.

(g) Payment

Payment for Pile Integrity Test shall be full compensation for testing, analyzing and reporting using low strain waves as per ASTM D 5882 or equivalent standard or as directed by the Engineer, all complete.

1616 Measurement

Add at the end of the first sentence as follow:

“, except concrete and reinforcement bar for working piles”.

1617 Payment

Add the following at the end:

The rate shall also include the cost of undertaking 'confirmatory sub-soil investigation' as per Clause 1619, boring equipment, standard penetration testing, split spoon sampling, boring, excavation, concreting, inspection and control, cutting off, welding, coupling and all related tools, rigs, cranes, jets, frames, leads, labour, barge mounted platform/island of adequate sizes and other incidental equipment and work necessary to complete the work.

Add new Clause "1618 High Strain Dynamic Testing (HSDT) of Piles" after Clause "1617 Payment"

1618 High Strain Dynamic Testing (HSDT) of Piles

(1) PDA Test –Foundation Piles

In addition to load tests described in 1614 above the Contractor shall carry out the following High Strain Dynamic Test (popularly known as Pile Dynamic Analyser or PDA) on;

1. Foundation piles on which load test will be carried out,
2. One third of working piles randomly selected by the Engineer.

(2) Specification

- a) The purpose of high strain dynamic testing shall be to obtain pile capacities for bridge foundation piles with a higher confidence level than obtainable with a static load test. This shall be achieved by correlating dynamic tests with static load tests on pilot piles.
- b) The equipment for dynamic testing shall be 'Pile Dynamic Analyser'(PDA) or similar approved equipment conforming to the requirements of ASTM D-4945.
- c) Ram weight, height of fall, cushioning (wood + steel plate) to prevent damage to pile head shall all be in accordance with standard documented international practice.
- d) This work shall be carried out by a specialist sub-contractor who shall employ a professionally qualified engineer with a minimum of 5 years of experience in pile dynamic testing using PDA or similar equipment. He shall be in charge of testing and interpretation of results. He shall present himself at least by video contact for interview prior to being engaged.

(3) Number of Test Piles

Dynamic pile testing shall be carried out on one working pile as selected by the Engineer and pilot test pile. However, the Engineer may reconsider the total number of piles to be tested depending on the quality of results.

(4) Test Report

On completion of all field work, the specialist engineer shall prepare a final report covering all aspect of pile load-settlement behavior including ultimate tip resistance and ultimate shaft resistance. This final report shall incorporate results of the PDA monitoring, and results of all CAPWAP computer analyses. The results of CAPWAP analysts shall be compared to the PDA results and correlations shall be drawn between the CAPWAP results and the PDA field monitoring results.

(5) Measurement

High Strain Dynamic Test (popularly known as Pile Dynamic Analyser) shall be measured in number.

(6) Payment

Payment for High Strain Dynamic Test shall be full compensation for Pile Instrumentation, Accelerometer, Strain transducer, Pile Driver Analyser, Impact Pile Driving Hammer, labour, transportation, professionals, recording and reporting including all incidentals necessary to complete the test.

Add new Clause "1619 Ground Conditions" after Clause "1618 High Strain Dynamic Testing (HSDT) of Piles"

1619 Ground Conditions

No responsibility is accepted by the Engineer or the Employer for any opinions or conclusions given in any factual or interpretative Site Investigation Reports. The Contractor shall report immediately to the Engineer any circumstances which indicates that in the Contractor's opinion the ground conditions differ substantially from those reported in or which could have been inferred from the site investigation reports, geotechnical design report, or from pilot pile test results or from trial boreholes SPT values and tests.

The Contractor shall drill one borehole at each pier and abutment to the design depth of the piles at that location. The bore log shall be provided to the Engineer within three days of the completion of each borehole for his assessment of the consistency of the subsurface conditions with those used for design. No separate payment will be made for such boreholes.

The pile lengths shown on the Drawings are design lengths. Final pile lengths will be determined in the field by the Contractor and approved by the Engineer after considering the pilot pile load test results. If the results vary significantly the Engineer may order confirmatory subsoil investigation.

(1) Confirmatory Sub Soil Investigation

(a) Boreholes

Confirmatory boring and sub soil investigation during construction shall be carried out by the Contractor,

(b) Boring

Boring shall be carried out in accordance with the provisions of AASHTO T-86 or ASTM D 420 and ASTM D 1452 as agreed with the Engineer. Field identification and logging of soil samples shall be made in accordance with the Unified Soil Classification System (USCS).

Before taking any undisturbed samples or making any in-situ test, the lining shall be carried down to the bottom of the borehole at the test depth.

Augers of proper size shall be used in very soft to soft clays and silts to avoid suction, the use of shell shall only be restricted to moderately stiff to very stiff and hard clays and also in sandy strata below water table. The use of a chisel will be permitted only in boulder or rock formation or through local obstructions etc.

Uncased boreholes may be permitted only up to a depth where, the sides of the hole can stand unsupported. In case side fall or squeezing is noticed, steps shall be taken immediately to stabilize the sides of the borehole by casing pipes as directed by the Engineer. Use of bentonite slurry of 5% concentration may be permitted to stabilize the borehole.

No water shall be added while boring through cohesive soils and cohesion- less soils above the water table. While boring through cohesion- less soil below the water table, the water level in the casing shall always be maintained at or above the water table.

The cuttings brought up by the auger, shell or the split-spoon or undisturbed sampler shall be carefully examined and the soil description duly recorded after performing field identification tests.

After completion of the boring at any borehole, a bore log shall be prepared in an approved standard template in consultation with the Engineer and submitted to the Engineer in triplicate. After observing the position of the water table after 24 hours, backfilling of the borehole shall be carried out with approved materials and in a manner as directed by the Engineer.

(c) Standard Penetration Test (SPT)

SPT tests will be carried out in accordance with the procedure in AASHTO T-206 or ASTM D-1586 at 1.5 m interval or at every identifiable change of strata, whichever is earlier.

The driving of split-spoon shall be recorded for every 150 mm of penetration until the total penetration is 450 mm.

Boring shall be terminated when a combined 100 blow count (from SPT) is recorded for 300 mm of penetration or less in the borehole. Other conditions for termination of SPT and subsequently, the borehole are as follows:

- i. 50 blows produce less than 150 mm advance
- ii. 10 successive blows produce no advance

When termination conditions are met, the borehole log shall show the number of recorded blows for the amount of penetration e.g. 70/100 (or 50/100) will indicate that 70 (or 50) blows resulted in a penetration of 100 mm.

N-values as observed in the field shall be reported in the bore logs without any correction for overburden and water table.

(d) Disturbed Samples

Disturbed samples shall be taken from borehole cuttings and split-spoon for visual classification tests at the site. The samples shall be taken at 1.5 m intervals or at every identifiable change of strata, whichever is met earlier to give a reliable record of the variations in the conditions of the soils. Disturbed samples shall be sent to the laboratory in air-tight plastic container with proper labelling for the purpose of record and laboratory testing.

(e) Undisturbed Samples

Undisturbed samples (75 mm diameter) shall be collected in good quality thin walled seamless Shelby Tubes conforming to the ASTM D-1587/AASHTO T-207 from cohesive soil strata. No SPT shall be conducted immediately before collection of an undisturbed sample.

Undisturbed samples shall be taken from the boreholes at following intervals or at every identifiable change of strata if met with earlier.

0.00 m to 15 m @ 1.5 m
interval 15 m and above @
3.0 m interval

The size of the thin walled sampler should be such that a sample having a minimum size of 75 mm diameter and 450 mm length can be recovered. The sampler shall be pushed straight by jacking in soft to firm deposit and no hammering shall be allowed. Use of thick wall samplers may be permitted in case of deposits having very high consistency, subject to the approval of the Engineer. Recovery ratio shall be observed and reported in the boreholes, for every sample. The top and bottom of a sample must be indicated clearly on the sample tube to facilitate laboratory testing in proper orientation.

(f) Handling and Labeling of Samples

The following conditions of handling and protection of undisturbed samples shall be undertaken on undisturbed sample.

- a) Immediately after being taken from the borehole pit, the ends of the sample shall be cut and removed to a depth of about 25 mm (or more in the top to cover any obviously disturbed soil). Several layers of molten wax should then be applied to each end to give a plug about 25 mm thick. If the sample is very porous a layer of waxed paper should first be placed over the ends of the sample.

Any space left between the end of the sample tube and the top of the wax should be tightly packed with saw dust or other suitable material, and a close fitting lid or screwed cap shall be placed on each end of the sample tube.

The lids should, if necessary, be held in position by adhesive tape.

- b) A label bearing the number of the sample, borehole number, depth of sample, date etc., shall be placed inside the container just under the lid. It shall be placed at the top of the sample. In addition, the number of the sample shall be painted on the outside of the container, and the top or bottom of the sample shall be indicated.
- c) Undisturbed soil sample tubes shall be placed in a stout wooden box, and packed with moist saw dust, paper, etc. to prevent damage during transit to the laboratory.

(g) Dispatch of Samples

Samples shall be dispatched to the laboratory as soon as possible after being obtained and shall not be allowed to accumulate on site. If it appears to the Engineer that there is a danger of samples deteriorating through further storage, the contractor shall dispatch such samples as soon as directed by the Engineer.

(h) Groundwater Table Measurement

Groundwater table shall be measured 24 hours after drilling and shall be recorded in the bore log.

(i) Laboratory Tests

Laboratory tests shall be carried out as per relevant AASHTO or ASTM specifications, the results of all tests shall be submitted in the template approved by the Engineer.

(j) Reports and Records

On completion of each borehole, three copies of each bore log shall be submitted to the Engineer, together with one copy of the list of disturbed and undisturbed samples taken from the borehole.

The bore log shall show:

- i) Ground level at borehole referred to the reduced level;
- ii) Co-ordinates of the bore hole location;
- iii) A detailed description of each stratum ;
- iv) The position, type and identification of each sample and SPT value;
- v) Location of samples in bore log;
- vi) Any other site test results available;
- vii) The levels at which each separate ground water level is first encountered and at which it comes to rest (standing water level).

The Engineer shall select the samples and type of test to be conducted.

On completion of all field and laboratory testing, three copies of all the results shall be submitted to the Engineer in hard and digital format.

(k) Measurement and Payment

There shall be no separate payment to the Contractor for the subsoil boring and testing. The cost for these investigations and related works is covered under payment under the relevant Clause of these Specifications.

FOR REFERENCE ONLY

Section 1900 – Bearings and Expansion Joints

Add New Clause 1903 "Rubber Strip Bearing" as follows:

1903 Rubber Strip Bearing

This Sub-clause covers the work in connection with the furnishing and fixing of rubber strip bearings in position for the minor slab bridge in accordance with the details shown on the Drawing to the requirements of these Specifications or as directed by the Engineer.

The thickness of the rubber strip bearing shall be as shown in the Drawings or as mentioned in the Bill of Quantities. The quality of the rubber strip bearing shall meet the requirements as detailed in the ORN 9 "Design of small bridges" or as instructed by the Engineer.

The rubber strip bearing shall be measured and paid in square meter in the respective unit rate of Bill of Quantities.

FOR REFERENCE ONLY

Section 2000 – Concrete for Structures

2004 The Design of Concrete Mixes

Add before Sub clause (1):

All necessary labour, materials, equipment, etc., for sampling, preparing test cubes, curing, crushing of cubes, etc. shall be provided by the contractor. The cube-crushing machine to be provided by the contractor, in accordance with this special provision, shall be approved by the engineer and shall be duly calibrated by an independent inspector/ agency approved by the engineer.

The machine shall be recalibrated at one (1) year intervals or more frequently if instructed by the Engineer, all at the Contractor's expense.

Testing of other materials and concrete may be arranged by the Engineer in an approved independent laboratory at the cost of the Contractor in case the equipment is not operational or test facility does not exist at site.

As a confirmatory test, the Contractor shall carry out the third party lab test on his own cost upon the request of the Engineer.

Add after Sub-Clause: 5(a)

The test cubes prepared during the trial mixes shall be designated preliminary test cubes and as such shall comply with Clause 2004 Sub-Clause 5(a) of the Standard Specifications.

The engineer shall require the contractor to make trial mixes and preliminary test cube at least 40 days before the start of concreting.

2006 Transportation of Concrete

In the last paragraph delete from the end of first sentence "...shall not be longer than the initial setting time of the concrete" and substitute:

".. shall not be longer than 45 minutes. At the discretion of the Engineer, when the ambient air temperature is below 30 degrees Centigrade and conditions are suitable this period may be increased to 90 minutes but in no case shall it be longer than the initial setting time of the concrete."

2007 Placing of Concrete

(3) Placing Procedures

In the first sentence delete "...as nearly as possible in its final position." and substitute with:

"...as nearly as possible to and in no case more than 3 metres from its final position."

Add to the 7th Paragraph as a final sentence.

"In no case shall concrete be discharged from such devices at a height of more than 1.5 metres above its place of final disposition."

2011 Concreting in Hot Weather

(2) Concrete Placing in Hot Weather

Insert as Final Paragraph:

Concrete shall not be placed when the ambient air temperature exceeds 40 Degrees Celsius unless the Contractor submits a proposal for special precautions and receives written approval from the Engineer."

2012 Construction Joint

Add after Clause 2012

The surface of the concrete against which fresh concrete is to be placed is to be maintained in a damp condition for 24 hours before placing the fresh concrete.

2014 Reinforcement

Add after Sub-Clause (1)

Reinforcement bars shall be of high yield strength deformed (HYSD) type (Grade Designation Fe415) and/or Thermo Mechanically Treated, having specified minimum 0.2 percent proof stress of 500 MPa, conforming to IS:1139 or IS:1786 or equivalent or shall be as specified on the Drawings, or as instructed by the Engineer.

Add after Sub-Clause (4)

Prior to pouring the concrete all reinforcement placed in position shall be checked and approved by the Engineer

2017 Measurement

(4) Reinforcement

Delete "All types of reinforcement shall be measured in metric tonnes in the given ranges:" together with the three bullet ranges and substitute:

"All types of reinforcement shall be measured in metric tonnes irrespective of bar diameter"

2018 Payment

(2) Admixtures, Workability and Hardening Agent

Delete entire paragraph and replace with:

No separate payment shall be made for these agents and all costs in connection with these agents shall be considered included in the respective items of work provided in the Bills of Quantities.

(5) Payment for Sub-standard Works

Delete all paragraphs

Add new Clause 2019 "Plum Concrete" as follows:

2019 Plum Concrete

(1) Scope

This covers the works related to the construction of scour protection, works required to fill scour holes, works required to repair the existing structures, works required to construction the foundation base or to the works related to the construct of retaining structures etc as specified or directed.

(2) Materials

Stones/rocks shall be hard, dense, unlaminated natural stone, not liable to deterioration in water and of general quality of soundness and abrasion resistance prescribed for concrete aggregates. Broken rocks shall be of regular "cubical" shape and shall not be flaky. Flat or needle shaped rocks shall not be accepted unless the thickness of the individual piece exceeds 1/3 of their length. The specific gravity of the stone/rock shall be not less than 2.50 and when immersed in water for 24 hours, it shall not absorb water more than 5 percent of its dry weight tested in accordance with IS: 1124. The size of the stone/rock shall not be larger than 200 mm measured in any direction.

Concrete to be used in plum concrete shall be as specified in Section 2000.

(3) Construction

Composition of the plumb concrete shall be 60 to 70 % M15/20 concrete and 40 to 30 % of stones by volume or as directed by Engineer. The place to be filled up with the plum concrete shall be cleaned and chipped for adhesion with the concrete. Following completion of form work a layer of concrete minimum 100 mm thick shall be laid upon which clean and moist stones shall be placed at a distance of min 100 mm measured from face to face in any direction. The distance between the outer edge of the concrete mass and the nearest face of the stone to the edge shall not be less than 100 mm.

Then another layer of concrete having thickness not less than 100 mm measured from the top of the stone to the top surface of the layer shall be laid and compacted.

In case the proportion of concrete to stones is to be changed, the clear space between stones shall be adjusted as directed by the Engineer.

After compaction, again stones shall be placed on the layer as described above and the process shall be continued until the top layer of the concrete is completed. The placing of stones shall be staggered both in horizontal and vertical directions

(4) Tests and Standards of Acceptance

Stones shall be tested for specific gravity and water absorption test. The test result shall meet the requirements as specified in these Specifications.

Concrete shall be tested as specified in section 2000.

(5) Measurement

Plum concrete work shall be measured in cubic meter to the lines and levels shown on the drawing or as directed by the Engineer. Formworks (Class F2 finish) shall be measured in sq. m. separately and paid. Struts, bracing supports etc. shall not be measured separately. They are deemed included in the measurement of formwork.

(6) Payment

Payment will be made as per contract unit rate of the item which shall be the full and the final compensation to the Contractor as per Clause 112 to complete the works as per these Specifications.

Section 2100 – Pre-stressed Concrete

2102 General

In first paragraph in first sentence, replace "IRC:18-1985" by "IRC:18-2000".

2103 Cement and Concrete Classes for Prestressed Concrete Structures

In second paragraph, replace "M45/20" by "M50/20" or "M50/40".

2113 Measurement

Delete the third paragraph and replace with the following:

"Provision of ducts/sheaths shall be measured in meter which shall be inclusive of removal of extractable formers and then grouting in ducts."

Insert new Clause 2115 "Lifting and Placing of Precast Girders" as follows"

2115 Lifting and Placing of Precast Girders

(1) Description

The Work shall consist of:

- 1) Lifting or launching of the precast post-tensioned girders from the precast yard;
- 2) Transportation if required;
- 3) Installation of the girders at the designated space on the substructure;
- 4) Securing the girders in place for further operations with necessary false work or bracings.

(2) Submittals

The Contractor shall submit the following to the Engineer, in accordance with this Specification, for his approval:

- (a) A Girder Transportation Plan, if required, identifying the loading and transportation procedures, including the proposed route, schedule and traffic control procedures.
- (b) A Girder Erection Plan comprised of a schedule and detailed procedure clearly illustrating the method and sequence by which the Contractor proposes to unload and erect the precast prestressed concrete girders.

The Girder Erection Plan shall include detailed notes and Shop Drawings, as necessary to describe the following:

- i) Access to undertake work, including earth berms, work bridges, and/or platforms;
- ii) Type and capacity of equipment;
- iii) Sequence of operation, including position of cranes, trucks with girders, and traffic accommodation for all stages of unloading and erection;
- iv) Detailed crane position on the ground, particularly adjacent to substructure elements, such as piers and abutments;
- v) Details of temporary supports, falsework and bracings, including proposed methods to be used to ensure structure stability during further construction activities.

(3) Compliance

The Contractor shall strictly adhere to the following instructions:

- (a) During any operation of transportation or erection the girders shall be lifted only by the lifting loops provided at both ends. In the absence of such loops the girders shall be lifted by holding at both ends, the position of grip or support being at the designated position of bearing centerline. Lifting the girder by any kind of grip or support towards the mid-span is strictly prohibited.
- (b) The re-bars projecting outside the girder concrete surface, such as shear connector bars at the top or the dowel bars at the positions of cross girders or diaphragms, or any other bar provided for the purpose of further construction shall not be used for any operation of lifting, transportation or securing the girder in place. All such bars shall be kept in the shape shown in the drawings.
- (c) Any kind of support, fulcrum or underpinning at any position towards the mid-span from the designated position of bearing centerline is strictly prohibited during storage, lifting, transportation or installation of the precast girders.

(4) Measurement and Payment

Unless specified otherwise in the contract, the item of lifting, transportation and installation of the girders shall be considered one job per girder and shall be measured and paid in number per girder. All the incidental costs including the submittals shall be considered included in the quoted rate.

FOR REFERENCE ONLY

Add new "Section 2100A – Manufacture and Erection of Precast Prestressed Concrete Members" **after** "Section 2100 – Pre-stressed Concrete"

Section 2100A – Manufacture and Erection of Precast Prestressed Concrete Members

2101A Scope

This Section covers the manufacture and erection of precast and precast prestressed (pre-tensioned) concrete members.

2102A General

The manufacture and erection of precast and precast prestressed concrete members shall conform to the requirements of these specifications and details as shown on the Drawings.

Precast concrete elements shall be manufactured in plants certified to the current Canadian Standard Association (CSA) A23.4 requirements for the product groups corresponding to the element types being fabricated. Certification shall be in effect prior to the beginning of Work and maintained throughout the period of manufacture.

Materials and construction shall confirm to the current CSA A23.4 and the current PCI "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products". Where there is a discrepancy between the requirements of these two standards, the more stringent shall apply.

2103A Prefabrication Meeting

The Employer or its representative will at its discretion, convene a prefabrication meeting with the Contractor to review issues such as, but not limited to, lines of communication, fabricator and sub-fabricator scope of work, location of all work, procedures on quality control, plant certification, concrete source and mix designs, use of Hydration Stabilization Admixtures (if applicable), mill certificates, alternate details and procedures, and any other specific requirements of this specification as it relates to the Work.

2104A Working Drawings

The contractor shall submit Working drawings and details which shall consist of the following:

- (a) Shop drawings,
- (b) Transportation details, and
- (c) Erection details

Working drawings shall be in the same system of units as the design drawings.

Working drawing format

The Contractor shall transmit working drawings through attachments to e-mail or as paper copies. Electronic attachments to an email must total no more than 7 MB and must be submitted unzipped. Drawing files shall be submitted in PDF format to print out on A3 size pages. PDF sets shall be created by "distilling" CAD sheets rather than by scanning paper plan sets. Electronic attachments greater than 5 MB in size shall be sent in two parts by separate emails, denoting "1 of 2" and "2 of 2" in the subject lines after other required subject-line information. All PDF sheets within a single file shall be assembled ensuring that all sheets are rotated to a "ready to read" orientation within the PDF file set. Generally, A3 plan sheets in landscape, A4 note sheets in portrait, so that the majority of text is vertical. PDF sheets shall be ready to print out on appropriate sized paper sheets with no additional formatting required by the viewer. Drawing sets that are not legible will be returned to the Contractor without being reviewed and the Contractor shall submit two paper copies of the drawing set as substitutes. Drawings of large or complicated pieces, where it is not practical to show all details on an A3 sheet, may be submitted

on full size paper drawings, in which case the Contractor shall submit two copies of the drawing set. When revisions to full size paper drawings are required, the Contractor shall supply two complete sets to the Employer or its representative.

2105A Shop Drawings

Shop drawings shall show all information and details needed for the fabrication of the members including, but not limited to, such items as member shapes and dimensions, mark numbers and general arrangement of member locations, mass, prestressed and non-prestressed reinforcement, embedments, openings, block outs, chamfers, recesses, finishes, concrete mix design, stressing details, special tolerances, special handling instructions, lifting details and lifting locations.

Shop drawings shall be prepared and sealed by a qualified and competent Engineer hired by the Contractor when the Contractor is responsible for the design of items that are detailed on the shop drawings.

A copy of the shop drawings shall be available at all times at the location where the components shown on the drawings are being fabricated. Changes to the steelwork from what is shown on the reviewed shop drawings, or repairs made during fabrication and/or construction, shall be indicated by the Contractor on a marked-up set of shop drawings and submitted to the Client's Representative at the completion of the Work.

2106A Transport Details

Transportation details shall include such items as:

- (a) Description of hauling and handling equipment,
- (b) Weight of members,
- (c) Length and height of loads,
- (d) Location and method of member support,
- (e) Details for handling, storing, and loading of members.

Transportation details shall be prepared and sealed by the qualified and competent Engineer hired by the Contractor.

2107A Erection Drawings

Erection drawings shall show in detail the method of erection including, but not limited to, the following:

- (a) Erection procedures
- (b) Procedures for off-loading of members upon delivery
- (c) Details for temporary storage and support of members on site prior to erection
- (d) Equipment to be used
- (e) Layout or general arrangement drawing showing the layout of the members, equipment positioning, and access roads
- (f) Crane make, model, and capacity charts, boom length (s), crane placement, and access for transporting of members to crane(s)
- (g) Radii and loads for crane lifts
- (h) Rigging details
- (i) Mass of members, rigging and special installation equipment
- (j) Details for installation and removal of all falsework, temporary supports, temporary bearings, bracing, guys, dead-men, and lifting devices
- (k) Attachments to the bridge members and bridge structure for temporary support and special launching equipment
- (l) Detailed description of sequence of operations

- (m) Details for special installation equipment such as a launching truss, launching nose, head frames, spreader beams and rollers
- (n) Details for installation of members onto the permanent bearings
- (o) Traffic control plan for roadway traffic
- (p) Details for protection of existing utilities affected by the erection procedures
- (q) Layout and detail of fall protection and their sequence of installation.

The Contractor shall be responsible for the lateral stability of members and shall design and provide bracing as necessary until completion of the Work.

The erection drawings shall be complete in detail for all anticipated phases and conditions during erection and during the temporary support of members. The Contractor shall submit calculations upon request, to the Employer or its representative that demonstrate that allowable stresses are not exceeded in members, falsework, temporary bracing and temporary supports and that member capacities and final geometry will be correct. Erection drawings shall be prepared and sealed by the qualified and competent Engineer hired by the Contractor. The calculations shall be sealed by the Contractor's responsible engineer that who prepared and sealed the erection drawings.

A qualified and competent Engineer designated by the Contractor shall be responsible for any field designs and any changes made to the erection procedures. Field designs and changes to the erection procedures must be documented and sealed by the Contractor's responsible engineer and must be available at the Site prior to the affected erection work being carried out.

Immediately before placement of loading on falsework, the Contractor must ensure that the falsework is properly inspected by the Contractor's responsible engineer to verify that falsework has been erected in accordance with the latest approved erection drawings and supplementary instructions indicating the specific areas inspected.

Prestressed concrete stringers shall not be set on their bearings, nor shall the bridge deck be cast, until 30 days after the casting of the stringers. If it is necessary to erect the stringers earlier, they shall be placed on temporary supports. Prestressed concrete twin cell box stringers up to a maximum length of 20 metres may be shipped and erected after 10 days if the specified 28 day compressive strength has been attained.

2108A Submittals

The Contractor shall submit to the Employer or its representative one set of all working drawings in digital format. Prior to submission to the Employer or its representative, working drawings shall be reviewed and approved by the Contractor. By this review and approval, the Contractor represents that it has determined and verified all field measurements, field construction criteria, materials, and similar data, and that it has checked and coordinated each working drawing with the requirements of the work and the contract documents. The Contractor shall indicate its review and approval by including on each drawing the date and signature of a person designated by the Contractor as being responsible for the Work. Working drawings shall be submitted at least fourteen days prior to the fabrication of the Work and shall be accompanied by a transmittal listing each of the drawings submitted. At the time of submission, the Contractor must notify the Employer or its representative in writing of any deviations in the shop drawings from the requirements of the contract documents. Any Work done or materials ordered prior to the review of the working drawings shall be at the Contractor's risk. The Employer or its representative will review the drawings for general compliance with the contract requirements.

If modifications to the drawings are required, the Employer or its representative will return one set of drawings, marked up, to the Contractor. The Contractor shall re-submit one complete set of revised drawings in digital format to the Employer or its representative. Any drawing that has changed from the version originally submitted shall be identified as such on a transmittal accompanying the revised drawing set.

If no exceptions are taken to the drawings, the Employer or its representative will return one set of reviewed drawings to the Contractor. Shop drawings will not be reviewed without the transportation and erection drawings applicable to the members in question.

Any work done on materials ordered prior to the review of working drawings shall be at the Contractor's risk. Erection will not be allowed to proceed without the Employer or its representative review of the method proposed.

Review of working drawings shall not relieve the Contractor of any responsibility for dimensions or detail or for carrying out the work in full accordance with the drawings and specifications.

At least 14 days before fabrication is to commence and when requested by the Employer or its representative, the fabricator shall submit a schedule of fabrication to the Employer or its representative in the form of a Gantt Chart. At the discretion of the Employer or its representative, the schedule shall be updated on no less than a monthly basis. The schedule shall be made available to the Fabricator's Quality Control and to the Employer or its representative, the Contractor shall report any interim variations to the schedule.

2109A Quality Control and Quality Assurance

The Contractor shall implement a quality control program to meet the Contract requirements. The quality control plan shall be made available to the Employer or its representative for review.

The Employer or its representative will implement a quality assurance program by auditing the Contractor's quality control program and by inspection at its discretion.

The Contractor shall notify the Employer or its representative at least 14 days before fabrication is to commence. In addition, the Contractor shall provide a minimum of 48 hours notice to the Employer or its representative that a product will be available for inspection and/or certification by the Employer or its representative's. If the schedule is subsequently changed, the Contractor shall provide the 48 hour notice from the time that the Employer or its representative is notified of this change. If the product is not available or is not sufficiently complete for inspection/certification as notified, at the sole discretion of the Employer or its representative, the Contractor shall be charged stand-by costs for the Employer or its representative's. The Contractor shall allow the Employer or its representatives safe access to all parts of work, and shall supply such information and assistance as is required. When the Employer or its representative requests, the Contractor shall provide samples of any materials. Inspection by the Employer or its representative shall not relieve the Contractor from obligation to perform the work in accordance with the Contract.

Concrete tests shall be in accordance with the current CSA A23.2 and with concrete sampled as close to the point of final deposit into the form as is practicable. The Contractor shall make available at the plant a sheltered with curing tanks and a concrete Cube testing machine.

The Client may reject any items which, in its opinion, do not comply with the requirements of this specification. The Client in its sole discretion may back charge all inspection costs for the rejected material to the Contractor.

Each unit shall be certified as acceptable by a Employer or its representative before it is transported from the fabrication yard. This certification shall not relieve the Contractor of responsibility for subsequent damage or for defects which become apparent before the work is finally accepted by the Employer or its representative. The Contractor shall provide 5 days notice to the Employer or its representative regarding intent to transport a unit or product and the product shall be made available for inspection prior to loading and transportation.

MATERIALS

2110A Materials Supplied by the Contractor

(1) Cement

Cement shall conform to requirements specified in the standard specification.

(2) Aggregates

Fine and Coarse Aggregates shall conform to requirements specified in the standard specification. Coarse aggregates shall not exceed 20 mm nominal size.

(3) Water

Water shall conform to the requirements specified in standard specification. The mortars and tests shall be made in accordance with the current CSA A23.2.

(4) Reinforcing Steel

All reinforcement steel shall be in accordance with the requirements specified in standard specification. All reinforcing shall be of the lengths called for on the Drawings.

All bending schedules shall be furnished by the Contractor for the Employer or its representative's review and any material ordered before such review shall be at the Contractor's risk. The review of bending diagrams by the Employer or its representative shall in no way relieve the Contractor of responsibility for the correctness thereof.

(5) Prestressing Steel

Pre-tensioning steel shall consist of seven-wire, uncoated, low relaxation strands as called for on the Drawings and complying with the requirements of the current ASTM A 416M.

All strands for each project shall be obtained from one mill, and preferably strands from one heat shall be used for one project. Each reel of strand shall be identified by a secure tag showing the size of strand, heat number, and name or mark of the manufacturer.

The Contractor shall supply to the Employer or its representative, for each heat number, one set of the standard mill test reports. Strands shall be protected at all times to prevent corrosion and shall be dry and clean (free from scale, rust, oil, soap, grease, and other deleterious materials) immediately before the concrete is placed. No strand which has previously been tensioned or gripped by strand chucks shall be incorporated into the members.

(6) Admixtures

Chemical admixtures shall conform to the current ASTM C 494. Water reducing admixtures shall be of a lignosulfonic acid or salt, or hydroxylated carboxylic acid or salt.

Type B, Retarding or Type D, Water-Reducing and Retarding (Hydration Stabilizing) Admixtures conforming to the requirements of ASTM C 494 shall not be incorporated into the mix design and/or added to the concrete without the acceptance of the Employer or its representative.

(7) Storage of Materials

All materials shall be stored in accordance with the requirements of the current CSA A23.1. Cement lots shall be used in the order in which they are received.

(8) Premixed Aggregates

Pre-mixed aggregates in which the fine and coarse aggregates are combined in definite proportions will be permitted provided that the aggregates are delivered in batches directly to the hopper of the concrete mixer. Pre-mixed aggregates shall be transported and delivered in batches, each containing the correct quantity for one batch of concrete. At no time after the fine and coarse aggregates are combined shall any batch come in contact with or intermingle with any other batch.

(9) Forms

All exterior forms shall be of steel and shall be mortar-tight and of sufficient rigidity to prevent distortion due to incidental loadings during construction. Forms for skewed ends may be of rigid steel-reinforced plywood.

Wood forms will be permitted for the side walls of ballast wall pieces and for side walls of the deck panel pieces only. Wood formwork shall be designed, supplied and installed in accordance with CAN/CSA-S269.3-M. Wood formwork shall render a true smooth surface free from fins and projections. Only new plywood shall be permitted for plywood formwork.

Forms shall produce 20 mm chamfers and fillets as shown on the Drawings.

2111A Construction

(1) Reinforcing Steel

All reinforcing bars shall be accurately placed in the positions shown on the Drawings and firmly held during placing and setting of the concrete. Installation shall be in accordance with this specification. Tolerances shall be as specified by the current CSA A23.4.

When placed in the work the reinforcing steel shall be free from dirt, rust, loose scale, paint, oil, or other foreign materials. Bars shall be tied at all intersections except that where spacing is less than 300 mm, alternate intersections shall be tied. Form clearance shall be maintained by stays, ties, hangers or other approved supports. Before placing concrete, the placing and securing of reinforcing in the forms shall be inspected by the Employer or its representative.

All reinforcing shall be placed in the full lengths called for on the Drawings. Splicing of bars will not be permitted unless acceptable to the Employer or its representative. Splices shall be staggered. The bars shall be placed so as to maintain the minimum specified clearances between bars and the concrete surface. Welding of reinforcing steel shall be done only if called for on the Drawings.

(2) Stressing

The dials of gauges shall be at least 150 mm in diameter; digital gauges are an acceptable alternative. Gauges shall be calibrated with the hoses and jacks with which they are to be used, in accordance with CSA A23.4 clause 28.2.3.2. The calibration must have been performed within the previous 6 months of use or 12 months maximum. Before stressing commences, certified calibration curves shall be furnished to the Employer or its representative. All strand chucks shall be cleaned and carefully inspected before each use.

At the sole discretion of the Employer or its representative, the stressing operation shall be inspected by the Employer or its representative. The Contractor shall provide a minimum 48 hours' notice to the Employer or its representative for inspection prior to the stressing operation. If during the work any gauges give erratic results, the tension system or tension device shall be recalibrated.

The Contractor shall schedule the work so that placement of concrete follows tensioning of strands within 24 hours. In cases of unavoidable delay, a maximum period of 80 hours will be allowed, provided that the strands do not show unacceptable corrosion. The reason for the unavoidable delay shall be documented in the Contractor's Quality Control documentation along with documentation that strand condition is still acceptable. This information shall be made available to the Employer or its representative upon request.

Before tensioning, an initial force shall be applied to each strand to equalize stresses and eliminate slack. This force shall be between 10 and 20% of the final prestress force. After the initial tension forces have been applied, each strand shall be marked at the outer end of each chuck as a reference line from which the elongation of the strand can be measured.

The method of tensioning shall be such that the specified tension is maintained in the strands until the forces in the strands are transferred to the concrete member(s). The maximum jacking load in each strand shall be 80% of the ultimate strength of the strand.

A tensioning force shall be determined both by reading the jacking load on the calibrated gauge and by measuring the elongation of the strand. When the difference between the two methods is greater than 5%, the cause of the discrepancy shall be ascertained and corrected.

Elongations of strands shall be calculated and shown on the working drawings. Calculations for elongations shall include appropriate allowances for possible slippage or relaxation of the anchorages, friction at hold down points, temperature difference, and strand relaxation.

(3) Forms

The design of the forms shall take into account the effect of vibration of concrete as it is placed.

All exterior forms shall be set and maintained true to the designated lines until the concrete has hardened. When forms are unsatisfactory in any way, either before or during the placing of concrete, the Employer or its representative may order the work stopped until the defects have been corrected.

The shape, strength, rigidity, mortar-tightness and surface smoothness of re-used forms shall be maintained at all times. Any warped or bulged formwork must be realigned before being re-used. Forms which are unsatisfactory in any respect shall not be reused.

Void forms shall be of an approved product and shall be anchored firmly by a method acceptable to the Employer or its representative, to prevent displacement during the placing of the concrete. Any member with a void out of position in excess of the specified tolerance will be rejected. Exterior forms shall be treated in moderation with form oil before placing the concrete. Any material which will adhere to or discolor the concrete shall not be used.

Side forms and any attachments which would obstruct strain of the members shall be removed before transfer of stress.

(4) Admixtures

The Contractor shall add sufficient air-entraining agent to entrain 5% to 1% air as determined by an air-meter used in accordance with the current CSA A23.2 or as called for on the Drawings.

The use of any admixtures, such as air entraining agent, water-reducing agents or superplasticizer, shall be subject to the acceptance of the Employer or its representative.

Retarding or Water-Reducing and Retarding (Hydration Stabilizing) Admixtures shall not be incorporated into the mix design and/or added to the concrete without the acceptance of the Employer or its representative. When accepted by the Employer or its representative, the guidelines given in 2111A (7), 2112A (4) and 2114 A (1) shall apply.

(5) Measurement of Materials

Measurement of materials shall conform to the current CSA A23.1. The Contractor shall produce a certificate or report of inspection from a weights and measures approved, independent testing authority, and which is not more than 6 months old. The certificate or report will be accepted as proof of accuracy for the batching equipment. Cement in standard packages need not be weighed.

The surface moisture shall be determined in accordance with the current CSA A23.2 and the batch weights of aggregates and water adjusted accordingly.

(6) Mix Requirements

Slump measurement shall be determined by the current CSA A23.2. The mix design shall specify the slump and the tolerances in the measured slump shall be ± 20 mm for superplasticized concrete. Slump shall not exceed 200 mm for superplasticized concrete and shall be measured within 5 minutes after discharge from the mixer.

In order to minimize shrinkage and creep the cement/aggregate ratio shall be kept as low as is consistent with strength requirements.

(7) Batching and Mixing

The batching plant and mixing of concrete shall conform to the current CSA A23.1. Mixing shall begin within 15 minutes after the cement has been added either to the water or aggregate.

Within 30 minutes after the introduction of the mixing water to the cement and aggregate, or the cement to the aggregate, the concrete shall be placed in its final position in the forms. In hot weather or under other conditions contributing to quick stiffening of the concrete, the maximum allowable time may be reduced by the Employer or its representative.

Time of placement extensions will be considered on a case by case basis and may require the use of Hydration Stabilizing Admixtures (HSA's) conforming to the requirements of ASTM C 494 Type B, Retarding or Type D, Water-Reducing and Retarding Admixtures. If accepted by the Employer or its representative, guidelines for the use of HSA's shall be as follows:

- HSA modified concrete when used shall be fully discharged and placed in its final position within 90 minutes after the introduction of water to the cement and aggregate.
- All concrete in a given precast element shall be placed in its final position before 90 minutes.
- When HSA's are used, these time extensions are subject to preconstruction trials being conducted by the Contractor, to establish the appropriate HSA dosage to provide suitable extended slump life of concrete, without increasing the water/cementitious ratio of the concrete above that which would be required if HSA's were not used. The use of HSA's shall in no instance modify the maximum concrete temperature required at time of placement. A one time only addition of HSA will be allowed. This will be during initial batching of the concrete or immediately at completion of batching as recommended by the admixture manufacturer. Addition of HSA at any other time will be cause for rejection of the concrete.

Concrete mixing and transporting equipment shall be capable of placing concrete in the forms at the rate of 20 cubic metres per hour. Batch delivery shall be uniform and at a maximum interval of 10 minutes.

The maximum size of each batch shall not exceed the maximum rated capacity of the mixer as stated by the manufacturer of the mixer.

(8) Handling and Placing Concrete

In preparation for the placing of concrete, all construction debris and extraneous matter shall be removed from the interior of forms. Struts, stays and braces inside the forms shall be kept to a minimum and entirely removed when the concrete placing has reached an elevation rendering their service unnecessary.

Concrete shall be handled and placed in accordance with the requirements of the current CSA A23.1 and shall be placed in the shortest possible time after mixing is completed. When rectangular void forms are used, concrete under voids shall be placed and compacted before void forms are in position.

Concrete may be deposited a maximum of 2 m without the use of pipes, provided, when required, suitable measures are taken to prevent segregation and premature coating of upper reinforcing steel. When pipes are used they shall, as far as practicable, be kept full of concrete during placing and their lower ends shall be kept buried in the newly placed concrete.

After initial set of the concrete, the forms shall not be jarred and no stress shall be placed on reinforcing bars which project.

(9) Vibrations

Concrete, during and immediately after depositing, shall be thoroughly compacted. The compaction shall be accomplished by mechanical vibration subject to the following provisions:

- a) Vibration shall be internal for all accessible parts and shall be external for inaccessible parts.
- b) Vibrators shall be of a type and design acceptable to the Employer or its representative. They shall be capable of transmitting vibration to the concrete at frequencies recommended in the current CSA A23.1.
- c) The intensity of vibration shall be such as to visibly affect a mass of concrete of 50 mm slump

over a radius of at least 500 mm.

d) The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after concrete is placed in the forms.

e) Vibrators shall be manipulated so as to thoroughly work the concrete around the reinforcing and embedded fixtures and into the corners and angles of the forms.

Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. The vibrators shall be inserted into and withdrawn from the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete but shall not be continued so as to cause segregation. Vibration shall not be continued at any one point to the extent that localized areas of grout are formed.

Application of vibrators shall be at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective.

f) Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration. It shall not be used to make concrete flow in the forms over distances so great as to cause segregation, and vibrators shall not be used to transport concrete in the forms.

g) Vibration shall be supplemented by such spading as is necessary to ensure a smooth surface and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrators.

h) Vibrator heads shall be smaller than the minimum clear distance between prestressing strands.

2112A Test Specimen

The Contractor shall make available, as may be required by the Employer or its representative, samples of the concrete used in casting the members.

Further, the Contractor shall take samples and make test Cubes in the presence of the Employer or its representative and in accordance with the current CSA A23.2-1C, -3C and -9C.

At least 8 specimens per casting bed for prestressed girders, and 3 specimens per casting bed for non-prestressed components shall be made for testing. At the discretion of the Employer or its representative, depending on the quantity and type of element being cast, the number of specimens may be reduced.

(1) Release Strength

Two specimens from each end of the casting bed shall be cured in the same manner as the members and tested by the Contractor under the discretionary observation of the Employer or its representative at the Contractor's plant to assess the strength of the concrete at the time of transfer of force to the concrete. Only one specimen from each end need be tested if the average strength of the two Cubes is equal to or greater than the required release strength at transfer and no test specimen is more than 1.4 MPa below the release strength. No transfer of force shall occur without the acceptance of the Employer or its representative. At the discretion of the Employer or its representative, depending on the quantity and type of element being cast, the number of specimens may be reduced.

If all release specimens are tested and the release strength has not been attained, further testing with an impact hammer shall be allowed, provided a written procedure acceptable to the Employer or its representative is provided by the Contractor. The procedure shall correlate readings from areas of a prestressed girder where the release strength has been determined by concrete test specimens with similar areas on the girder in question. If this situation occurs, extra pairs of release specimens shall be made on future casts until confidence in determining the release strength is re-established.

When HSA's are incorporated into the mix design, pre- construction tests shall be conducted to determine the rate of early strength development for the selected concrete mix design. Tests shall be repeated when there is a change in the HSA dosage rate.

(2) 28 Day Strength

Two specimens from each end of the casting bed shall be identified as "acceptance specimens" and shall be cured in the curing tanks. These specimens shall be tested by the Contractor under the discretionary observation of the Employer or its representative to determine the twenty-eight-day strengths. The strength of the concrete in the member shall be taken as the average of the compressive strength of the "acceptance specimens", however, no individual specimen shall be more than 3.5 MPa below the specified strength and the average strength shall equal or exceed the 28-day strength.

(3) Additional Specimens

For special cases, extra specimens shall be made and tested if required by the Employer or its representative. In the case of ready mix, and plant mixed concrete with no established records, extra specimens, in addition to the release strength or 28-day strength specimens, shall be made from each load.

2113A Surface Finish

Throughout the work, special precautions shall be employed in formwork and concrete placing to produce a smooth and dense concrete. Exposed surfaces shall be as free as possible from form marks, fins, honey-combing and pock marking. Only a minimum amount of pointing will be allowed. Poor surface finish upon the removal of the forms shall be sufficient cause for the rejection of any member. All exposed edges shall be chamfered unless otherwise noted on the Drawings.

Roadway and surfaces to be bonded to shall be rough screeded by wood floating following initial strike off.

Surfaces to be bonded to shall be sandblasted or exposed with chemical retarder and water blasted to remove all laitance and foreign matter and to roughen the surface. The amplitude of the surface roughness shall be 5 mm. Loose sand and debris shall be washed or blown off. Water, cement or proprietary topping material shall not be added to the surface during finishing. The surface roughness amplitude at keyways in box beams and recesses at the lifting devices shall be approximately 1 mm.

The outer surfaces of all outside stringers shall be given a Class F1 finish.

A Class F1 finish shall provide surfaces of uniform colour and texture as viewed from 25 m. In order to produce a Class F1 finish, formwork shall be mortar tight and shall render a true surface. Fins 3 mm wide (maximum) shall be allowed at the panel joints; however, sheathing joints must be mortar tight. Irregularities of 3 mm in height with areas of 50 mm x 75 mm shall be allowed to a maximum of four such areas per 3 m² of formwork. Patches of dissimilar material will not be permitted. Horizontal and vertical joints shall be aligned.

All ties, bolts, nails and other metal specifically required for construction purposes shall be removed or cut back to a depth of 50 mm from the surfaces of the concrete and the resulting holes filled.

No dry ties shall be permitted; form tie rods shall remain embedded and terminate not less than 50 mm from the formed face of the concrete. Removable embedded fasteners on the ends of the rods shall be such as to leave holes of a regular shape for reaming and filling.

Honeycombs and voids over 25 mm diameter shall be filled, and all bugholes over 5 mm diameter shall be pointed. All fins and projections shall be removed with a hand stone or power grinder. The use of a power grinder shall be kept to a minimum and confined to the areas required.

When a rubbed finish is not called for, patches shall be textured with a mortar float or lightly brushed after trowelling smooth.

Where more than 50 voids or bugholes over 5 mm diameter occur per square metre, or if the surfaces are not acceptably uniform in colour or texture, the entire area affected shall be given a rubbed finish, as follows:

- allow patches to attain an initial set.
- keep surfaces saturated with water for 60 minutes before applying mortar.
- remove free water from surfaces.

apply mortar, proportioned as specified in the manufactures instruction and mixed at least 60 minutes before application, to the concrete surfaces with a sponge, float or a hand carborundum stone, and work mortar well into the surfaces.

- allow mortar to dry 30 - 60 minutes.
- remove residues from the surfaces by rubbing with clean dry burlap but with no addition of neat cement to the surface during the "sacking" operation

2114A Curing

Precast or precast prestressed members may be cured by steam as outlined herein.

(1) Steam Curing

The concrete shall attain its initial set before application of steam (generally 2 to 4 hours after the final placement of concrete or as justified by previous experience or in accordance with ASTM C403/C403M Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance, all to the acceptance of the Employer or its representative.

If HSA's are used in the mix design, time to attain initial set after concrete has been placed may exceed that required for conventional concrete.

After the placement of concrete, and until the concrete has attained initial set, sufficient steam shall be applied to hold the air surrounding the member at a temperature not less than 13 degrees Celsius.

Steam curing shall be done within a suitable enclosure to contain the steam and minimize moisture and heat losses. The enclosure shall allow free circulation of steam around the sides and tops of members and shall not be in contact with the member.

Steam at the outlets shall be at 100% relative humidity and low pressure. Application of the steam shall not be directly on the concrete or test cubes/cylinders and shall be from outlets distributed uniformly along the whole length of the member.

Temperatures within the concrete shall be measured and recorded. Recording of temperatures shall continue until the end of the cooling off period. If requested, temperature measurement records shall be made available to the Employer or its representative. During application of the steam the temperature within the concrete shall increase at a rate not to exceed 20 degrees Celsius per hour until an optimum temperature of 55 degrees Celsius is reached. In no case shall the temperature within the concrete exceed 60 degrees Celsius. The maximum temperature shall be held until the concrete has reached the transfer strength. In discontinuing the steam, the concrete temperature shall not decrease at a rate greater than 15 degrees Celsius per hour until a temperature has been reached 20 degrees Celsius above the temperature of the air to which the concrete will be exposed. The forms shall not be stripped until the completion of this cooling off period.

2215A Debonded strands

Where called for on the Drawings strands shall be debonded in accordance to IS: 1343-2012.

2116A Transfer of Force to Concrete

The transfer of the forces in the strands to the concrete member(s) shall be in accordance with the current CSA A23.4 (section on Detensioning).

2117A Protective Coating for Ends of Strands

After completion of concrete curing the ends of tensile strands shall be ground flush with the concrete surface. Where the ends of the members are to be embedded in concrete, the ends of the strands shall be painted with two coats of an organic zinc rich paint acceptable to the Employer or its representative. Where the ends of the members are not to be embedded in concrete, the ends of the members shall be covered with thixotropic epoxy to provide at least 3 mm cover for a band width of 50 mm on each side of all strands. This material is to be applied in accordance with the manufacturer's recommendations.

2118A Tolerances

For bridge stringers, the tolerances specified in the PCI "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products " shall be modified so that the length of each member, measured parallel to the longitudinal axis, to extreme corners, at 20 degrees Celsius, does not exceed the specified length by more than 10 mm / 10 m (25 mm maximum).

The Contractor shall employ an adequate method of checking tolerances both before and after placement of concrete. Review of the method of checking tolerances by the Employer or its representative will not limit the Contractor's responsibility for the accuracy of the members.

2119A Repairs to Members

Defective areas should be repaired immediately following removal of forms and before detensioning of strands, except where observation of the defect is not possible before detensioning.

If a defect is deemed to be a structural repair and meets the criteria stated in CSA A23.4 Section 33.3, notification shall be provided to the Employer or its representative and/or Inspector regarding the nature and extent of the defect. The Contractor shall follow the repair procedures described in CSA A23.4 Section 33.3 and submit the proposed repair procedure to the Employer or its representative for review and acceptance prior to any repair work being undertaken.

Holes, honeycomb spots, etc., shall be treated as for Class F1 finish. The method of repair for cracks, broken corners and edges, bulges and other defects shall be submitted to the Employer or its representative for review and acceptance. In any case, the Employer or its representative shall be notified regarding all repairs to precast and precast prestressed members.

2120A Handling, Storing and Loading of Members

Girders/stringers shall at all times be kept in their normal upright position during handling, storage and transportation. They shall be picked up by means of vertical forces or forces inclined towards the opposite ends of the members by no more than 30° from the vertical, applied to lifting devices near the ends of the stringers. I-beams shall be adequately stiffened during lifting and transportation. Stored girders shall rest on unyielding level supports near the ends of the girders/stringers.

When loaded for transportation, members shall be supported so that they will not be overstressed. In general, beams with straight strands may be supported up to one-tenth of their lengths from each end, whereas beams with draped strands should be supported at their bearings. If the Contractor believes that it is possible to safely support members further from their ends, the Contractor shall submit to the Employer or its representative, sketch (es), sealed by a registered professional engineer, showing the proposed support arrangement. Adequacy of support shall be based on the following assumptions:

- 100% impact on cantilevering ends, when checking stresses at supports,

- 50% negative impact on the whole member, when checking stress near midspan,
- 50% of prestress losses at time of shipping (unless circumstances dictate otherwise),
- allowable tensile stress = $0.5\sqrt{f_c}$
- allowable compressive stress = $0.6f_c$
- where f_c = estimated strength of concrete at time of shipping.

Such sketch(es) shall be submitted at the time of submittal of the working drawings. Members transported on supports further from their ends than outlined above, without the submittal of sketch(es) acceptable to the Employer or its representative, will be rejected.

Piles shall be lifted in the horizontal position at the pick-up positions shown on the drawings and at no other points. When stacking for storage or for delivery, piles shall be supported at the pickup points. They shall be handled carefully, avoiding dropping and jarring and avoiding surface abrasions or other damage.

Any member damaged so as to be, in the opinion of the Employer or its representative, unfit for the use for which it is intended shall be replaced at the Contractor's own expense.

2121A Placement of Concrete in Keyways

Keyways between box girders / stringers shall be clean and shall be pre-wet and saturated dry surfaces, before being filled with concrete.

Concrete in keyways shall attain a strength of at least 15 MPa before light traffic such as one-tonne trucks are allowed on the bridge, and at least 25 MPa before heavy loads such as concrete trucks are allowed on the bridge.

QUALITY CONTROL PROGRAM

2122A Quality Control Plan

These Subsections describe the general Quality Control Program required by the Employer or its representative for any Contractor/Fabricator undertaking the fabrication of permanent precast prestressed concrete bridge components.

The term "Quality Control" defines those activities that the Contractor/Fabricator performs to conform to the Contract.

The term "Quality Assurance" defines those activities that the Employer or its representative performs to ensure conformance to the Contract.

These Subsections contain statements of the Quality Objectives and Policies that the Employer or its representative considers essential for successful and economical quality management. They also outline the Procedures and Documentation to implement and confirm that the Objectives are met.

The provisions of the Quality Control Program set forth in these Subsections shall apply to all precast prestressed concrete bridge components contracted by the Employer or its representative.

These Subsections require the establishment of a Quality Organization within the Contractor with the responsibility for the successful and timely implementation of all necessary Quality Control activities. Some positions shown in the Suggested key personnel for the job shown in Table 1 at the end of the section may be held by the same individual. For example, the General Manager may also be the Contract Administrative Manager and the Purchasing Manager. The Plant Superintendent may also be the Receiver and the Structural Supervisor.

2123A Quality Objectives and Policies

(1) Quality Objectives

The Quality Objectives of the Employer or its representative cover all precast prestressed concrete members produced under the Contract, as follows:

- a) Completed products shall conform fully to the governing Codes and Specifications stipulated in the Contract.
- b) The Quality Control Program shall be fully integrated into the ongoing manufacturing activities of the Contractor/Fabricator.
- c) The operations of the Quality Control Program shall protect the interests of the Employer or its representative with respect to scheduled delivery date and contracted price.

(2) Quality Policy

The Quality Control Program is an essential part of this policy. It is based on the fact that the best way to do any job is to do it right the first time. This applies to all stages of the design, drafting, procurement, manufacturing and testing of the product.

A Quality Control Manager shall be appointed by the Contractor with defined responsibilities in resolving quality matters and shall report to a senior management level. At each hold point, the Quality Control Manager shall:

- Document the successful completion of each stage as it progresses through fabrication and erection.
- Identify and report nonconforming components.
- Initiate or recommend disposition of nonconforming components.
- Verify corrections.

Any persons assigned to perform quality control inspections shall be other than those performing or directly supervising the work and they shall not report directly to immediate supervisors responsible for producing the work.

The Quality Control Program is not subordinate to any design, drafting, procurement, manufacturing and testing activities, it is an essential part of them.

2124A Scope of the Quality Control Programs

This Quality Control Program governs the fabrication of precast prestressed concrete members for the Project. The Suggested key personnel for the job is shown in Table 1.

The General Manager appointed by the Contractor shall be responsible for:

- adhering to this Quality Control Program in all respects.
- ensuring that completed structural components shall conform fully to the applicable design and fabrication requirements stipulated in the Contract.
- ensuring that all required documentation is produced according to this Quality Control Program.

2125A Range of Capability

Within the Contractor organization, there shall be the necessary knowledge, skill (in-house or on a contract basis) and equipment to do the following work on precast concrete structural components:

- Design of lifting and erection devices not shown on drawings
- Preparation of shop fabrication drawings
- Preparation of bills of material

- Preparation of material requisitions and purchase orders
- Receiving, checking and storing materials for bridges
- Layout, form set-up, reinforcing steel, prestressing and post-tensioning
- Mix designs, batching, mixing, placing and curing of concrete
- Sampling, testing, making and breaking of concrete test Cubes
- Dimensional checking and verification
- Resolution of non-conformances
- Documentation of all stages of work with capability of tracing all major components
- Finishing, patching, storing and shipping
- Erection of bridge components

2126A Drawings and Specifications

The Chief Design Engineer of the Contractor shall be responsible for:

- the design and location of lift hooks and the preparation of stressing sheets for prestressing or post-tensioning; and for the design of the erection procedures and any special erection equipment needed.

The Chief Draftsperson of the Contractor shall be responsible for:

- obtaining the latest revision of the design Drawings and Specifications for the Work.
- submitting shop drawings and erection drawings to the Employer or its representative for acceptance before commencement of the work.
- preparing material requisitions containing a full description of the material sizes, material specifications, and certifications required for conformance to the contract.
- delivering the material requisitions to the Purchasing Manager in ample time to permit ordering, delivery and documentation and not delay the progress of the work.
- issuing requisitions for all sub-contracted drafting work and shall ensure that all conditions of the Contract are part of such sub-contracts.

2127A Material Control

All materials for structural components shall be ordered by the Purchasing Manager of the Contractor in full conformance with the material requisitions provided by the Chief Draftsperson.

The Purchase Orders shall contain all information necessary to ensure that materials purchased will comply fully with the terms of the Contract. Where mill certificates and test reports are required, it shall be so stated on the Purchase Order. Instructions shall state when the certificates and reports are to be delivered to the Contractor/Fabricator.

If a supplier proposes a substitute for any material, the Purchasing Manager shall refer the proposed substitution to the Chief Design Engineer for review. If the substitute is acceptable to the Employer or its representative, the Chief Draftsperson shall amend all drawings and requisitions, withdraw old issues and issue the new versions.

The Receiver shall:

- inspect all materials on arrival for conformance with the Purchase Orders.
- confirm that mill certificates and test reports are provided and that they correctly identify the materials delivered.
- arrange with the Plant Superintendent to store all materials for the Contract in segregated areas.
- ensure all materials are clearly identified with the Contract.
- issue a non-conformance report covering overage, shortage or damage to the materials. Copies of the report shall be provided to the Purchasing Manager and the Quality Control Manager.

The Purchasing Manager shall deliver all documentation to the Quality Control Manager for inclusion in the Quality Control file for the Contract.

2128A Pre-Pour Inspection and Reporting

The Quality Control Manager shall ensure only documented materials are used for the contract. Forms used in the casting of members shall be inspected prior to use and shall meet all the requirements of the current CSA A23.4.

Reinforcement shall be fabricated and placed to the current CSA A23.4 and the detailed shop drawings for quantity and spacing.

All cast in hardware shall be fabricated and placed according to the current CSA A23.4.

All pre-tensioning operations shall be done according to the current CSA A23.4. Care shall be taken to properly execute, supervise and record the operations in a clear and legible manner.

The Quality Control Manager shall file a written report of verification with the General Manager and report any non-conformance that may exist on any of the above items in 2128A.

2129A Concrete Control

All materials used in concrete mixes such as cement, fine and coarse aggregates, and admixtures, shall have representative certificates that can verify the quality of them.

Production of concrete shall be done according to the Contract. Records shall be kept of the mix type and quantity used in each pour.

Handling, placing and vibration of freshly mixed concrete shall be done as per specifications. Any variations and interruptions in the process shall be recorded.

The sampling and testing of freshly mixed concrete shall be in accordance with the specifications and procedures laid out in the current CSA A23.2. Concrete test specimens shall be made, cured and tested in accordance with the Specifications.

Reports for all concrete testing shall be kept on file and all non-conformities reported.

2130A Post Pour Inspection and Reporting

Dimensions of all members shall be verified to ensure tolerances are being maintained as per the specifications.

Verification shall be made of finishes, blockouts, keyways, projecting rebar, sole plates and protection of the cut off strands.

Camber shall be monitored at release and 28 days.

Members shall be stored according to the fabricator's documented procedures.

Members shall only be allowed to be transported out for erection after they have been approved by both Quality Control and accepted by the Employer or its representative.

Records shall be kept on file for all items in this section.

2131A Correction of Non-Conformities

When a non-conformance is encountered, the Quality Control Manager shall determine a recommended disposition and submit such disposition to the Employer or its representative for acceptance as quickly as possible.

If there is non-conformance to the material specification stipulated in the Purchase Order, the Purchasing Manager shall immediately find out the reasons for the delivery of non-conforming materials. If the material is of a grade superior to that ordered, the Quality Control Manager and the Chief Engineer shall be notified. They shall verify that the material is an acceptable alternative in all respects. This verification shall include consultation with the Employer or its representative. If the material is of a grade inferior to that ordered, it shall be rejected and the

correct material or a superior material shall be obtained.

If there is non-conformance of material delivery that will delay production, the Contract Administrative Manager and Plant Superintendent shall be notified immediately. They shall be given revised delivery dates for the adjustment of production scheduling. The General Manager shall determine the alternatives available and shall notify the Employer or its representative.

If there are pre-pour non-conformities in form set-up, prestressing, rebar placement, hardware and blockout size and location, the Quality Control Manager and Structural Supervisor shall immediately review the non-conformance and notify the Chief Design Engineer who may require further investigation prior to submitting corrective action to the Employer or its representative for acceptance. If the necessary corrective action will result in delay to production, the General Manager shall be notified for adjustment to the production schedule. The Plant Superintendent shall inform the Quality Control Manager when the corrective actions are being done so that conformance can be verified and the non-conformance report cancelled.

If there are post-pour non-conformities such as honeycombs or large voids after form removal, before de-tensioning the Quality Control Manager shall notify the Chief Design Engineer who will investigate and submit corrective action to the Employer or its representative for acceptance. Other non-conformities such as low concrete strength, dimensional errors due to faulty forms, variations in camber from design and missing hardware shall all be reported by the Quality Control Manager to the Employer or its representative.

2132A Calibration of Measurement and Test Equipment

All measurement and testing equipment owned by the Contractor/Fabricator and used in the Quality Control Program shall be calibrated and re-calibrated at the intervals and in the manner stipulated in the current CSA A23.4.

When the concrete testing services are contracted to a qualified testing firm the testing firm shall meet the requirements of the latest edition of CSA A283. The testing firm shall confirm in writing to the Employer or its representative that all their measurement and test equipment used in the testing is properly calibrated. If requested, they shall furnish copies of the calibration test data for inclusion in the contract documentation.

2133A Records Retention

The Contractor/Fabricator's Record File for each Contract shall contain the pertinent drawings, purchase orders, bills of material, material mill certificates, test reports, Quality Control documents, and certificates of compliance.

The Contractor/Fabricator's Record File shall be made available to the Employer or its representative upon request.

Items in the Contractor/Fabricator's Record File shall be retained as per company policy.

The Quality Control Manager shall ensure that each file is complete in all respects before it is placed in the Project archives.

2134A Hold Points

In planning the work flow, it is essential to coordinate with the Employer or its representative to decide "hold" points for inspection. A list of hold points shall be drawn up by the Contractor/Fabricator and the Employer or its representative at a prefabrication meeting. The Employer or its representative should be continuously informed of progress so that delays are minimized.

The "hold" points will typically include, but not be limited to, the following:

- verification of form size, quality and layout
- after stressing, rebar and hardware placement
- prior to form close up
- sampling and testing of concrete
- release Cubes
- after patching and finishing
- 28 day Cube results

- shipping arrangements.

It must be understood that work will not proceed past a "hold" point until it has been signed off by Quality Control and Quality Assurance. Reports must be completed promptly.

2135A Measurement

(a) The item of supply of precast, pre-stressed box girder including transportation of girder from fabrication yard to construction site, including all the activities to be carried out as per the Specifications all complete as shown in drawings shall be considered one job per girder and measured in number (nr) for a specified length of the girder. No separate measurement of the individual items of works shall be made.

(b) Lifting and placing in position precast box girder with suitable equipment including erection, shifting and removal of the erecting equipment & its accessories, all complete as shown in drawing shall be considered one job per girder and shall be measured and paid in number per girder.

2136A Payment

The item of supply of precast, pre-stressed box girder including transportation of girder from fabrication yard to construction site, including all required materials to fabricate and the construction activities, curing, repairs to members, testing, etc. that have to be carried out as per this Specifications, all complete as shown in drawings and the item of lifting and placing in position precast box girder with suitable equipment including erection, shifting and removal of the erecting equipment & its accessories, all complete as shown in drawing shall be paid as per their respective contract unit rates which shall be the full and final compensation to the Contractor as per clause 112 and also for the cost of load tests if specified, and other ancillary and incidental works necessary to complete the item as per this Specification.

The concrete grade to be used for precast prestressed concrete box girder shall be as per specified in the drawings. Likewise, the formworks types, reinforcement bars, straight strands, debonding/sheathing etc. shall be used as specified in this Specifications and as shown in the drawings. No separate payment of the individual items of works shall be made.

Table 1: Suggested Key Personnel

General Manager
Chief Engineer
Chief Design Engineer
Chief Draft person
Purchasing Manager
Quality Control Manager
Contract Administrative Manager
Plant Superintendent
Structural Supervisor

Section 2400 – Miscellaneous Structures

2401 Gabions

(1) Scope

Delete “This Clause covers the furnishing of materials and construction of gabion works...” and substitute:

“This Clause covers the furnishing of materials, reuse of salvaged materials and construction of gabion works...”

(2) Materials

(b) Gabions

Delete Table 24.2 and Add:

Gabion Mesh Type shall be 100 x 120 mm (hexagonal), thickness of mesh wire shall be 3 mm, thickness of binding and connecting wire shall be 2.4 mm, and thickness of selvedge wire shall be 3.9 mm. Gabion boxes and mattresses shall be machine made.

(3) Construction of Gabions

(a) General Requirements

Add as additional last paragraph:

“Where salvaged materials are to be used they shall meet the requirements of this Specification and are subject to written approval of the Engineer.”

(4) Test and standard of Acceptance

Delete clause (c) and (d)

(5) Measurement

Replace all by following:

The Gabion and Gabion Mattresses shall be measured in cubic meters all in place which includes all materials, making of gabion boxes, placing of gabion boxes in position, filling of stones and tying with binding wires and tension wires as specified.

(6) Payment

Replace all by following:

The quantity of the gabion masonry work measured as provided above shall be paid at the contract unit price per cubic meter.

The contract unit price for gabion masonry work will be considered full and final compensation to the Contractor for all expenditure incurred in providing and placing machine made gabion wire mesh boxes and mattresses, including binding wires, selvedge wire and tension wires. It also considers stone filling in gabions including fixing of gabions in position, tying with binding wires and tension wires and preparation of the bottom foundation to the lines and in levels shown on the drawings or as directed by the Engineer and in accordance with the Drawings and the Specifications.

The payment for gabion masonry work shall be made in two (2) installments. First installment 80% of the unit rate quoted in the BOQ shall be made after the construction of gabion masonry structures. The second installment 20% of the unit rate quoted in the BOQ

shall be made after carrying out the backfilling of the structures as per the Specifications and to the satisfaction of the Engineer along with the payment of the backfill works.

2406 Scour Protection and River Training Works

(3) Rip Rap

(b) Tests and standards of acceptance

Delete Fourth sentence onwards

(5) Pitching/Revetment on Slopes

(a) Dry stone Pitching

(ii) Tests and standards of acceptance

Delete the second and third paragraphs

(c) Gabion Pitching

(ii) Test and standards of Acceptance

Delete the second paragraph and replace with the provisions of 2401(4) above

FOR REFERENCE ONLY

Section 2600 – Masonry for Structures

2603 Construction

(1) General

Add the words “levelled, compacted” after the word “cleaned” in the first sentence of fourth paragraph.

2610 Test and Standard of Acceptance

Delete the second and third paragraphs

2611 Measurement

Delete the 2nd sentence and add:

“Pointing shall not be measured separately”.

2612 Payment

Delete the 1st sentence and replace by:

The stone masonry shall be paid at the contract unit price which shall be full and the final compensation to the Contractor as per Clause 112. The cost of the pointing shall be deemed to be included in the cost of the stone masonry.

Add the following paragraph after the first paragraph.

The payment for stone masonry works shall be made in two (2) instalments. First instalment 80% of the unit rate quoted in the BOQ shall be made after the construction of stone masonry structures. The second instalment 20% of the unit rate quoted in the BOQ shall be made after carrying out the backfilling of the structures as per the Specifications and to the satisfaction of the Engineer along with the payment of the backfill works.

FOR REFERENCE ONLY

Section 2700 – Repair of RCC Structures

2709 Cement Grouting

Add Sub-clause (7) Measurement and Payment after Sub-clause (6) Testing as follow:

(7) Measurement and Payment

The cement (pressure) grouting with admixtures shall be measured and paid in number (nr) for each pile which shall include adding of admixtures, and other set ups as necessary for performing the works as per the specifications.

The measurement in number (nr) for each pile shall have the limits for 0.06 m3 of grouting material including admixtures or 100 kg of cement quantity. Any under or over use of specified limit of grouting material shall be deducted or paid separately in kilogram of cement-admixture.

FOR REFERENCE ONLY

Section 2800 – Bio-Engineering Works

2802 Provision of Seeds

(2) Tree and Shrub Seed Collection

Delete Clause 2802 (2) (f) and substitute:

- (f) Seeds shall only be collected when fully ripe. Seeds collected early shall not be accepted. The Contractor shall be held liable if the germination rate of seeds is lower than the rates given for each species in manuals and information bulletins published by the Geo- Environmental Unit of the Department of Roads or the Ministry of Forests and Soil Conservation.

2803 Provision of Plant Cuttings

(2) Provision of Hardwood Cuttings

Delete Clause 2803 (2) (g) and substitute:

- (g) Hardwood cuttings are to be 20 to 40 mm in diameter and 300 to 500 mm long for palisades, vegetated stone-pitched walls and for pegging jute netting; 450 to 600 mm for brush layers; and a minimum of 1000 mm long for fascines. These sizes should not be exceeded unless specified or approved by the Engineer.

Delete Clause 2803 (2) (h) and substitute:

- (h) For live check dams, all cuttings are to be 2000 mm in length; the cuttings for cross pieces should be 20to50 mm in diameter and the truncheon cuttings for the vertical elements should be 30 to 80 mm in diameter: truncheon cuttings are made from the species listed in Clause (j) below. These sizes should not be exceeded unless specified or approved by the Engineer.

Delete Clause 2803 (2) (j) and substitute:

- (j) Once cuttings have been made, they shall be wrapped in wet hessian jute immediately. At all times, cuttings shall be kept moist and as cool as possible, and shall be wrapped in wet hessian between all operations such as taking from the parent plant, trimming and planting. Under any circumstances, all cuttings shall be planted the same day that they are made.

Provision of Bamboo Cuttings

Delete Table 28.2: Types of bamboo cuttings and substitute:

Table 28.2: Types of Bamboo Cuttings

Local name	Botanical name	Best propagation	Details
Choya /tama bans	Dendrocalamus hamiltonii	Rhizome cuttings / Single node culm	Rhizome cuttings: culm 2500-3000 mm length, leave all branches; rhizome 300-500mm. Single node culm cuttings: 1 node and 150mm of culm each side, straight and fine cut, main branch should be 200-300 mm long.

Dhanu bans	Bambusa balcooa	Rhizome cuttings / Single node culm	Rhizome cuttings: culm 2500-3000 mm length, leave all branches; rhizome 300-500mm. Single node culm cuttings: 1 node and 150mm of culm each side, straight and fine cut, main branch should be 200-300 mm long.
Kalo bans	Dendrocalamus hookeri	Rhizome cuttings / Single node culm	Rhizome cuttings: culm 2500-3000 mm length, leave all branches; rhizome 300-500 mm. Single node culm cuttings: 1 node and 150mm of culm each side, straight and fine cut, main branch should be 200-300 mm long.
Mal bans	Bambusa nutans (subsp. cupulata)	Rhizome cuttings	Rhizome cuttings: culm 2500-3000 mm length, leave all branches; rhizome 300-500 mm.
Nibha/ghopi/lyas bans	Ampelocalamus patellaris	Rhizome cuttings	Rhizome cuttings: culm 2500-3000 mm length, leave all branches; rhizome 300-500 mm.
Padang bans	Himalayacalamus hookerianus	Rhizome cuttings	Rhizome cuttings: culm 1500-2000 mm length, leave higher branches; rhizome 200-300 mm.
Tharu bans	Bambusa nutans (subsp. nutans)	Rhizome cuttings	Rhizome cuttings: culm 2500-3000 mm length, leave all branches; rhizome 300-500 mm.
Titenigalo bans	Drepanostachyum intermedium	Rhizome cuttings	Rhizome cuttings: culm 1500-2000 mm length, leave higher branches; rhizome 200-300 mm.

2804 Nursery Construction

Delete Table 28.3: Construction details of nursery beds and substitute:

Table 28.3: Construction Details of Nursery Beds

Bed type	Bed size	Details of construction
Beds for grass seeds, grass slips and tree stool cuttings	1000-1200 mm wide × 250 mm high	50 mm of washed gravel placed above the ground; then 50 mm of 1:1 mix of sieved soil and compost; and topped with 150 mm of 3:1 mix of sieved forest topsoil and washed sand
Seed beds for tree seedlings	1000 mm wide × 170 mm high	50 mm of washed gravel placed above the ground; then 50 mm of unsieved forest soil; 50 mm of 1:3 mix of sieved forest soil and washed sand; and topped with 20 mm of washed, sieved and sterilized sand.
Stand out beds for polypots seedling	1000 mm wide × 150 mm high	50 mm layer of gravel placed above compacted ground. A flat stone or brick surround.
Beds for the propagation of bamboo culm cuttings	1000 mm wide × 300 mm high	Ground below the bed is dug to a depth of 300 mm. Bed is made with 100 mm of un-sieved soil (lower) and 200 mm of sieved soil (upper). A bund 100 mm high is formed around the edge.

(2) Construction of Nursery Beds

Delete Clause 2804 (2)(d) and substitute:-

- (d) Soil beds shall be constructed to hold grass seeds, grasses being propagated by vegetative means and trees tool cuttings. These can be of any practical length but shall be flat and of 1200 mm base width and 1000 mm of top width on compacted

and cambered ground. They shall rise to a height of 250 mm above the surrounding ground. They shall be made up as follows: 50 mm of washed gravel is placed above the ground; then 50 mm of 1:1 mix of sieved soil and compost; and the bed is topped with 150 mm of 3:1 mix of fertile, loamy forest topsoil and washed sand. All sieving should be done with a mesh size of 2 mm or smaller.

2805 Nursery Operation and Management

Delete Clauses (b) and replace with:

- (f) Measurement and Payment: The basis of measurement shall be the actual numbers of plants counted, certified and accepted by the Engineer. Quantities measured as above shall be deemed to be included in the other respective items in the Bill of Quantities. So no separate payment will be made this operation and management.

2806 Final Slope Preparation for Bio-Engineering

(2) Final preparation of fill Slopes for Bio-Engineering

Add, between Clauses (b) and (c) the following:

If backfilling is required behind a retaining structure, the trimmed material shall be compacted at intervals as the operation proceeds. This will require halting the trimming. The debris shall be redistributed and compacted as backfill. Compaction shall be carried out in level layers approximately 100 – 150 mm thick, laid back into the slope at about 5°. In dry conditions, water shall be added while compacting the material.

2807 Site Planting and Sowing

(2) Direct Seed Sowing of Shrubs and Trees on Site

Delete 2807 (2) (a) and substitute:

- (a) The Contractor shall be required to carry out the sowing of shrub and tree seeds along the green belt, median, road side or any other location specified by the Engineer in accordance with the Engineer's specific instructions (if any).

Delete 2807 (2) (g) and substitute:

- (g) In some cases the Engineer will instruct that seed shall be broadcast on to the slope. In this case, seeding shall be started at the top of the site, working down slope as evenly as possible so that the whole site is lightly covered. This shall be instructed where the site is still active and only warrants minimum expenditure, or where the site is naturally rough, providing plenty of niches in which the seed can catch. Quantities of seed shall depend on the type of seed involved but are generally half that of the quantities used in the nursery. With utis (*Alnusnepalensis*) seed it should be at a rate of 1 gramme of seed per square metre.

Delete 2807 (2) (h) and substitute:

- (h) Measurement and Payment: Work shall be measured in square metres on the basis of the actual area of surface over which seeds have been sown. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, providing seeds, all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein. If the seeds are supplied through a separate contract, costs for the supply of the same shall not be included herein. However, if the Contractor is responsible for the supply and storage of seeds no separate payment shall be made for these items.

(3) Site Planting of Grass Slips and Cuttings

Delete 2807 (3) (e) and substitute:

- (e) All grass slips, whether supplied to the Contractor from a nursery (if so provided in the Contract) or otherwise obtained by the Contractor, shall be prepared for planting by the Contractor as given below. The Contractor shall transport them from the source wrapped in hessian jute. At all times, plants shall be kept moist and as cool as possible, and should be wrapped in wet hessian between all operations such as

extraction from the bed, pruning and planting. Under any circumstances, all plants shall be planted in the same day that they are lifted from the nursery or other source.

(4) Site Planting of Shrubs and Trees raised in Polythene Pots

Delete 2807 (4) (a) second sentence and substitute:

- (a) The Contractor shall be required to carry out the planting of seedlings along the green belt, median, road side or any other location specified by the Engineer in accordance with the Engineer's specific instructions (if any).

(6) Brush Layering, Palisades and Fascines

Delete 2807 (6) (d) and substitute:

- (d) If the instruction to the Contractor includes the provision of cuttings, then the Engineer shall specify the species and expected sources, and the Contractor must then obtain the cuttings required. This shall be done in the manner described in Sub-clause 2803 (2), wherein the size of the cuttings shall be 20-40mm in diameter and of length 300-500 mm for palisades, 450-600 mm for brush layering, and a minimum of 1000 mm for fascines.

Delete 2807 (6) (e) and substitute:

- (e) Cuttings of the following species, if specified for truncheons, shall be a minimum of 2000 mm in length: chuletro (*Brassaiopsishainla*), dabdabe (*Garugapinnata*), kavro (*Ficuslacor*), phaledo (*Erythrina species*) and *Gliricidia sepium*.

Delete 2807 (6) (k) (iv) and substitute:

- (k) (iv) Cuttings shall then be laid along each trench, so that they lie horizontally along the trench. There shall normally be eight cuttings together, although where material is short a minimum of four cuttings is permissible at the Engineer's discretion. They shall be overlapped so that no two ends coincide. Under no circumstances shall buds be damaged. The cuttings shall then be tied using jute or coir (coconut fibre) string at 500 mm intervals to form a bundle, as the fascine is created, it thereby forms a continuous bundle right across the slope.

2810 Site Protection

Add Clause 2810 (4) as follows:

(4) Fabrication and Placement of Steel Tree Guards

The Contractor shall provide steel tree guards as shown on the Drawings in place of the bamboo tree guards as specified in the Clause 2810 (2). No bamboo tree guards shall be accepted.

The steel tree guards shall be placed in line with the provisions detailed in the Clause 2810 (3).

No separate payment shall be made for the fabrication and placement of steel tree guards. All the associated cost is deemed to be included in the relevant item of tree and/or shrub plantation.

2811 Site Aftercare and Maintenance

Delete Clause 2811 (12) and substitute:

(12) Measurement and Payment

"No separate payment will be made for site aftercare and maintenance and all the associated cost is deemed to be included in the relevant item rate".

Add new Clause 2812 "Turving" as follows:

2812 Turfing

Grass turfs shall be harvested, delivered and planted within 36 hours, unless otherwise authorized by the Engineer. Grass turfs shall be free from noxious weeds and diseases and shall contain a minimum of 30 mm of soil. The turfs shall be of a variety of grass approved by the Engineer. The grass shall either have been grown specifically for turf purposes, mown regularly and maintained to provide an approved quality of uniformity or shall be from some other source approved by the Engineer. It shall be harvested by special machines which ensure an even depth of cut with sufficient root material and soil.

Areas to be grassed by turfing shall be given a layer of topsoil at least 75 mm thick unless, due to the presence of suitable sub-soil, the Engineer orders that the topsoil be omitted. The areas to be turfed shall be thoroughly watered beforehand so that they are wet to a depth of at least 150 mm when turfing is done. The surface shall be made slightly rough to ensure a good penetration of roots into the soil. Turfs shall be protected against drying out and shall be kept moist from the time of harvesting until finally placed.

The first row of turfs shall, where it is possible, be laid in a straight line and, if on a slope, starting at the bottom of the slope. The turfs shall be butted tightly against each other, care being taken not to stretch or overlap turfs. Where a good fit cannot be obtained, the intervening space shall be filled with topsoil. The next row shall be placed in the same manner tightly against the bottom row with the joints staggered and so on until the full area is covered with turfs. On steep slopes, when instructed by the Engineer, the turfs shall be held in position by sufficient wooden stakes approximately 300 mm long by 20 mm in diameter.

The Contractor shall water the turfs directly after placing to prevent undue drying out. As turfing is completed, each section shall be lightly rolled and thoroughly watered.

All turfed and planted areas shall be adequately watered at frequent and regular intervals in order to ensure proper germination of seeds and growth of grass until the grass has established an acceptable cover and thereafter until the beginning of the maintenance period of the grass. The amount and frequency of watering shall be subject to the Engineer's approval.

The Contractor shall further mow the grass on all areas that have been grassed whenever so instructed by the Engineer, until the end of the maintenance period. All grass cuttings shall be collected and disposed of if so directed by the Engineer. Weeds shall be controlled by means of pulling, cutting or any other approved means. Any bare patches where the grass has been damaged or has dried up, shall be cultivated, planted, turfed or seeded at the Contractor's expense until an acceptable healthy cover has been established.

All grassed areas shall have acceptable cover as defined below at both the beginning and the end of the maintenance period.

In the case of turfing, acceptable cover shall mean that the full area shall be covered with live, healthy grass without bare patches at any time not less than three months after turfing.

"The maintenance period of grass shall commence when an acceptable cover as defined above has been established and shall be one year or until the end of the defects liability period, whichever is the later.

Payment for Turfing shall be by the square metre instructed to be turfed and successfully turfed to provide acceptable cover as defined above. Payment shall include the full costs of all works required to establish and maintain acceptable cover and to comply with the Specification requirements.

Add new Clause 2813 "Site Planting of Bamboo" as follows:

2813 Site Planting of Bamboo

- (a) The planting of bamboo is intended to replace or restore something of the natural vegetation on the slope to be treated. The Contractor is required to carry out the planting of seedlings to the Engineer's specific instructions.
- (b) The spacing of plants will be determined according to individual site conditions. However, it will normally be at two meters across a slope and five meters up and down the slope.
- (c) Select a suitable culm of the parent clump and dig out the rhizome carefully. Cut off the clump about two meters above the ground level. Cut the rhizome where it branches from the main plant, taking great care not to damage buds and small roots.
- (d) Wrap the root ball in damp Hessian and transport the cuttings to site for planting on the same day
- (e) Dig a hole (at least five times the size of the cutting rhizomes) and plant the rhizome either upright or at right angles to the slope. Carefully backfill the hole and firm the soil as much as possible.
- (f) The Contractor is required to supervise all field operations very closely. The planting of bamboo is a delicate business and should be approached in the same way as the planting of horticultural seedlings. The Contractor should employ experienced agricultural or forestry labourers for this work.
- (g) Measurement and Payment:

The measurement shall be made in number of plants planted, counted and accepted by the engineer at site. The quantities measured shall be paid at the unit rates shown in the Bill of Quantities.

Add new Clause 2814 "Live Check Dam Construction" as follows:

2814 Live Check Dam Construction

- (a) The cuttings should be at least 2000 mm long and 50-80 mm in diameter made from woody material that is 6 to 30 months old. The contractor is to collect the cuttings from local area and transport them from there wrapped in hessian jute. At all times, cuttings are to be kept moist and as cool as possible. Under any circumstances, all plants supplied must be planted the same day.
- (b) Cuttings of the following species, if specified, should be a minimum of 2000 mm in length: dabdabe (*Garugapinnata*), kavro (*Ficuslacor*), phaledo (*Erythrinasp*) and *Gliricidiasepium*.
- (c) Spacing between check dams depends on the steepness of the gully slope and the profile of the floor. Live check dams should normally be at intervals of between three and five metres. Within check dams, cuttings should be about 30 to 50 mm apart.
- (d) Live check dams should be constructed as given below, unless specified differently.
 - (i) Make a hole deep and big enough to insert vertical hardwood cuttings of the largest size available. Use a crowbar if necessary to extend the hole.
 - (ii) Insert the vertical cuttings by carefully pushing them into the hole and firming the soil around them. Try not to damage the bark. They should protrude about 300 mm above the ground surface.
 - (iii) Place long hardwood cuttings on the uphill side of the vertical stakes.
 - (iv) Backfill around the check dam and compact the soil.
- (e) Measurement and Payment: The measurement shall be measured separately as per the accepted final product in linear metre. The quantities measured shall be paid at the unit rates shown in the Bill of Quantities.

Add new Clause 2815 "Measurement and Payment" as follows:

2815 Measurement and Payment

All the bioengineering items shall be measured in the respective units of the items of works specified in the Bill of Quantities (BoQ).

The payment of all the bio-engineering work items shall be made in two installments. First installment of 50% of the unit rate quoted in the BoQ shall be made after the completion of the works as per the Specifications and satisfaction to the Engineer. The second installment 50% of the unit rate quoted in the BoQ shall be made at the end of Defect Liability/Notification Period after carrying out the aftercare and maintenance of the bioengineering works that deem to be covered within the quoted rate, and acceptable to the Engineer.

Add new Clause 2816 "Priority on Bioengineering Works" as follows:

2816 Priority on Bio-engineering Works

The bioengineering works are very important to stabilize the side slopes. The Contractor shall require prioritizing the bioengineering works and stabilizing the side slopes before carrying out the bituminous works at the locations as instructed by the Engineer. In case of the bituminous works are carried out by the Contractor without carrying out the bioengineering works, and hence the bituminous works are damaged due to the slope failure in the absence of the bioengineering works, it is the responsibility of the Contractor to repair the bituminous works at his own cost. In no case, the Works shall be considered as completed unless the Contractor completes the bioengineering works to the satisfaction of the Engineer.

FOR REFERENCE ONLY

Section 3100 – Miscellaneous Works

3105 Railings

(5) GI Pipe Railing with RCC Posts

(a) GI Pipe

Add at the end of the second paragraph as follows:

“The diameter of GI Pipe shall be as shown in the Drawings and/or as mentioned in the Bill of Quantities.”

(b) RCC Posts

Add at the end of the second paragraph as follows:

“The size of the RCC poles shall be as shown in the Drawings.”

Insert new Sub-clause (5a) “GI Pipe Railing” as follows:

(5a) GI Pipe for Railing

GI pipe shall comply with NS: 199/2046 (Heavy Duty). The diameter of GI Pipe shall be as shown in the Drawings and/or as mentioned in the Bill of Quantities.

All GI pipes shall be free from abrasions, rough or sharp edges, and shall not be kinked, twisted or bent. Any pipe which does not meet the requirements of the field Specifications shall be replaced at the Contractor's expense.

(6) Measurement

Delete the whole content of (6) Measurement and replace with the followings:

(a) Measurement for GI Pipe Railing with RCC Posts

GI Pipe Railing with RCC Post shall be measured in linear meter for complete railing set including GI pipes and RCC posts installed and accepted. Railing shall include both horizontal and vertical members, posts including bolts, nuts, fittings, etc as shown in the Drawings. It also includes the excavation for the foundation of the RCC post, preparation of the foundation and backfilling with the concrete of grade as shown in the Drawings to the satisfaction of the Engineer.

(b) Measurement for GI Pipe for Railing

GI Pipe for Railing shall be measured in linear meter installed and accepted. The works shall also include complete fixing with the respective elements including bolts, nuts, fittings, etc. as shown in the Drawings to the satisfaction of the Engineer.

3106 Approach Slabs

(1) General

Delete “..M20/40.” and substitute with:

“..M25/20.”

(2) Measurement

Delete existing sentence and substitute:

"Approach slabs shall be measured as per the respective items in Section 2000 - Concrete for Structures".

3107 Drainage Spouts

(5) Measurement

Delete the entire content and modify as follows:

The drainage spouts shall be measured in number for the complete set including the materials, fabrication, and placement and finishing and the pipes for drainage spouts as shown in the Drawings and to the satisfaction of the Engineer.

(6) Payment

Delete the entire content and modify as follows:

The drainage spouts shall be paid at the contract unit price as mentioned in the Bill of Quantities. Such cost shall include all the cost for the complete set including the materials, fabrication, and placement and finishing and the pipes for drainage spouts as shown in the Drawings and to the satisfaction of the Engineer.

3108 Utility Facilities

(3) Measurement

Delete the entire content and modify as follows:

The galvanized steel bracket under utility facilities shall be measured in number (nr) for the complete set including procurement of materials, fabrication, installation and completion as shown in the Drawings and to the satisfaction of the Engineer.

(4) Payment

Delete the entire content and modify as follows:

The galvanized steel bracket under utility facilities shall be paid at the contract unit price as mentioned in the Bill of Quantities. The payment shall include all the cost for the complete set including procurement of materials, fabrication, installation and completion as shown in the Drawings and to the satisfaction of the Engineer.

3109 Weep Holes

(2) Measurement

Modify the 1st sentence of this Sub-Clause as follows:

Where instructed by the Engineer and placed in the works, pipes for weep holes shall be measured in linear meter.

(3) Payment

"Modify the 1st sentence of this Sub-Clause as follows:

Pipes for weep holes shall be paid at the contract unit price shown in the Bill of Quantities.

Add new Clause 3111 "Interlocking Concrete Block" after Clause "3110 Pervious Material" as follow:

3111 Interlocking Concrete Block

(1) General

Interlocking Concrete Block Pavements shall be used in footpaths for the pedestrians or as per the instruction of the Engineer. Laying of the blocks shall be done, precisely at the indicated level and profile. The blocks shall be laid to the pattern as shown in the drawings or as directed by the Engineer. The blocks shall be laid as tight as possible to each other. The maximum joint width shall be limited to 4 mm. Fine angular sand as per specification shall be brushed into the joints, and thereafter compaction shall be done with a vibrating plate compactor on a clean surface.

(2) Design Parameters

(a) Block Thickness

The thickness of interlocking blocks shall be 60 mm. The blocks shall be constructed with M 20/20 grade concrete. All blocks should be of the same thickness, with a maximum allowable tolerance limit of ± 3 mm.

(b) Sand Bedding and Jointing

A layer of stone dust /fine sand bedding is provided between block pavement and compacted base with granular sub-base material to provide a cushion between the hard base and the paving blocks and to correct the permitted surface unevenness of sub-base.

The stone dust /fine sand bed should not be too thick lest it would be difficult to control the surface level of the blocks. A layer thickness of 20 to 40 mm is found to be satisfactory. The stone dust /fine sand used should be free from plastic clay and should be angular type.

Joints between blocks are filled by stone dust /fine sand. Normally, the bottom 20 to 30 mm of the joint gets filled with bedding sand, whereas, the remainder space has to be filled with jointing sand by brooming it from the top. The joints are normally 2 to 4 mm wide.

(c) Base Construction

This layer is the important structural layer of a block pavement. The material used for base construction consists of granular sub-base material meeting the standard of Clause 1201 of 75 mm thickness.

(3) Construction

(a) General

The construction of interlocking concrete block involves preparation of sub-grade and sub-base layers, bedding sand and finally the laying of blocks. The block paving can be done entirely by manual labour. However, for efficient construction work, the work force has to be properly trained for this specialized job.

(b) Preparation of Sub-grade

Sub-grade should be compacted in layers of 150 mm to 200 mm thickness as per the use of compaction equipment. The prepared sub-grade should be graded and trimmed to a tolerance of ± 20 mm of the design level.

(c) Sub-base Course

The granular sub-base course shall be constructed following the section 1201 of this Specification.

(d) Placing and Screeding of Bedding Sand

The thickness of the sand bed after compaction should be in the range of 20 - 40 mm, whereas, in the loose form it can be 25 to 50 mm. Bedding sand should not be used to fill-up local depressions on the surface of a sub-base layer. The depressions should be repaired in advance before placing sand. Sand to be used should be uniformly in loose condition and should have uniform moisture content. Best moisture content is between 6 to 8 percent.

The processed sand is spread to the required thickness. The sand is subsequently compacted with plate vibrators weighing 0.6 tonnes or more.

(e) Laying of Blocks

Blocks can be laid generally by manual labour.

As far as possible, laying should proceed in one direction only, along the entire width of the area to be paved.

While locating the starting line, the following should be considered:

- In case of irregular shaped edge restraints or strip, it is better to start from straight sting line.
- Influence of alignment of edge restraints on achieving and maintaining laying bond.

(4) Measurement and Payment

The measurement and payment of the interlocking concrete block shall be made in Square meter. Payment made at the contract unit rate for interlocking concrete block shall be payment in full compensation for furnishing all labour, material, tools, equipment including all incidental costs necessary for carrying out the works of sub-grade preparation, sub-base layer, stone dust/fine sand laying, supply and laying of concrete blocks etc at site conforming to the Specifications as per approved drawings or as directed by the Engineer.

Add new Clause 3112 "Passenger Shade" after Clause 3111 "Interlocking Concrete Block" as follow:

3112 Passenger Shades

The Contractor shall procure materials and fabricate the passenger shades as shown on the Drawings. The location of the passenger shades at site shall be determined and instructed by the Engineer. The placement, erection and the finishing of the passenger shades shall be to the satisfaction of the Engineer. The passenger shades shall be measured and paid in number as specified in the Bill of Quantities for the procurement of material, general requirements, fabrication, placement and finishing of the whole unit of the passenger shade as shown on the drawings and to the satisfaction of the Engineer. The payment shall be full and final to the Contractor to complete the work as per these specifications and the Drawings.

Add new Clause 3113 "High Density Poly-Ethylene (HDPE) Pipe" after Clause 3112 "Passenger Shade" as follow:

3113 High Density Poly-Ethylene (HDPE) Pipe

The pipes to be used for sub-surface drain, grouting purpose etc. if specified in the Bill of Quantities shall be made of high density polyethylene and shall comply with series II as specified by NS40/2040. Jointing of pipes shall be done by fine-cutting and heating following with equipment complying with the prescription of the HDPE pipe manufacturer. Pipes may be jointed with angles to fit the requirements of the terrain, but angles shall not exceed the maximum specified by the manufacturer. The joints shall be water tight and develop the same strength as unjointed HDPE material. The method of jointing shall be approved by the Engineer prior to starting the works.

For sub-surface drain purpose, pipes shall be provided with holes of minimum 5 mm diameter. The pipes shall be perforated by drilling minimum 50 holes per meter length on the upper half of the pipe in a staggered pattern uniformly distributed. The Engineer might adjust these specifications according to the site conditions.

The measurement and payment of HDPE pipe shall be made in meter (m) including jointing, fitting etc. all complete. The contract unit rate shall be the full and the final compensation to the Contractor as per Clause 112 to complete the works as per these Specifications.

Add new Clause 3114 "Galvanized Steel Base Plate" after Clause 3113 "High Density Poly-Ethylene (HDPE) Pipe" as follow:

3114 Galvanized Steel Base Plate

The galvanized steel base plate shall be used in fixing the pedestrian handrails and crash barriers railings in the bridges as shown in the drawings. Materials, fabrication, transportation, installation and painting for base plate shall conform to the requirements of Section 2200.

All complete steel base plate elements, bolts, nuts, hardware and other steel fittings shall be galvanised or painted with an approved paint as specified in the Contract. If galvanized, all elements of the base plate shall be free from abrasions, rough or sharp edges, and shall not be kinked, twisted or bent.

Galvanising shall be carried out as per Clause 2209. Damaged galvanised surfaces, edges of holes and ends of base plate cut after galvanising shall be cleaned and re-galvanised.

The galvanized steel base plate shall be measured and paid in Kilogram (kg) for the complete works as shown in the drawings and specified in these specifications.

Add new Clause 3115 "Reflectorized Enamel Painting Works" after Clause 3114 "Galvanized Steel Base Plate" as follow:

3115 Reflectorized Enamel Painting Works

This Clause covers the enamel painting works of safety and/or warning barrier with black or yellow paint as indicated on the Drawing or instructed by the Engineer.

The colour, width and layout of the painting on safety and/or warning barrier shall be in accordance with the Traffic Signs Manual (latest publication), Department of Roads.

Paint shall comply with the requirements of NS 408/054 or BS 6044 (1987) or as specified in the Contract. If specified in the contract, the paint may also be reflectorised paint, in which case the paint shall be reflectorised by the addition of reflecting beads (ballotini). The ballotini shall comply with BS 6088:1981 (1993).

The paint shall be delivered to the site in sealed containers bearing the name of the manufacturer and the type of paint.

The viscosity of the paint shall be such that it can be applied without thinning. Under no circumstance thinning shall be allowed.

The paint shall not be applied to damp surfaces or when the relative humidity exceeds 80%, or at temperatures lower than 10o C, or when, in the opinion of the Engineer, wind strength is such that it may adversely affect the painting operations.

Before the paint is applied, the surface shall be clean and dry and completely free from any soil grease, oil, acid or any other material which shall be detrimental to the bond between the paint and the surface. The portions of the surface where the paint is to be applied shall be properly cleaned by means of watering, brooming or compressed air.

If any material not complying with the requirement is delivered on the site or used in the works, or if any sub-standard work is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer at the Contractor's own cost. Rejected paint which has been splashed or dripped on the surfacing, kerbs, structures or other such surfaces, shall be removed by the Contractor at his own cost, in such a way that the marking or split paint shall not show up again later. After the application of paint, it shall be protected against damage by traffic or other causes. The Contractor is responsible at his own cost for the correction of the painting works damaged by the external means.

The painting works shall be measured and paid in square meter for completed works. The quantities measured as provided above shall be full and the final compensation to the Contractor as per Clause 112 for carrying out the work as specified in these Specifications.

3116 Road Studs

1 Introduction

Retro-reflective road studs (also known as raised retro-reflective road pavement markers or cat's eyes) shall be installed along the centre-line, islands, path-line markings, etc., to improve delineation and safety along the road, junctions of strategic importance and complexity. Road studs are also used across the carriageway to serve as speed arrestor coupled with eschewing warning as they create rumbling sensation to the road user driving through these devices. A series of such road studs are laid in advance to junctions/crossing and end of fly-over section where road crashes is prevalent.

These road studs may also be self-illuminating (solar-powered) to improve delineation. Road studs provide better night time delineation than painted centre-lines and edge lines, especially under adverse weather condition. It is also useful in reducing encroachment across the centre-line at narrow bridges. A 33 percent reduction of crashes have been reported following the installation of these delineating devices.

2 Road Stud specification

2.1 Type, Dimensions and Strength of Studs

Road studs shall be manufactured from plastic materials with reflectors for all type of roads. The reflectors should have abrasion resistant protective coating. The studs with anchorage or without anchorage can be bonded to the road surface using suitable epoxy or bitumen adhesive as prescribed by the manufacturer.

The road studs shall comply with the BS873: Part 4: 1987 and shall be either of the corner-cube and glass spheres encased in an acrylic or plastic shell with honeycomb or flat base but the former type is preferable owing to its effectiveness. The road studs may have one reflecting surface (uni-directional) or two (bi-directional), with each reflecting surface fitted either with a

corner-cube reflecting plate or with groups of reflecting glass spheres.

The road studs should be about 15 – 20 mm thick and withstand a minimum of 200 KN compressive force. One reflecting surface of the corner-cube type should have at least 6100 - 7350 mm² reflective area. The glass-sphere type of markers should have a reflective number of at least 18. The road studs should be durable up to five years when installed in asphalt concrete roads.

Uni-directional road studs shall be used on one directional carriageway of undivided roads one way street or slip roads. Bi-directional road studs shall be used for two directional roads to delineate the centre line and edge line.

2.2 Lateral Placement of Road Studs

The road studs should be installed at the mid-point of the gap between the broken lines or at a lateral offset of 25 -50 mm in the case of solid lines at the interval stipulated in Table 1, to avoid interference or prevent degradation of their reflective properties during the re-painting works of the road-markings.

On carriageway with a paved shoulder, road studs shall be placed outside the shoulder side edge-line and shall be set back by a distance of 50 mm from the edge-line.

When the road studs are to be placed on edge-line having no paved shoulder, it can be placed on edge line due to space constraints.

When road studs are to be installed on median side edge, it should be ensured that they are not placed on the median line marking but in hard strip or kerb shy distance¹, keeping at least 50 mm set back from the median side edge-line by ensuring a minimum 100 mm clearance distance from the vertical face of the raised kerb. This measure is expected to help in preventing road studs being covered by mud and dust that generally accumulate on the raised kerb corner of the median side as well as on the edge-line side due to mud/ dust accumulating from the footpath.

At flushed or depressed medians, road studs shall be placed at a minimum 50 mm clearance from the median side edge-line.

In extreme circumstances where the width of the hard strips or shy distance is inadequate to allow placement of the studs at the 50 mm minimum set back distance, the studs can be placed adjacent to the edge-line and even directly on the edge-line.

Road studs with anchorage is preferable for edge lines. If all the road studs with anchorage is to be applied to road markings other than edge-lines, the anchorage shall be applied to ensure proper workmanship so that the pavement structure will not be affected during the installation process. However, the road studs with anchorages are not recommended for concrete roads.

2.3 Colour Scheme

The colour scheme of the road studs to be adopted will depend on location where they are to be installed as outlined below.

Colour scheme	Area where road stud is to be installed
White	Lane-line, centre-line and turning-path lines
Yellow	Lines which should not be crossed; right edge of carriageway of multi-lane divided or one-way carriageway; around ghost-islands
Red	Line which should not be crossed, left edge-lines and around traffic
Green	Crossable edge-lines like lay byes, boundary of acceleration or deceleration line on left side of the carriageway of multi-lane divided
Blue	To mark fire hydrants or water-supply locations only

¹ Shy distance to the kerbed median is the minimum offset required from the kerb to mitigate vehicles hitting the kerb.

Uni-directional carriageways should have one coloured face with the applicable colour given above. For bi-directional carriageway, two colours should be adopted (e.g. red- white, white-white or yellow-yellow) bi-directional road studs should be adopted.

2.4 Spacing of Road Studs

Table 1 indicates the spacing of the road studs to adopt at undivided roads of various cross-sections.

Table 1 Spacing of Road Studs at Undivided Roads

Road Cross-section	Traffic Movement	Carriage way (m)	Type of marking	Area	Spacing (m)
Single/ intermediate lane	Two way	< 5.5	Dashed centre line	Urban	NA
				Rural	NA
			Hazard centre line	Urban	NA
				Rural	NA
			Solid centre line	Urban	NA
				Rural	NA
			Edge-line normal section	Urban/ rural	18
			Edge warning section	Urban/ rural	9
			Edge no parking section	Urban/ rural	6
			Lane line normal section	Urban	NA
				Rural	NA
			Lane line warning section	Urban	NA
				Rural	NA
			Lane line no overtaking	Urban	NA
				Rural	NA
Two lane	Two way	5.5 -7	Dashed centre line	Urban	12
				Rural	18
			Hazard centre line	Urban	6
				Rural	9
			Solid centre line	Urban	4
				Rural	6
			Edge -line normal section	Urban/ rural	18
			Edge warning section	Urban/ rural	9
			Edge no parking section	Urban/ rural	6
			Lane line normal section	Urban	NA
				Rural	NA
			Lane line warning section	Urban	NA
				Rural	NA
			Lane line no overtaking	Urban	NA
				Rural	NA
			Left/ right turn path-line	Urban/rural	12

Road Cross-section	Traffic Movement	Carriage way (m)	Type of marking	Area	Spacing (m)
Two lane road with paved shoulder; three or four lane road	Two way	>7	Through turn path-line	Urban/rural	24
			Traffic islands, medians	Urban/rural	4 -12
			Dashed centre line	Urban	12
				Rural	18
			Hazard centre line	Urban	6
				Rural	9
			Solid centre line	Urban	4
				Rural	6
			Edge -line normal section	Urban/ rural	18
			Edge warning section	Urban/ rural	9
			Edge no parking section	Urban/ rural	6
			Lane line normal section	Urban	Not required
				Rural	
			Lane line warning section	Urban	Not required
				Rural	
			Lane line no overtaking	Urban	4
				Rural	6
			Left/ right turn path-line	Urban/rural	12
			Through turn path-line	Urban/rural	24
			Traffic islands, medians	Urban/rural	4 -12

Table 2 indicates the spacing of road studs at divided carriageway of various cross sections.

Table 2 Spacing of Road Studs at Divided Carriageway

Road Cross-section	One side Carriageway (m)	Type of marking	Area	Spacing (m)
Four/ six lane divided carriageway; four/ six lane divided expressway	>7.3	Shoulder edge-line normal section	Urban/ rural	18
		Shoulder edge warning section	Urban/ rural	9
		Shoulder edge no parking section	Urban/ rural	6
		Lane line normal section	Urban	Not required
			Rural	
		Lane line warning section	Urban	6
			Rural	9
		Lane line no overtaking	Urban	4
			Rural	6
		Median edge normal section	Urban/ rural	18
		Median edge warning section	Urban/ rural	9
		Median edge no parking section	Urban/ rural	6

At one-way ramp, slip road or street, road studs shall be spaced as given in

Table 3 below.

Table 3 Spacing of Road Studs at One-way Ramp, Slip Road or Street

Road Cross-section	Traffic Movement	Carriageway (m)	Type of marking	Area	Spacing (m)
Single/ intermediate lane ramp/ slip road/ one way street	One way	<5.5	Edge-line normal section	Urban/ rural	18
			Edge warning section	Urban/ rural	9
			Edge no parking section	Urban/ rural	6
			Left/ right turn path-line	Urban/ rural	12
			Through turn path-line	Urban/ rural	24
			Traffic islands, medians	Urban/ rural	4 -12
Two lane ramp/ slip lane/ one way street	One way	>7.5	Edge-line normal section	Urban/ rural	18
			Edge warning section	Urban/ rural	9
			Edge no parking section	Urban/ rural	6
			Lane line normal section	Urban	NA
				Rural	NA
			Lane line warning section	Urban	NA
				Rural	NA
			Lane line no overtaking	Urban	8 (optional)
				Rural	12 (optional)
			Left/ right turn path-line	Urban/ rural	12
Three lane ramp/ slip lane/ one way street	One way	>11	Edge-line normal section	Urban/ rural	18
			Edge warning section	Urban/ rural	9
			Edge no parking section	Urban/ rural	6
			Lane line normal section	Urban	12 (optional)
				Rural	18 (optional)
			Lane line warning section	Urban	12 (optional)
				Rural	18 (optional)
			Lane line no overtaking	Urban	8 (optional)
				Rural	12 (optional)
			Left/ right turn path-line	Urban/ rural	12
			Through turn path-line	Urban/ rural	24
			Traffic islands, medians	Urban/ rural	4 -12

Red coloured studs should be provided at the chevron/ diagonal marking at a spacing equal to spacing of the diagonal/ chevron marking. The studs shall be placed to mark the continuous line of the diagonal / chevron marking and should be placed inside the continuous line marking at the mid-point of the diagonal/ chevron marking as shown in Figure 1.

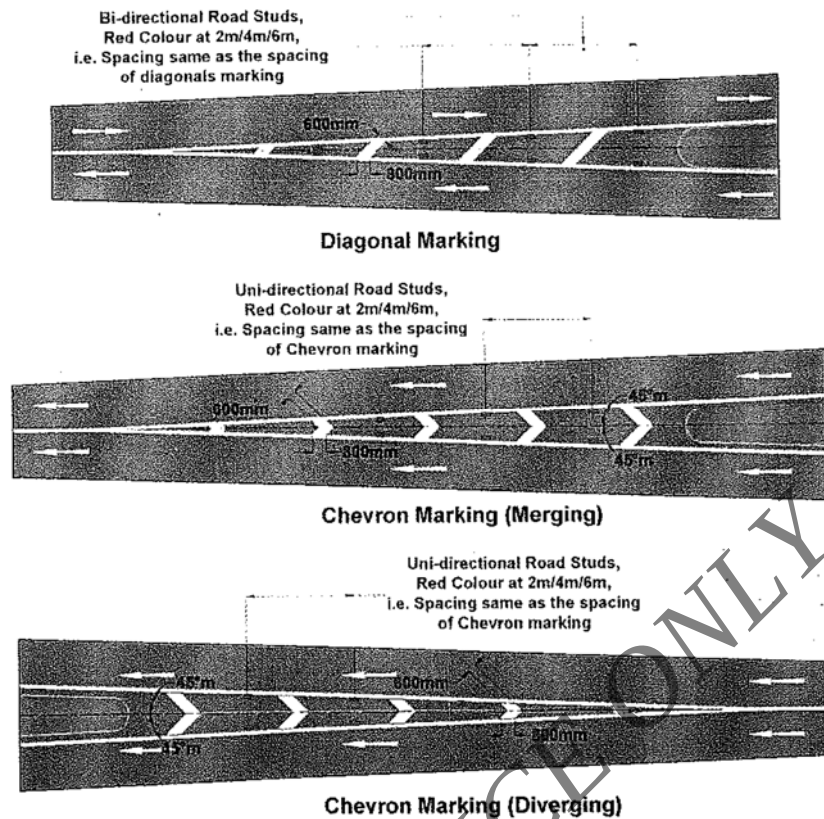


Figure 1 Layout of road studs at diagonal/ chevron marking

At continuous lines delineating acceleration/ deceleration lanes, requiring lane changing, green coloured studs should be provided at 8 m spacing as shown in Figure 2.

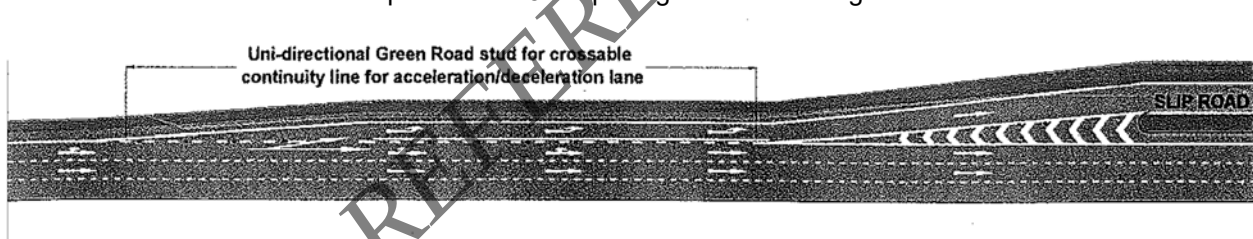


Figure 2 Layout of road studs at acceleration/ deceleration lanes

At zebra crossing, two rows of yellow studs should be provided at 1.37 m spacing across the carriageway at both sides of the crossing as shown in Figure 3.

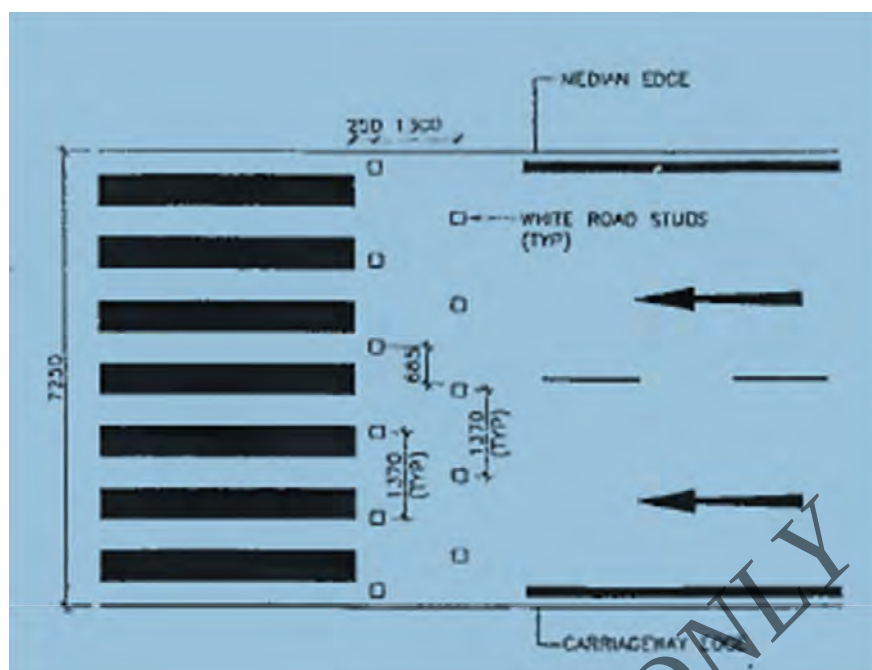


Figure 3 Layout of road studs at zebra crossing

As shown in Figure 3 above, the first row of stud should be installed 0.25 m before the crossing and the second row of studs should be placed 1.3 m away from the first row. The studs in each row should be offset by 0.685 m between one another as illustrated above.

2.5 Solar Road Studs

Solar powered road studs are more effective to immediately draw the attention of drivers and should be provided at the approaches to road crash prone locations and highly hazardous locations such as bridge crossing; toll plaza; sharp curves; pedestrian crossings; lane transition; road humps; junctions; channel islands; construction sites, railroad crossings, median opening and lane change, etc., where normal studs are not as effective due to streetlights and other roadside activities.

Solar road studs functions automatically and do not rely on vehicle headlight to be visible. The intense brightness of the light emitting diode (LED) make them visible at distance more than 800 m under favour conditions. The solar studs are also more distinctly visible during rainy and foggy weather when conventional studs could be ineffective.

The spacing of solar studs should be the same as that for conventional studs as discussed in the previous sections.

2.6 Installing Road Studs

Prior to the installation of the road studs, the road surface should be cleaned and dust, oil, grease and other contaminants removed. The surface should, where possible, be allowed to weather and compact for a minimum period of six to eight weeks depending on the traffic conditions prior to the installation of these devices.

The retro-reflective face of the road studs should face the oncoming traffic rather than being placed perpendicular to the tangent of the turning path. These devices should be oriented in such a way so that the full reflective effect is realized when vehicles make their approach. The studs shall be bonded to the asphalt road-surface using any of the following methods:

- bituminous or epoxy adhesive
- Thermoplastic pads adhesive
- Heavy duty road nail plus epoxy adhesive.

For surface-dressed road-surfaces, the same method of installation may be followed taking extra precaution to ensure that a good bonding.

Normally, the road studs shall be laid immediately after applying the adhesive. However, some markers may require a groove to be cut into pavement for proper siting and anchorage. One shall refer to the manufacturer's manual to ensure that such groove are properly made using the right equipment and prevent undue damage to the pavement structure.

2.7 Method to apply the adhesive

The bonding should be in accordance with the manufacturer's instructions. The quantity of adhesive should be just sufficient to completely cover the area of contact between the road stud and the pavement and any excess adhesive around the edges of the markers should be removed to prevent it from obscuring the reflective face of the stud.

It is advisable to install the road studs when the road surface is completely dry and the road surface temperature is greater than 4°C unless the adhesive manufacturer recommends its suitability for use in other conditions as well. A blowlamp may be used to prepare the road surface in damp or cold weather but care should be taken not to overheat the road surface as this can weaken it. In cases of doubt the adhesive manufacturer's advice should be sought to ascertain whether the adhesive is appropriate to the road-surface in question.

Any settling of fillers or pigments in the adhesive components should be completely dispersed by stirring before the components are mixed.

Just before use the components should be thoroughly mixed to give a homogeneous mixture of uniform colour. The manufacturer's instructions should be followed regarding the application of the adhesive and any safety precautions.

Studs that are bonded with bitumen, thermoplastic pads should be heated as per the manufacturer's instruction and laid over the road surface. The adhesive should be used as quickly as possible after mixing and never after it has started to set in the container. Once the adhesive is applied, the stud should be laid over it by pressing it as per the manufacturer's instruction. The whole of the bottom surface of the stud should be allowed to set sufficiently before allowing traffic to run over it.

2.8 Installing anchored road studs

The anchor bolts shall be properly inserted into the road stud as per the manufacturer's literature.

The cavities formed in the bituminous surfaces should be thoroughly cleaned. In cold weather, the temperature of the bituminous material immediately surrounding the cavities formed to accept the anchored part of a marker, may be gently heated in order to prevent rapid cooling of any heated bituminous adhesive or grout used in the cavity. Care should be taken not to overheat the road surface as this can weaken it.

2.9 Warrant for Installation

Though road studs shall be installed at all types of roads in rural and urban areas, they shall be confined at present within the strategic roads and complex intersections due to their high initial cost. Their installations will also be limited to roads having a surface that will not be subject to major repair for at least one year.

The road studs should be used to supplement the central-line of a single carriageway two-way road, if the annual average daily traffic (AADT) is in excess of the following:

- 3,000 vehicles on rural roads
- 6,000 vehicles on urban roads

These devices should be used to supplement the edge line if the AADT is in excess of the following:

- 5,000 vehicles on rural roads
- 10,000 vehicles on urban roads

2.10 Special Warrants for Installations

On single carriageway, two-way roads, road studs should be provided where the following conditions exist.

- Roads where the average annual rainfall exceeds 1000 mm or is prone to frequent fogs
- Sharp curves
- Hazardous locations, such as narrow bridges
- Roads having high incidence of crash at night and when wet

2.11 Exceptions to the Warrants for Installations

- Road studs may not be necessary on edge lines of rural divided or undivided roads if the edge-lines and delineator-posts are properly maintained, except in those cases given above in **Section 2.10**
- On single lane carriageways, e.g. ramps. Road studs should not be used to supplement edge lines unless they are also used, at the same location, to supplement separation, barrier or lane lines. They should not generally be used on edge lines where the shoulder is less than 1 m wide.
- Road studs should not be used on continuity lines at lane drops in areas subject to frequent fogs, as they may inhibit rather than enable correct merging maneuvers under such conditions.
- In urban areas, especially on narrow lanes, noise generated by traversing motorists may cause concern in or near residential areas. An alternative form of delineation (large glass beads) may be considered.
- Road studs may not be necessary in tunnels, which are illuminated and are unlikely to get the pavement markings obliterated due to water. It is recommended to use profile lane and edge lines instead.

2.12 Maintenance

Driver behaviour and cleanliness of the road surface affects the durability of the road studs. For example, when the road studs are frequently run over by heavy vehicles, the reflectors may get scratched and when dirt accumulates on the reflectors, their reflective quality diminishes. Thus the reflectors should be brushed and cleaned at a regular interval.

Add new “Section 3200 – Special Provisions for Minor Bridges” after “Section 3100 – Miscellaneous Works”

Section 3200 – Special Provisions for Minor Bridges

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FOR REFERENCE ONLY

3201 Review of Foundation Design of Minor Bridges

The minor bridges included in the Contract are of type designed. The Contractor shall check, prepare and propose suitability of the foundation of the minor bridges after carrying out hydrological and geotechnical investigations referring the drawings issued.

The foundation design verification of the minor bridges including the required investigations and reporting shall be measured in number (nr) and paid as per contract price on a lump sum basis. The measured number for foundation verification/design of the minor bridges shall cover one set of bridges that includes two (2) bridges in each direction at a river location. The contract price and/or rates shall be the full and the final compensation to the Contractor as per Clause 112.

3202 Dismantling of the Existing Bridges and Clearance of Site

The Contractor shall dismantle the existing bridges completely including the superstructure, substructure, foundation and ancillary structures of the bridge so that the construction site is made clear for new construction. The job also includes the clearance of sites, stockpiling of the reusable materials and disposal of the unusable materials at environmentally safe tipping sites to the satisfaction of the Engineer before the start of the construction of new minor bridges.

The dismantling of existing bridges including clearance of sites shall be measured in number (nr) and paid as per contract price on lump sum basis for the complete job as described above in this Specification to the satisfaction of the Engineer. The contract price and/or rates shall be the full and the final compensation to the Contractor as per Clause 112.

FOR REFERENCE ONLY

Add new “Section 3300 – Performance Based Maintenance Works” after “Section 3200 – Special provisions for Minor Bridges”

Section 3300 – Performance Based Maintenance Works

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FOR REFERENCE ONLY

3301 Overview of Performance Based Maintenance

(1) Description

This Section 3300 Performance Based Maintenance Works and Services describes the works and services to be undertaken during Phase 2: Performance Based Maintenance Works.

The objective of performance based maintenance works and services is to ensure that the good physical condition of the road asset under contract over the entire period of the contract.

In traditional road maintenance contracts, the Contractor is responsible for the execution of works which are normally defined by the Engineer, and the Contractor is paid on the basis of unit prices for different work items and quantities of works executed. In Performance Based Maintenance contracts, the Contractor is responsible to identify, plan and carry out the Works and Services to achieve and maintain the Service Levels (Management Service Levels and Operational Service Levels) specified in Section 3300. He will not receive instructions by the Employer and/or Engineer of what to do when, where and how as in traditional maintenance contracts, except for Emergency Works or Day Works.

The role of the Engineer, on behalf of the Employer, is to enforce the contract by verifying compliance with the agreed Service Levels and with all applicable legislation and regulations.

The Contractor will receive a Monthly Lump Sum Fee for the Performance Based Maintenance Works and Services. Payment reductions will be applied if the Contractor fails to comply with the Service Levels in any given month. Emergency Works are paid on unit price basis.

(2) Required Services

Two groups of services are required: Management Services and Operational Services.

The management services include providing the information the Employer requires to manage the road asset during the Maintenance Phase of the Contract and to facilitate either the next tendering process or handover to the Employer, such as:

- Information on how the Contractor assures the quality of his services, manages the health and safety of his staff, manages emergencies, and manages traffic at the worksite
- Contractor's work programs
- Regular progress reports
- Inventory updates and other data sharing requirements
- Maintenance history
- Management of enquiries from third parties (public, police, etc.)

The operational services include the activities needed to maintain the satisfactory condition of the road assets, to assure their durability, as well as to satisfy the road users riding comfort requirement. These include, inter alia:

- Road and lane width
- Road roughness
- Control of potholes and cracking
- Drainage off the pavement
- Rutting
- Visibility of road signs and markings
- Response times to rectify defects that compromise the safety of road users
- Vegetation control
- Edge break
- Depression
- Raveling
- Shoulder condition

(3) Contractor's Responsibilities

Besides the timely provision of management information to the Employer, the Contractor shall be responsible for defining, optimizing and carrying out in a timely manner the works which are needed to ensure the roads remain at or above the Operational Service Levels defined in the Contract. In doing this, the Contractor shall comply with local legislation, the Specifications, environmental and social regulations.

The Contractor shall set up a Performance Monitoring Unit to observe road conditions and plan the various works needed to ensure the roads meet the defined Operational Service Levels. The Performance Monitoring Unit will provide the Contractor with information on the Contractor's compliance with the Operational Service Levels, and data required to define and plan all works. Under the maintenance works and services, the Employer will not issue instructions to the Contractor regarding the types and volumes of works to be carried out but instead, the Contractor will decide what to do where, when, and how.

(4) Definitions

In addition to the terms defined in the Conditions of Contract, the following words and expressions shall have the meanings stated.

- "Day" means calendar day
- "Emergency Work" means the works that are defined under Clause 3306.
- "End Date of Phase 2: Performance Based Maintenance Works" means the date on which the maintenance works were completed in accordance with the Contract as stated in the Taking- Over Certificate issued for Phase 2: Performance Based Maintenance Works.
- "GPS" means Global Positioning System.
- "Management Service Levels" means Service Levels associated with the Management Services.
- "Maintenance Unit" means the Contractor crew dedicated to execute the maintenance works. This Unit shall also act as the initial response unit in case of any emergency.
- "Maintenance Works" means all Works and Services required to comply with the Service Levels. This includes replacements of road assets, if necessary.
- "MSL" means Management Service Levels.
- "Performance Monitoring Unit" means the Contractor's dedicated personnel tasked among other things to evaluate and report on the condition of the road as well as plan the necessary maintenance and rectification works.
- "Monthly Lump Sum" means the monthly rate per Kilometer of road payable to the Contractor for completed Maintenance Works, subject to reductions as provided in the Contract.
- "Operational Service Level" means the level of usability of the road and its various assets as established by the prescribed allowable non-conformances, beyond which the road is considered as non-complying and requiring rectification works to be executed.
- "OSL" means Operational Service Level.
- "Phase 1" means the period for which the upgrading works of the road is to be executed by the Contractor under Phase 1: Upgrading Works.

- "Phase 2" means the period for which the performance based maintenance works and services to be executed by the Contractor under Phase 2: Performance Based Maintenance Works.
- "PRP" means Payment Reduction Point.
- "Payment Reduction Point Value" means the monetary value of one PRP.
- "Rainy Season" means generally the time between June 15 and September 15.
- "Road Assets" means all road related assets, including road furniture, within the right of way of the Kanchanpur – Kamala Road section of East – West Highway belonging to the Department of Roads.
- "SL" means Service Level, a generic abbreviation for both OSL and MSL.
- "Commencement Date of Phase 2" means the day immediately following the conclusion of the Defects Notification Period of the Phase 1: Upgrading Works.
- "Works" means Works and Services
- "Work Order" means an order issued by the Employer in response to the Contractor's proposal for the execution of works under Emergency Repair Works, which details the works required as well as the agreed time and cost.

3302 General

(1) Project Site

The project site is Kanchanpur – Kamala Road section of East – West Highway.

Maintenance is to be provided for the road and all associated items for the full width of the road right of way and for any ancillary works outside the right of way such as drainage inlets and outlets, slope and structure protection works etc. The area to be maintained includes the first 10 m length of the side/approach roads.

(2) Scope of Services

In accordance with GCC Clause 7, the Works to be provided by the Contractor include all managerial, administrative and physical activities that the Contractor needs to carry out, to comply with the Service Levels specified herein, or with any other requirements of the Contract. In particular, they include physical activities associated with the following road-related assets and items:

- (i) Paved areas of roads, parking areas, lay-bys, shoulders, footways and the like;
- (ii) Unpaved shoulders, medians and verges;
- (iii) Signs, road markings and road safety furniture;
- (iv) Road lighting and associated facilities;
- (v) Bridges, culverts, earth retaining structures and other structures;
- (vi) Drainage ditches, pipes, manholes and related items;
- (vii) Slopes of cuttings and embankments;
- (viii) Landscaped areas; and
- (ix) Other road assets, which have been constructed or installed during Phase 1.

Management services include processes and procedures such as:

- (a) assure the quality of the services;

- (b) manage the health and safety of the Contractor's personnel;
- (c) protect the environment;
- (d) manage emergencies;
- (e) manage traffic at work sites, and
- (f) collect, manage and report on data specifically required by the Contract and in addition necessary for the effective management of the services
- (g) Daily inspection patrols.

(3) Performance Criteria and Service Levels

The required condition of road assets is achieved by satisfying performance criteria designed to limit the presence of defects such as potholes and cracking in the pavement. Performance criteria are defined by Service Levels, which are the specified threshold for each of the performance criteria; for example, it may be specified that there shall be no pothole in excess of 150 mm in diameter or 50 mm deep and no crack shall be wider than 5 mm. The defined Service Levels are the accepted minimum thresholds for the quality levels of the road assets for which the Contractor is responsible.

Service Levels are specified in two categories:

- (a) Management Service Levels relating to the various management processes and procedures of the Contractor that deliver the Operational Service Levels, ensure good governance of the asset during the term of the Contract, provide information that the Employer concerning the delivery of the Works and facilitate the next tender round. They address matters such as:
 - (i) Information on how the Contractor assures the quality of his services, manages the health and safety of his staff, protects the environment, manages emergencies, and manages traffic at worksites;
 - (ii) Contractor's work programmes;
 - (iii) Regular progress reports;
 - (iv) Recording of network and inventory updates;
 - (v) Recording of maintenance history; and
 - (vi) Management of enquiries from third parties (public, police etc)
- (b) Operational Service Levels that are measures of the condition of the assets to assure their durability, to provide road user services and to ensure safe operation and comfort, such as:
 - (i) Timely response to rectify defects that compromise the safety of road users;
 - (ii) Repair of potholes and cracking;
 - (iii) Repair of Rutting;
 - (iv) Maintenance of drainage systems;
 - (v) Keeping road signs and markings clean, visible and in good condition;
 - (vi) Keep lighting equipment suitably visible and in good condition;
 - (vii) Vegetation control;
 - (viii) Maintenance of structures; and
 - (ix) Safety Inspection Patrol

For each performance criterion, a Service Level (SL) is specified. Throughout the contract period, if the Contractor fails to comply with an SL, reductions will be made from amounts due to the Contractor. The fundamental concept associated with such reductions is the Payment Reduction Point (PRP). Each SL breach attracts PRPs, which are accumulated and combined with the value of the individual PRP to evaluate the total reduction applicable.

(4) Monitoring of Performance

Under the terms of the contract, the Contractor shall also be responsible for the continuous monitoring and control of road conditions and Service Levels for the road or road sections included in the contract. This shall be necessary not only to fulfill the contract requirements, but the activity shall also provide the Contractor with the information needed to be able (i) to know the degree of his own compliance with Service Level requirements, and (ii) to define and plan, in a timely fashion, all physical interventions required to ensure that service quality indicators never fall below the indicated thresholds. The Contractor shall not receive instructions from the Employer concerning the type and volume of road maintenance works to be carried out. Instead, all initiative rests with the Contractor who shall do whatever is necessary and efficient to achieve the quality levels required.

Some emergency works are to be foreseen. Those are meant to remedy unexpected damage which occurs as a result of extraordinary natural phenomena, and which affect the normal use of the road network, or the safety and security of the users. For emergency works, the contract limits the responsibility of the Contractor, establishing that the Employer will approve execution of services and separate remuneration based on specific amounts proposed by the Contractor for each case, on the basis of volume of works estimated at each time and on unit prices included in the bid and in the contract.

3303 Management Services

Management Services are the various management processes and procedures of the Contractor that deliver the Operational Service Levels, ensure good stewardship of the road asset during the term of the Contract, provide information that the Employer requires concerning the delivery of the Services and facilitate the next tender round.

(1) Functions of Contractor's Key Personnel

During the Maintenance Phase of the Works, the Contractor's key personnel shall include but not be limited to the following key personnel whose duties are outlined below:

- Contractor's representative / Contract Manager shall act and represent the Contractor during the Phase 2 of the Contract. His duties and responsibilities include those discussed in Sub- Clause 4.3 of the General Conditions of Contract.
- Performance Manager shall be responsible for the Performance Monitoring Unit and for the development and monitoring of the Program of Performance.
- Maintenance Engineer shall instruct and supervise the works undertaken on the site based on the requirements of the Contract.
- Performance Based Road Maintenance Expert (part time) to coach and train the staff of the contractor and subcontractors in the planning, execution and monitoring of the performance based maintenance works.

(2) Performance Monitoring Unit

The Contractor shall establish a Performance Monitoring Unit staffed by qualified personnel, who shall verify continuously the Contractor's degree of compliance with the required Operational Service Levels. The Performance Monitoring Unit shall also be responsible for undertaking the quality control testing required for all Works.

The Performance Monitoring Unit shall maintain, at all times, a detailed and complete knowledge of the condition of the road sections included in the Contract and shall provide the Contractor with all the information needed in order to efficiently manage and maintain the roads. The Performance Monitoring Unit shall carry out, together with the Employer, the formal and scheduled inspections of Operational Service Levels.

(3) Facilities for the Employer

The facilities provided to the Employer under the Construction Phase of the Contract such as offices, accommodations, laboratory, vehicles, supplies, consumables, telephone services, internet services, utilities and the like shall not be required.

(4) Communication System

In accordance with Clause GCC 1.3, the Contractor shall provide and maintain in operation for the duration of the Contract a communications system or systems that ensure that both written (letter, fax or E-mail) and oral (voice) communications can be established at all times:

- (i) between the Contract Manager and his senior field staff;
- (ii) between the Employer/Engineer and the Contract Manager;
- (iii) between the public telephone system and the Contract Manager;
- (iv) between the public telephone system and the Employer/Engineer;

The equipment to be provided and maintained includes the equipment located at the Employer's and/or Engineer's office.

The equipment may comprise cellular mobile phones, satellite phones, radio equipment, tele-facsimile equipment and computers with broad band internet access linked by local area network and/or similar. The Communications System shall provide for "24/7/365" (i.e 24 hours per day, every day of the year) communication with security and redundancy provisions that are fully fit for purpose.

(5) Site Regulations

In accordance with GCC Clause 4, the Contractor shall prepare Site Regulations setting out the rules to be observed in the execution of the Contract at the Site and shall comply therewith. Such Site regulations shall include, but shall not be limited to:

- (a) Security;
- (b) Gate control;
- (c) Safety;
- (d) Traffic control;
- (e) Accident and Emergency response;
- (f) Dealing with third party enquiries and complaints;
- (g) Sanitation;
- (h) Medical care; and
- (i) Fire prevention.

The Site Regulations shall comply with the relevant laws and regulations of Nepal.

(6) Specifications and Work Methods

The Maintenance Works shall be executed in accordance with the Specifications and the Special Provisions for Performance Based Maintenance Works and/or any applicable Standards stated in the Specifications.

In case of conflict between the Specifications and Work Procedures defined in Phase 1 and the Service Levels or specifications of Phase2, the Service Levels and Work Procedures of Phase2 shall take precedence. If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.

With the prior written approval of the Employer, the Contractor may introduce new materials and work methods as long as they provide a better quality of work.

Under no circumstances shall the Contractor be entitled to any additional payment or relief from payment reduction due to the inadequacy of the materials and work procedures that he has proposed and employed in the Works and Services, notwithstanding any consent by the Employer to their use.

(7) Program of Performance

The Contractor shall develop, implement and maintain a Programme of Performance, which shall set out in detail the management processes, procedures and controls that he will employ to deliver the Services and Works. The Programme of Performance shall comprise the following components:

a) Operational Plan

The Operational Plan shall describe how the Contractor will undertake the Works to achieve the Service Levels, including but not limited to the following matters:

- (a) Organizational structure for management and delivery of the Services;
- (b) Locations and coverage of depots and storage facilities;
- (c) Numbers, classification and deployment of equipment and personnel;
- (d) Provisions for procurement and storage of materials;
- (e) Procedures for Safety Inspections and Service Level Inspections;
- (f) Procedures for Structural Inspections;
- (g) Procedures for routine maintenance and repair works;
- (h) Procedures for incident response and emergency works;
- (i) Procedures for response to third party enquiries, reports and complaints.
- (j) Procedures for data collection, recording and storage.

b) Contractor's Quality Assurance Plan

The purpose of the Contractor's Quality Assurance Plan is to integrate the requirements of the Contract and the Contractor's quality assurance systems to deliver the Services.

The Quality Assurance Plan describes the methods and procedures, which the Contractor will apply for the execution of the Contract, including how the Contractor will:

- (a) identify the quality requirements specific to the Contract;
- (b) plan and execute the Services and Works to satisfy those requirements;
- (c) inspect and/or test work and materials to ensure compliance with the quality requirements;
- (d) record and monitor the results as evidence of compliance;
- (e) audit the Quality Assurance processes and procedures to ensure compliance; and
- (f) ensure that prompt action is taken to correct non-compliance.

The Quality Assurance Plan shall comply with the principles of ISO 9001:2008 or any revision thereof. It shall clearly describe the systems, procedures and methods that will be used to deliver and monitor compliance of the Services.

c) Health and Safety Management Plan

The purpose of the Health and Safety Management Plan is to foster a responsible attitude towards occupational health and safety and to comply with the provisions of the Law of Nepal.

Because of the nature of the Services, the Contractor may occasionally be exposed to hazardous situations, which could involve risk of various degrees of harm, to the Contractor's personnel and/or the public.

Situations will arise when it is not practical to eliminate or isolate significant hazards. In these situations, the Contractor must mitigate hazards by ensuring planned protection systems (e.g. equipment, clothing) are available and used. The Contractor's personnel and all sub-contractors must comply with the Health and Safety Management Plan at all times.

The Health and Safety Management Plan shall, when implemented in accordance with the plan requirements:

- (a) Ensure the systematic identification of existing and new hazards on work site(s) and at depots, storage facilities, in offices or wherever activities are undertaken;
- (b) Ensure the mitigation of significant hazards, where elimination and isolation are impractical;
- (c) Ensure the provision and use of appropriate protective measures;
- (d) Include emergency procedures for dealing with accidental spillage, pollution or imminent danger;
- (e) Ensure regular review and assessment of each hazard identified and monitor own staff and subcontractor's exposure to these hazards;
- (f) Ensure reporting and recording of work site safety incidents so health and safety problems can be addressed quickly and regularly. It is a requirement of this Contract that any such incident be advised promptly to the Engineer;
- (g) Comply with all other health and safety aspects requirements of Nepalese law and regulations.

d) Environmental Management Plan

The purpose of the Environmental Management Plan is to foster a responsible attitude towards protection of the environment, occupational health and safety and shall comply with all applicable national, provincial and environmental laws and regulations of Nepal. The Environmental Management Plan shall comply with the principles of ISO 14001:2008 or any revision thereof.

Because of the nature of the Services, the Contractor's operations have the potential to cause adverse environmental impacts. Situations will arise when it is not practical to avoid such impacts. In these situations, the impacts must be mitigated by planned actions and protection measures, which must be employed.

The Contractor's shall execute the contract in accordance with the Environmental Management Plan (EMP) and approved Initial Environmental Examination (IEE) prepared for the Project at all times.

The Environmental Management Plan shall, when implemented be in accordance with the plan requirements:

- a) Contractor shall establish an operational system for managing environment impacts.
- b) The means by which the environmental management systems will be supervised, monitored and audited to ensure compliance with the principles and objectives of the EMP at all times;
- c) Carry out all of the monitoring and mitigation measures set forth in the EMP and approved IEE prepared for the project.
- d) Records to be prepared and maintained by Environmental Management staff and communication procedures to be followed so that the Employer and others associated with the Works (e.g. sub-Contractors) are kept fully informed on matters relating to the EMP and approved IEE and applicable regulations throughout the Contract period;
- e) Proposals to ensure that maintenance methods do not compromise the Contractor's commitment to the EMP and IEE and compliance with all relevant statutory regulations;
- f) An organizational structure showing the appointed environmental management staff and the responsibilities of environmental protection participants;

- g) The names, addresses, telephone and fax numbers of all participants;
- h) The criteria used for the appointment of the principal staff;
- i) The proposed interactions and communications procedures between the Contractor's personnel and the environmental protection staff, including proposals for the communications facilities to be provided. In particular, the establishment of a regular communications and reporting system;
- j) The frequency, coverage and intent of environmental management meetings together with the rationale for attendance;
- k) Frequency, coverage and intent of regular environmental reports;
- l) Methods proposed for promoting awareness of environmental protection issues among all personnel directly or indirectly associated with the maintenance works;
- m) Provisions for storage of liquid, toxic and dust creating materials;
- n) Waste control and management;
- o) Materials handling;
- p) Erosion prevention;
- q) Dust Control
- r) The powers vested in the environmental management staff that would enable them to take urgent, appropriate and direct action to prevent or correct environmental impacts;
- s) The means by which environmental management matters will be communicated to Sub- Contractors to ensure effective compliance by subcontractors.

Further details of the Environmental Management are described in Appendix B of Phase 2 and approved IEE for the project.

e) Risk Management Plan

The Purpose of the Risk Management Plan is to ensure that uncertain events that may have adverse impacts on the integrity and condition of the road assets or on the Operational Service Levels are identified, analysed and placed under a proactive management regime. The Risk Management Plan shall, as a minimum, include:

- (a) establishment of a risk register, in which all foreseeable adverse events are identified and assigned values of probability and consequence of occurrence;
- (b) analysis of risks in which the impact of potential combinations of events is considered across a range of scenarios;
- (c) identification of risk management strategies involving avoidance and mitigation of risks together with management strategies for residual risks;
- (d) assignment of responsibility for risks to the organisations or individuals best able to manage them;
- (e) a process for the regular review and updating of the risk register and the risk management plan.

f) Emergency Procedures and Contingency Plan

The Emergency Procedures and Contingency Plan shall establish the roles, practices and procedures to be followed during and following the occurrence of natural phenomena with imponderable consequences, such as strong storms, flooding and earthquakes. The Emergency Procedures and Contingency Plan shall be developed by the Contractor and agreed with the Engineer and any other stakeholders the Engineer may identify.

The purpose of the Emergency Procedures and Contingency Plan is to ensure the safety of the Contractor's personnel and road users in the case of emergency and/or road closure. It should include:

- (a) an effective communication and event recording system;
- (b) the names, 24-hour contact telephone numbers and specific duties of the

Contractor's personnel nominated to respond to an emergency event;

- (c) the contact telephone numbers of other parties who need to be notified in cases of emergency events, e.g. police;
- (d) detailed response procedures for all potential emergency events;
- (e) possible detour routes in the event of road closure.

g) Traffic Management Plan

The Traffic Management Plan establishes the practices for traffic management at work sites and shall comply with the relevant rules and regulations in Nepal. The Traffic Management Plan must be developed by the Contractor and agreed with the Engineer.

The objectives of the Traffic Management Plan are to:

- (a) Clearly define and document the responsibilities and chain of command for the development, implementation and management of traffic control measures and systems,
- (b) establish the minimum requirements for temporary traffic control,
- (c) establish the minimum geometric, cross section and surfacing standards for temporary works,
- (d) provide appropriate transitions and enable safe and efficient traffic flow into, through and out of work sites,
- (e) protect the Contractor's personnel at all times,
- (f) protect the Road and related assets and the Contractor's resources at all times, and
- (g) meet the operational requirements for the Road.

The Traffic Management Plan must include at least the following:

- (i) a documented process for preparation, review and approval of the Traffic Management Plan;
- (ii) a document tracking and control system to ensure that only the latest operative copy of the Traffic Management Plan is in circulation;
- (iii) 24-hour contact telephone numbers for Contractor, Engineer, Employer, emergency services and other stakeholders; and
- (iv) layout diagrams, method statements, etc. for implementation of traffic control while undertaking each aspect of the Services (including site specific layout diagrams and method statements if the Services require traffic control measures not covered by standard codes of practice).

h) Road Management Database

Data about the conditions of the road assets being maintained under this Contract are required for current and future reference. The Contractor shall prepare and maintain a road management database of accuracy and completeness appropriate to the uses for which it is intended, which shall be kept current at all times. The Contractor shall supply all information necessary to prepare and maintain this data. The following information is to be collected and updated:

- Road and bridge inventory and treatment history
- Road condition and section rating
- Traffic and classification details
- Maintenance history

The Contractor shall undertake whatever actions may be necessary including detailed road condition surveys to obtain the above data and all information required to maintain the road management database.

The Contractor shall provide hard and electronic copies of the updated road management database and all relevant information to the Employer. Report and subsequent updates shall be submitted every three months thereafter together with the relevant monthly progress report.

8) Daily Inspections

The Contractor shall undertake Inspections of all lengths of road in both directions for which he is responsible on at least a daily basis to ensure the continuous safe operation of the roads and the compliance of all road related assets with the Operational Service Levels.

The procedures for Inspections shall be described in detail in the Contractor's Operational Plan. The Daily Inspection shall as a minimum record the following information:

- (i) Date and time of inspection at start and end of each of each day and the route covered
- (ii) Weather
- (iii) Route of inspection
- (iv) Summary of general operating conditions
- (v) Recording of all non-compliances with Operational Service Levels detected
- (vi) Incidents, hazards and defects discovered and actions taken
- (vii) Record of interactions with:
 - a. Police
 - b. Engineer's staff
 - c. Official bodies
 - d. Members of the public

9) Inspection of Structures

All bridges and all culverts with span or diameter in excess of two (2) metres together with all earth retaining structures with a height in excess of two (2) metres and other significant structures shall be visually inspected at least once in each calendar month to ensure that they are in a safe operating condition.

This inspection shall record:

- (a) Vehicular damage to structures;
- (b) Scour of foundations in watercourses and erosion of protective structures such as revetments, gabions and the like;
- (c) Settlement of foundations, movement or rotation of abutments, wing walls and earth retaining structures;
- (d) Significant corrosion of steel reinforcement in reinforced concrete members causing spalling of concrete;
- (e) New or worsened deflection or cracking of reinforced concrete members;
- (f) Corrosion of structural steelwork with significant loss of metal.
- (g) Anything else that impairs the safe operating condition of the bridge.

Where defects appear to be worsening rapidly, the Contractor shall inform the Engineer without delay and shall take appropriate measures to ensure the safety of road users and employees.

Any non-compliance with the Operational Service Levels discovered during any inspection shall be recorded. The record of each defect shall include an accurate positional reference, description and dimensions of the defect and a photograph taken with a digital camera and

bearing a date and time stamp. The record of each inspection shall be recorded. Upon completion of remedial works for each defect or group of defects, the record of works together with a further date and time stamped photograph shall be recorded as well and included in the Monthly Report.

10) Routine Maintenance Unit

The Contractor shall provide on a daily basis a minimum of one Routine Maintenance Unit (RMU) comprising of personnel and equipment required to undertake the carrying out of the Routine Maintenance Works. The Contractor may increase the number of RMUs as he may deem necessary to meet the requirements of the Works.

Each RMU shall have the following minimum resources:

- 1 No. Foreman
- 1 No. Light/Heavy vehicle driver
- 1 No. double cabin pick-up with identification (contractor's name, Employees' name, road name, and emergency contact phone no.)
- 1 Set Operational flashing amber lights fitted to the RMU truck
- 5 No. Maintenance workers
- 2 No. Mobile phones
- 1 No. Jack
- 1 No. Compressor
- 1 No. Vibrating plate compactor
- 1 No. Chain saw
- 1 m³ Cold storable bituminous premix and 0.5 m³ of sand
- 2 No. "Half Road Closed" Signs
- 2 No. "Roadwork Ahead" Signs
- 12 No. 300 mm plastic 'high visibility' colored traffic cones
- 200 kg drum of bitumen
- 1 No. Bituminous spray pump
- 1 No. 200 litre drum of clean water
- 2 No. Rakes
- 2 No. Long handle shovels
- 2 No. Long handle heavy duty brooms
- 2 No. Picks
- 8 No. Reflectorized safety jackets for the RMU crew

The RMU shall be available to work for a minimum of 8 daylight hours per day from Sunday to Friday inclusive. The starting and finishing times are to be agreed with the Employer.

The RMU shall also be the "Initial Emergency Response Unit" and shall have the following capabilities in case of an emergency:

- Haul a half cubic meter of sand (or other suitable granular material depending on the nature of the requirement)
- Provide an after-hours response with a minimum of a two-person crew
- Mobilize emergency kits such as temporary warning signs, flashing lights, barriers, safety clothing, shovels, brooms, etc.

The RMU shall carry at all times mobile phones to contact police, fire, ambulance, and hospital or medical center to obtain help in the event of accidents or any emergency encountered.

A listing of all emergency contact phone numbers shall be circulated by the Contractor to all relevant officers, including the Contractor's staff and the Employer within 14 days from the Commencement Date of Phase 2. It is the Contractor's duty to engage the regular lengthworker /supervisor of the DoR during the PBM Phase of the contract and pay them as per standard norms.

11) Reporting

a) Inception Report

Within 28 days after the Commencement Date of Phase 2, the Contractor shall submit an inception report to the Employer. The report shall include the following:

- Initial condition survey
- Video survey
- Roughness survey
- Initial road management database
- Detailed maintenance program for the first 3months
- Information regarding environmental, safety and social issues and other information as may be necessary

The Contractor's initial condition survey of the roads, structures and other appurtenances shall be attended by the Engineer. The detailed results of the survey shall be recorded by the Contractor and submitted to the Engineer for confirmation.

The initial condition survey will establish a baseline of road conditions at the time of commencement of the Phase 2. The video survey shall be undertaken during daylight hours from the passenger's seat of a slow moving vehicle with the camera aligned towards the center of the road. Video shall also be taken of all bridges, major culverts and any other major structures to show the conditions of each structure from all angles. The Contractor shall complete and formally submit to the Engineer two copies of the video record on DVD.

The roughness data is required to establish the actual roughness condition of the road at the time of commencement of the Phase 2. Roughness shall be measured using a method and equipment approved by the Engineer.

The environmental, safety and social surveys shall establish the issues existing prior to the commencement of Phase 2.

The Employer shall confirm the accuracy of the initial condition survey within 21 days of his receipt of the inception report. The Engineer's opinion on the condition of any road asset or any item shall be final.

Interim Payment Certificates will not be released until such time as the inception report is approved by the Employer.

b) Daily Report to be submitted to the Employer

The Contractor shall prepare and submit daily reports to the Engineer on all inspections, incidents, non-compliance with Operational Service Levels detected, remedial actions taken and other works executed by the Contractor. The format and the information to be supplied shall have to be approved by the Engineer.

The information provided in the daily reports shall be summarized by the Contractor and included in the relevant sections of his Monthly Reports.

c) Monthly Reports

The Monthly Report shall be submitted by the Contractor to the Engineer each month no later than the seventh calendar day of the following month; except for the reports under (b) and (c) below, which shall be submitted on the last working day of the respective month; shall comprise the following components:

- (a) Narrative Report, describing Services and Works undertaken during the period, problems and issues arising and measures taken to deal with them.
- (b) Contractor's Monthly Operational Service Level Inspection Report

- (c) Monthly Evaluation Form for Compliance with Operational Service Levels
- (d) Memorandum of Non- Compliance with Operational Service Levels – based on the Monthly Formal Inspections
- (e) Memorandum of Non-Compliance with Operational Service Levels – based on Informal Inspections
- (f) Report on all Maintenance Works and Services
- (g) Report on any Emergency Works or other Works instructed by the Engineer due to defects to be repaired under the Defects Notification Period liabilities.
- (h) Report on the compliance with the Contractor's Quality Assurance Plan, Health and safety Management Plan, Environmental Management Plan, Risk Management Plan, Emergency Procedures and Contingency Plan, and Traffic Management Plan.
- (i) Report on Testing undertaken in accordance with the Contractor's Quality Assurance Plan or as required by the Engineer. Tests shall be undertaken in accordance with the specifications and appropriate standards and the detailed test results shall be submitted to the Engineer in the respective month.
- (j) Structural Inspection Reports on inspections undertaken. First inspection reports shall be provided within two (2) calendar months of the Commencement Date of Phase2.
- (k) Summary of Incident Reports shall be submitted for each month (or a nil return).
- (l) Updated Monthly Work Programme, detailing the location, timing and extent of all works the Contractor proposes to complete during the next month.
- (m) Any other information as the Engineer may require from time to time.

d) Incident Reports

Every occurrence of an Emergency that requires "Emergency Works" as defined in Section 3306 Emergency Works below shall be reported to the Engineer as described below:

- (i) Landslides, defined as movement of earth or rocks encroaching on any carriageway or shoulder or blocking any drainage system or watercourse; reported without delay and in any event within one (1) hour of discovery.
- (ii) Flooding, defined as large volumes of water occupying all or parts of the roadway, shoulders and adjoining areas; reported without delay and in any event within one (1) hour of discovery.
- (iii) Any other event where the Contractor proposes to request issue by the Employer of an Emergency Work Order; reported without delay and in any event within one (1) hour of discovery.
- (iv) Road Accidents involving injury to people, significant vehicular damage and/or damage to the road surface, structures or road furniture; without delay and in any event within twenty-four (24) hours of discovery.
- (v) Other Damage, including vandalism, theft, damage of highway furniture and structures; reported weekly.

Incident reports shall include:

- (a) The precise location, timing and extent of the incident, supported by maps/plans and date/time stamped digital photographs;
- (b) A brief narrative description of the circumstances.
- (c) Where applicable, the names of the people and/or organizations responsible for causing the damage. This information is required so that the Employer may seek recovery of the costs associated with repairing the damage.

Copies of incident reports shall be included in the monthly reports.

e) Handover Report

No later than two (2) months prior to the Date of Completion of the Contract the Contractor shall submit the Handover Report in draft to the Engineer. The purpose of the Handover Report is to provide a smooth transition to the next contract and ensure that the next Contractor is aware of any outstanding issues.

The Report shall:

- (a) Summarize any unresolved issues,
- (b) Include the most recent complete set of data on the Road and related assets included in the Contract; and
- (c) Provide the following details:
 - i. The current and up-to-date Programme of Performance including all sections and particularly the updated risk register;
 - ii. A schedule of outstanding defects and liabilities;
 - iii. Any unresolved issues, especially those that may impact on the next Contractor;
 - iv. Details of any sensitive issues;
 - v. Any on-going special monitoring/maintenance needs.

The final Handover report shall be submitted no later than 14 days prior to the Date of Completion of Phase 2.

12) Management Service Levels

Table 33.1 lists Management Service Levels (MSL), which relate to the overall management of the Works along with the corresponding Submission Dates and resulting PRPs for each MSL.

The Management Services cease on the Date of Completion of the Contract. If any requirements are unfulfilled at that time, the Employer and/or Engineer may procure their completion and recover the cost thereof from amounts due to the Contractor.

The Management Service Level Number (see MSL No column in Table 1) comprises a section reference to one of the sections above followed by a count within that section.

Table 33.1 – Required Submission Dates and Payment Reduction Points for Management Service Levels

Management Services	MSL No	Action	Submission Dates	Payment Reduction Point
Key Personnel	1	Key Personnel appointed, approved by the Employer and on the site	At the Commencement Date of Phase 2	10 per day
Performance Monitoring Unit	2	Performance Monitoring Unit fully established	At the Commencement Date of Phase 2	10 per day
Communications System	4 (1)	Details of Contractor's proposed Communications System submitted in draft	At the Commencement Date of Phase 2	4 per day
	4 (2)	Engineer either issues a notification of "no objection" to the proposal or notifies Contractor that the Communications System is unsatisfactory, stating the specific areas of concern	Within 14 days after submission of the Draft	N/A
	4 (3)	Contractor submits revised details	Within a further 7 days of Engineer's notification	4 per day

Management Services	MSL No	Action	Submission Dates	Payment Reduction Point
	4 (4)	Communications System complete and fully operational	Within 60 days after the Commencement Date of Phase 2	4 Payment Reduction Points per day during which any significant element is inoperable for the entire day. (For the avoidance of doubt, a "significant element" is a communication medium, such as telephone or internet, for which there is no redundancy or equivalent alternate system in operation)
Site Regulations.	5 (1)	Draft Site Regulations submitted to the Employer, and copied to the Engineer, for approval, which shall not be unreasonably withheld.	At the Commencement Date of Phase 2	4 per day
	5 (2)	Engineer either issues a notification of approval of the draft Site Regulations or notifies the Contractor that they are not approved, stating the specific reasons for rejection.	Within 14 days after submission of draft Site Regulations	N/A
	5 (3)	Contractor submits revised draft Site Regulations	Within a further 7 days of Engineer's notification	4 per day
	5 (4)	Contractor implements Site Regulations and remedies breaches forthwith	N/A	2 Payment Reduction Points during the first week, 4 payment reduction points during the second week and 1 payment reduction point per day thereafter until the deficiency is remedied
Programme of Performance	7 (1)	Contractor's Programme of Performance submitted in draft	At the Commencement Date of Phase 2	4 per day

Management Services	MSL No	Action	Submission Dates	Payment Reduction Point
	7 (2)	Engineer either issues a notification of "no objection" to the Plan or notifies the Contractor that his Programme of Performance fails to comply with the Contract, stating the specific areas of "non-compliance"	Within 14 days after submission of Programme of Performance	N/A
	7 (3)	Contractor submits a revised Program of Performance	Within a further 7 days of Engineer's notification	4 per day
	7 (4)	Contractor implements Programme of Performance	Continuous	5 Payment Reduction Points for each material breach of the Programme of Performance per day during which the breach persists (For avoidance of doubt, a material breach is a neglect or disregard of any element of the Programme of Performance notified in writing to the Contractor by the Engineer)
	7 (5)	Contractor updates Road Management Data Base	Every three months together with the relevant Monthly Report	1 per day
	7 (6)	Contractor updates Programme of Performance annually or upon the occurrence of any material change to any of the constituent processes and procedures or upon the reasonable request of the Engineer and submits to Engineer	Within 14 days of each anniversary of the Commencement Date of Phase 2 or upon the occurrence of any material change to any of the constituent processes and procedures or upon the reasonable request of the Engineer	4 per day

Management Services	MSL No	Action	Submission Dates	Payment Reduction Point
Daily Safety Inspections	8	Contractor undertakes Safety Inspections on at least a daily basis to ensure the continuous safe operation of the roads	During each calendar day	5 Payment Reduction Points for each instance of failure to undertake an inspection in whole or in part
Inspection of Structures	9 (1)	Contractor inspects all bridges and all culverts with span or diameter in excess of three (3) meters together with all earth retaining structures with a length in excess of 3 m and other significant structures at least once in each month to ensure that they are in a safe operating condition	As per Operational Plan	As per Programme of Performance
	9 (2)	Contractor records any non-compliance with the Operational Service Levels discovered during any inspection and submits report to Engineer	Within 24 hours of completion of inspection	2 per day
Inception Report	11a	Submission of Inception Report	28 days after the Commencement Date of Phase 2	2 per day
Daily Reports	11b	Submission of Daily Report	By the end of the following day	2 per day
Monthly Report	11c	Contractor submits the Monthly Report to the Engineer	No later than the 7th calendar day of the following month (starting with the report on the first month after the Commencement Date of Phase 2)	3 per day

Management Services	MSL No	Action	Submission Dates	Payment Reduction Point
Incident reports	11d	(i) Landslides, defined as movement of earth or rocks encroaching on any carriageway or shoulder or blocking any drainage system or watercourse; reported without delay. (ii) Flooding, defined as large volumes of water occupying all or parts of the roadway, shoulders and adjoining areas; reported without delay. (iii) Any other event where the Contractor proposes to request issue by the Employer of an Emergency Work Order; reported without delay.	Within one hour of discovery	5 per hour
		(iv) Road Accidents involving injury to people, significant vehicular damage and/or damage to the road surface, structures or road furniture without delay.	Within twenty-four (24) hours of discovery.	2 per day
Handover Report	11e (1)	Contractor submits draft Handover Report to the Engineer.	No later than two months prior to the Date of Completion of the Contract	10 per day
	11e (2)	Engineer either accepts the report or notifies the Contractor of any inaccuracies or other inadequacy of the report.	Within 14 days after submission of the Handover Report	N/A
	11b (3)	Contractor submits final Handover Report, in which the comments of the Engineer are addressed and the report updated with any changes in the information contained therein.	One day prior to the Completion of the Contract	15 per day

3304 Operational Services

The operational services include the activities needed to maintain the satisfactory condition of the road assets, to assure their durability, as well as to satisfy the road users riding comfort requirement. This includes basically routine maintenance works but could include resurfacing, asphalt concrete overlays and replacement of road side assets such as road signs, crash barriers or other road related assets. These requirements are defined through Operational Service Levels, which the contractor needs to comply with during the entire Phase2.

There are 3 Categories of Operational Service Levels:

- a) Operational Service Levels Category A: They are the ones that are considered very important and need to be rectified within a short period of between 1 hour and 48hours.
- b) Operational Service Levels Category B: They are considered less important. Although the Contractor is required to frequently control that these OSL are complied with, they will attract Payment Reduction Points only if they are not complied and detected during the Joint Monthly Inspection.
- c) Operational Service Levels Category C: They are controlled only once per year.

For each of the 3 Categories of Operational Service Levels the OLS number, the Item, the Operational Service Level, the Count Unit and the Payment Reduction Points are specified. For the Categories A and C, the Rectification Periods are specified as well.

The Count Unit defines the unit for the application of the Payment Reduction Points, which is either per item, per event, per 1 km of double lane roadway, per 100 m of shoulder, etc. The Count Unit of 1 km of double lane roadway means between two adjacent kilometer posts. The Count Unit per 100 m of double lane roadway refers to 1/10 of a kilometer, whereby the kilometer is divided into 10 sections of 100 m.

For each Item defined in the Tables 33.2 to 33.3, the Payment Reduction Points shall be applied when one or more Operational Service Levels are not complied with. Payment Reduction Points shall be applied for each Item only once, even if several OSL are not complied with for the same Item.

For any section of a four lane highway, "double lane roadway" means the two lanes on each side of the medium.

(1) Operational Service Levels Category A

Note: The detection and measurement of Operational Service Level shall be achieved by visual inspections using the appropriate measuring tools such as a ruler, tape measure, 3.5 m spirit level straight edge (unless indicated differently in the respective OSL), measuring wheel, odometer of a vehicle, reflectometer or equipment for compaction testing and for coring.

Table 33.2: Operational Service Level for Category A

OLS No.	Item	Operational Service Level	Count Unit	Payment Reductions Points	Rectification Period
A.1	Lane Closure	Maximum number of closed lanes at any given time: 1 lane Maximum length of closed lane: 300m Minimum distance between closed lane sections: 500 m Minimum advance notice: 24 hours	Per event	3	12 hours
A.2	Potholes, including de-laminations on paved surfaces	Maximum diameter: 150 mm or equivalent surface area and /or Maximum depth: 30 mm Not more than 3 potholes in 1 km of double lane roadway. During the rainy season temporary patching of potholes is allowed. These potholes shall be patched permanently latest during the following dry season.	Per item	3	48 hours
A.3	Slides up to 50 m ³	No slide of slope material on the road blocking any lane or shoulder Notes: Clearing of slides up to 50 m ³ shall be part of Maintenance Works. Clearing of slides over 50 m ³ shall be part of Emergency Works	Per event	4	On roadway: 24 hours On shoulders: 48 hours
A.4	Oil spills on pavements	No oil spills more than 50 cm ³ shall be allowed	Per event	5	6 hours
A.5	Other Obstructions on paved roadway and shoulder, unpaved shoulders and roadway (e.g.: rocks, tree branches, animal carcasses, abandoned vehicles, etc.)	No obstruction posing a potential traffic or safety hazard shall be allowed. Maximum volume of obstruction that is not posing a traffic or safety hazard: 150 cm ³ Maximum quantity of debris that does not pose a traffic or safety hazard: 1 kg per 5 m ² pavement surface	Per 100 m of double lane highway	4	4 hours if hazardous 48 hours if not hazardous
A.6	Culverts, inlets, outlets, Drainage pipes	Not more than 25% of flow area or cross section is blocked during rainy season	Per structure	4	24 hours

OLS No.	Item	Operational Service Level	Count Unit	Payment Reductions Points	Rectification Period
A.7	Ditches	Not more than 25% of flow area or cross section is blocked during rainy season	Per 50 m of ditch	4	24 hours
A.8	Catch basis	Not more than 25% of sedimentation	Per structure	4	24 hours
A.9	Regulatory and Warning signs	Missing sign Sign obscured by vegetation (sight distance of a driver of 100 m on the roadway)	Per sign	4	24 hours
A.10	Temporary signs and safety devices for works	Missing sign or safety device Signs and safety devices not removed after termination of works	Per work place	4	24 hours
A.11	Waterways	During rainy season: Free flow of water under bridge and up to 50 m upstream and downstream shall not be obstructed by more than 15% of the cross section of riverbed up to design clearance under bridge as per original design	Per bridge	4	48 hours

(2) Operational Service Levels Category B

Note: Count unit of 1 km means between two adjacent kilometer posts. The detection and measurement of Operational Service shall be achieved by visual inspections using the appropriate measuring tools such as a ruler, tape measure, 3.5 m spirit level straight edge (unless indicated differently in the respective OSL), measuring wheel, odometer of a vehicle, reflectometer or equipment for compaction testing and for coring.

Table 33.3.1: Operational Service Levels for Bituminous/Asphalt Concrete Pavement

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.1.1	Cross fall of pavement of double lane roadway	Maximum tolerance: +0% and -0.5% for road sections repaired by Contractor	Per 100 m of double lane roadway	30
B.1.2	Patches	Shape: Rectangular and parallel to road centerline. Circular patches less than 100 mm diameter are allowable Maximum level tolerance with surrounding pavement: +/-10 mm including seals Materials: Equal or better than the surrounding pavement No unsealed cracks wider than 3 mm Temporary patching is allowed during rainy season, but permanent patching is required during the following dry season	Per patch	1
B.1.3	Linear Cracks	Maximum width of unsealed cracks: 5 mm of more than 10 m aggregated length Sealant height tolerance: +/- 5 mm of adjacent pavement surface of more than 5 m aggregated length	Per 100 m of double lane roadway	2
B.1.4	Multiple cracks	Maximum cracked area of 20 m ² and maximum	Per 1 km of	2

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
	(alligator cracking)	width of unsealed cracks: 3 mm Sealant height tolerance: +/- 10 mm of adjacent pavement The "cracked area" is equivalent to the rectangular area fully enclosing the cracks, where the outermost crack is at least 100 mm inside the rectangle	double lane roadway	
B.1.5	Depression, Rutting, Corrugation	Maximum depth of 20 mm for an aggregated length of more than 50 m. Depth measured with a 1.2 m straight edge	Per 1 km of double lane roadway	2
B.1.6	Heaves and Shoves	Maximum height: 25 mm measured with 1.2 m spirit level straight edge centered on the heave and adjusted parallel to the pavement surface	Per item	1
B.1.7	Surface drain defects	Ponding of water: Maximum depth of 20 mm at any point and surface area of more than 1 m ²	Per 100 m of double lane roadway	3
B.1.8	Raveling	Less than an aggregated surface area of 15 m ² Raveling is defined as a loss of binder of more than 5 mm in depth or loss of surface material of more than 10 mm in depth.	Per 100 m of double lane roadway	3
B.1.9	Edge damage	Maximum length from the edge of the paved roadway towards the centerline of the roadway of 150 mm and an aggregated length along the road edge of maximum of 2m Edge damage of pavement with sealed shoulders shall be treated like potholes, see items A.2 and B.1.2above	Per 1 km of double lane roadway	3
B.1.10	Edge drop off	Pavement edge shall not be lower than the adjacent paved shoulder and not higher than 20 mm at any point Maximum height difference between pavement and adjacent paved road surfaces at junctions: +/- 30 mm for an aggregated length of 3 m Pavement edge shall not be lower than the adjacent unpaved shoulder and not higher than 50 mm for an aggregated length of 10 m Maximum height difference between pavement and adjacent unpaved paved road surfaces at junctions: +/- 20 mm for an aggregated length of 1 m	Per 1 km of double lane roadway	2
B.1.11	Flushing, bleeding or Glazing	Within horizontal curves, approach to curves or intersections, and within an intersection: Maximum aggregated surface area 10 m ² In other road sections: Maximum aggregated surface area 100 m ²	Per 1 km of double lane roadway	4

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.1.12	Surface dressing, overlays	Shape: Rectangular and parallel to the road center line Maximum level tolerance with surrounding pavement: – 0 mm and +15 mm Materials: Equal or better than the surrounding pavement Applications of surface dressings or overlays require the prior approval of the Engineer. Pavements have to be repaired and inspected by the Project Manager prior to applying surface dressings or overlays.	Per 1 km of double lane roadway	4
B.1.13	Pavement Width	Road width after completing upgrading works to be maintained with a tolerance of + / - 50 mm For edge damage see B.1.11 above	Per 1 km of double lane roadway	3

Table 33.3.2: Operational Service Levels for Unsealed Roads Crossing at Intersections

Note: Unsealed roads crossing the main roadway at intersections shall comply with the following Operational Service Levels up to a distance of 10 meters (both ways) from the edge of the main roadway.

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.2.1	Surface defects	Maximum diameter: 250 mm or equivalent surface area and Maximum depth: 50 mm	Per item	1

Table 33.3.3: Operational Service Levels for Sealed Shoulders

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.3.1	Width	Maximum tolerance: +200 mm / -50 mm of design width	Per 1 km of shoulder	10
B.3.2	Cross fall	Maximum tolerance: +0% and -2% for shoulders repaired by Contractor	Per 1 km of shoulder	5
B.3.3	Potholes	Not more than 5 potholes smaller than 150 mm	Per 1 km of shoulder	2
B.3.4	Patches	Shape: Rectangular and parallel to road centerline. Circular patches less than 100 mm in diameter or equivalent surface area are allowable Maximum level tolerance with surrounding shoulder: -10mm and +20 mm including seals Materials: Equal or better than the surrounding shoulder No unsealed cracks wider than 3 mm For repairs of the base of more than 5 m ² compaction data shall be supplied.	Per item	1
B.3.5	D5:	Maximum width of unsealed cracks: 5 mm	Per 100 m of	2

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
	Linear Cracks	Maximum width of unsealed cracks: 3 mm for an aggregated length of 10 m Sealant height tolerance: +/- 10 mm of adjacent shoulder surface	shoulder	
B.3.6	Multiple cracks (alligator cracking)	Maximum width of unsealed cracks of 3 mm for an aggregated surface area of more than 15m ² Sealant height tolerance: +/- 10 mm of adjacent shoulder The "cracked area" is equivalent to the rectangular area fully enclosing the cracks, where the outermost crack is at least 100 mm inside the rectangle.	Per 100 m of shoulder	2
B.3.7	Depressions	Maximum depth of 25 mm for an aggregated length of 10 m Measurement of depth with a 1.2 straight edge	Per 100 m of shoulder	1
B.3.8	Heaves and Shoves	Maximum height or depth of 35 mm measured with a 1.2 m spirit straight edge centered on the heave and adjusted parallel to the shoulder surface	Per item	1
B.3.9	Surface drain defects	Ponding of water: Maximum depth of 30 mm and maximum surface area of 2 m ²	Per 100 m of shoulder	2
B.3.10	Edge damage	Maximum length from the edge of the paved shoulder towards the centerline of the road: 150 mm and an aggregated length along the road edge of 3 m	Per 100 m of shoulder	2
B.3.11	Edge drop off	Shoulder shall not be higher than 60 mm for an aggregated length of 10 m than the adjacent surface on the outer edge	Per 100 m of shoulder	1
B.3.12	Vegetation	No vegetation growing on the sealed shoulders	Per 100 m of shoulder	1

Table 33.3.4: Operational Service Levels for Unsealed Shoulders

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.4.1	Width	Maximum tolerance: +200 mm / -50mm of design width	Per 100 m of shoulder	2
B.4.2	Cross fall	Maximum tolerance: +0% and -2% for shoulders repaired by Contractor	Per 100 m of shoulder	2
B.4.3	Potholes	There shall be no pothole bigger than 350 mm in diameter or equivalent surface area and deeper than 30 mm There shall be not more than 10 potholes bigger than 200 mm in diameter and more than 30 mm deep in any continuous 1 km of shoulder	Per 1 km of shoulder	2
B.4.4	Patches	Patches shall be of the same material as the surrounding road surface material, properly compacted and in level with the adjacent road surface within a tolerance of +/- 30 mm	Per 1 km of shoulder	1

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.4.5	Ruts or corrugations	Maximum depth of 60 mm for an aggregated length of 50 m in any 1 km of shoulder Maximum depth measured with a 1.2 m straight edge	Per 1 km of shoulder	2
B.4.6	Surface drain defects	There shall be no ponding of water more than 40mm deep with an area of more than 1 m ² within a distance of 1.5 m of the edge of the pavement	Per 100 m of shoulder	2
B.4.7	Vegetation (e.g.: grass, weeds, plants)	Maximum height of 200 mm for an aggregated surface area of 100 m ²	Per 1 km of shoulder	2

Table 33.3.5: Operational Service Levels for Drainage System, Slope Protection Structures

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.5.1	Slopes of drainage system	There shall be no negative slope	Per 100 m of dual lane roadway	2
B.5.2	Uncovered ditches and drains with or without lining	Maximum area of obstructed cross-section at any point: 15% during the non-rainy season Maximum width of cracks in lined channels: 15mm Maximum diameter of holes: 40 mm Maximum area of damaged lining: 10% per 5 m length	Per 50 m of ditches and drains	2
B.5.3	Covered Drains	No major damage that may pose safety hazards to pedestrians or vehicles or allow water to leave the channel. Maximum area of obstructed drainage cross-section: 15% during the non-rainy season Maximum damaged surface area of each cover: 10% Maximum space between covers: 40 mm Maximum area of obstructed cover openings: 20% (excluding covers sealed with asphalt or concrete) Maximum level tolerance with adjacent covers: +/- 20 mm Maximum level tolerance with adjacent pavement: +15 mm and -20 mm	Per 50 m of covered drains	2
B.5.4	Culverts and headwalls	Culverts shall be structurally sound and firmly contained by surrounding soil or material with no major damage to allow water to seep through the wall of any culvert Maximum area of obstructed culvert cross-section of 15% during the dry season	Per culvert or headwall	2

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
		Headwalls shall be structurally sound and firmly contained by surrounding soil or material with no major damage		
B.5.6	Manholes, inlets, outlets, drainage pipes, and catch basins	Manholes, inlets, outlets, drainage pipes, and catch and sedimentation basins shall be structurally sound and firmly contained by surrounding soil or material with no major damage to allow water to seep through the structure Maximum sedimentation: 20% during the non-rainy season Maximum area of obstructed cross section: 15% during the non-rainy season Less than 30% of the cross-section shall be obstructed up to 2 m in front of any manhole, inlet and catch basin.	Per item	1
B.5.7	Manhole cover, grates	Maximum level tolerance with surrounding surfaces: +/- 10 mm Less than 20% of the flow area is obstructed	Per item	1
B.5.8	Kerbs and gutters	Maximum surface damage: 10% of any 10 m length	Per 100 m length per item	1
	Debris racks	Debris racks shall be structurally sound and less than 30% obstructed		
B.5.9	Slopes and cuts	Slope protections and gabions in place and functional Maximum cross sectional dimension of erosion gullies: 200 mm x 200 mm for more than 10m	Per 100 m of slope measured parallel to the centerline of the roadway	1
B.5.10	Retaining walls, cut-off walls and similar structures	Structurally sound and not more than 100 mm displaced from the original place and firmly contained by surrounding soil or material Maximum surface damage: 5% of any surface area of 1m ² Maximum width of cracks on concrete structures: 5 mm Maximum width of cracks on non-concrete structures: 10 mm Maximum numbers of blocked weep holes: 10% per structure	Per item	1

Table 33.3.6: Operational Service Levels for Road Signs, Pavement Markings and other Safety Devices

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.6.1	Regulatory, Warning, Information	All signs as per Drawings are in place Uniform intensity, clean, legible, and	Per item	2

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
	Signs and Hazard markers	structurally sound Minimum visibility distance at day and night (with low beam headlights) 150 m or if in doubt more than 70% of the required original retro reflectivity Maximum bending of sign face from original position: 30mm Post must be in place, structurally intact and properly connected to the foundation with less than 5% of its surface corroded Maximum inclination of posts from the vertical: 5%		
B.6.2	Road Markings	All markings as per Drawings are in place Uniform color and intensity, legible and firmly attached to pavement Minimum visibility distance at night: 150 m with low beam headlights Maximum length of damaged or missing edge or centerline markings: 15 m Maximum area of damaged or faded sign markings or markings of pedestrian crossings: 20% Maximum misalignment: 30 mm	Per 100 m of double lane roadway	2
B.6.3	Raised pavement markers or reflective pavement studs	Maximum missing/damaged markers: 5 Maximum number missing/damaged markers in curves:1 Minimum visibility distance at night:150 m with low beam headlights The reflective area of markers is higher than the pavement level	Per 100 m of double lane roadway	2
B.6.4	Kilometer posts	Present, properly painted, clean, legible, and firmly founded on the ground Maximum inclination from vertical: 8 degrees	Per item	1
B.6.5	Drainage markers, bollards or similar structures	All structures as per drawings are in place Properly painted, clean, 90% free of corrosion or damages Maximum inclination from vertical: 8 degrees	Per item	1
B.6.6	Kerb stones, traffic islands	Maximum surface damage of any kerbstone:10% Kerb stones and traffic islands shall not pose potential hazard to pedestrians	Per 1 km of double lane roadway	1
B.6.7	Concrete barriers	All structures as per drawings are in place Properly painted, clean and structurally sound	Per 1 km of double lane roadway	1

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
		Maximum misalignment: 100 mm Maximum damages: 5% of the surface area of any 1 m of barrier		
B.6.8	Guard rails and safety or crash barriers of metal	Guard rails and safety or crash barriers are in place Not more than 3 reflectors are missing or not functional Properly painted where required and free of severe corrosion Structurally sound with all fixing bolts present and secure Maximum misalignment: 100 mm of the original horizontal or vertical position	Per item and per 50 m length	2
B.6.10	Highway lighting	Lightning columns must be present, functional and more than 95% free from damage and corrosion Electrical installations must be electrically safe and functional	Per 1 km of double lane roadway	2

Table 33.3.7: Operational Service Levels for Vegetation and Litter Control

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.7.1	Vegetation (Grass, weeds, plants)	Vegetation height shall be between 50 mm and 600 mm within 50 cm of the outer edges of drainage ditches or the outer edge of the shoulders or embankments. For grass and weeds there shall be not more than 20 m ² deviations from the above-mentioned heights in any continuous 100 m of double lane road section. Vegetation height shall be between 30 mm and 300 mm around: • Edge marker posts • Signposts • Bridge end and culvert markers • Guardrails • Sight rails • Lighting Columns • Bridge abutments Vegetation height shall be less than 250 mm around or in: • Kilometer post • Drainage markers • Culvert ends • Culvert headwalls • Side drains • Culvert waterways • Surface water channels	Per 1 km of the centerline of the double lane roadway	3

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
		☐ Kerb and channel ☐ Lined channels ☐ All sealed surfaces ☐ Bridge decks. Vegetation height shall be between 30 mm and 200 mm on: ☐ Medians ☐ Traffic islands ☐ Verges AND There shall be not more than 30 m ² deviations from the above-mentioned heights in any continuous 100 m of double lane road section. Vegetation shall not hinder the free flow of water.		
B.7.2	Trees, limbs, shrubs and creepers located within the right-of-way	There shall be not shrubs or trees encroaching into the Vegetation Free Zone from the side or top. The Vegetation Free Zone is the area up to 5 m above the roadway and shoulders, and 3 m above a zone of 2 m lateral clearance besides shoulders. Vegetation shall not obscure any road signs or markers or limit sight distance on the inside of curves by more than 50 m. There shall be no dead or leaning trees or other vegetation within the right-of-way Approval of the Employer is required to remove trees with stem diameter more than 100mm	Per 1 km of the centerline of the double lane roadway	2
B.7.3	Litter	Maximum number of litter items greater than a fist size in any 1 km of double lane road: 50 pieces in the right of way outside built-up areas	Per 1 km of the centerline of the double lane roadway	15
B.7.4	Structures made by third parties	No structures like billboards of third parties within the right of way unless authorized by the Employer.	Per 1 km of the centerline of the double lane roadway	

Table 33.3.8: Operational Service Levels for Bridges

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
B.8.1	Approach to bridges	Maximum level tolerance between bridge deck and approaches: +/- 25 mm measured from the end of deck up to 1.5m into the approaches	Per bridge	2
B.8.2	Structures	Less than 10% of each the structural element shall show corrosion or missing paint The color of the paint shall be uniform and of the same intensity	Per bridge	3
B.8.3	Expansion joints	More than 95% of each expansion joint shall be clean, without major damage, and	Per bridge	2

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points
		shall not pose any hazard to vehicles		
B.8.4	Drains	More than 80% of drains of each bridge shall be more than 80% open	Per bridge	3
B.8.5	Railings	Less than 10% of the surfaces of the railings shall show corrosion or missing paint Paint shall be of uniform color and of same intensity	Per bridge	1
B.8.6	Scouring around bridge piers and erosion retaining walls	Erosion around bridge abutments and piers and on retaining walls (gabions, pitch, concrete) shall be less than 5% of the respective surface areas Cracks shall be less than 30 mm wide for pitch walls and less than 10 mm for concrete walls	Per bridge	2
B.8.7	Waterways	Free flow of water under bridge and up to 50 m upstream and downstream shall not be obstructed by more than 15 % of the cross section of riverbed up to design clearance under bridge as per original design	Per bridge	3

(3) Operational Service Levels Category C

Table 33.4 Pavement Roughness Survey

OLS No.	Item	Operational Service Level	Count Unit	Payment Reduction Points	Rectification Period
C.1.1	Roughness of pavement of highway	Lane-wise average IRI of the entire contract road length less than 3 m/km	Entire Contract Road Length	1,000	3 months
C.1.2	Roughness of pavement of highway	Average IRI of any continuous one lane kilometre less than 4 m/km	1 km lane	100	3 months

(4) Pavement Roughness

The indicator to be used to determine the road roughness will be the International Roughness Index (IRI), whose measure unit is expressed in meters per kilometre (m/km).

An equipment meeting the Class III: Response Type Road Roughness Measuring System (RTRMS) precision shall be used to measure the IRI. The measure of roughness shall be made in a continuous manner in the wheel-tracks of each lane of the carriageway. The equipment shall be calibrated/validated in accordance with the manufacturer's recommendations and from observation during previous use.

The IRI shall be measured at the end of Phase 1: Upgrading Works, at the beginning of Phase 2 and in 12 months' interval thereafter. The final measurement of IRI will be done 3 months before the end of Phase 2. The measurement shall be made in the presence of the Employer's and/or Engineer's Representative.

(5) Verification of Operational Service Levels

a) Service Level Inspections by the Contractor

Under the terms of the contract, the Contractor is required to inspect all roads and road assets that have to be maintained under this contract with sufficient frequency to ensure that they always comply with the Operational Service Levels (OSLs). The contractor shall therefore develop and implement a regime of inspections, sufficient to comply with this requirement, and shall document this inspection regime in his Operational Plan.

Any non-compliance with the OSLs discovered during any inspection shall be recorded.

The record of each defect shall comprise:

- (i) Its location reference (GPS position);
- (ii) Attributes of the defect;
- (iii) As appropriate, further textual notes;
- (iv) A photograph taken with a digital camera and bearing a date and time stamp. The

same procedure applies to the repair of each defect.

The record of each inspection shall be recorded and shall be included in the Monthly Reports.

The contractor shall submit the Contractor's Monthly Operational Service Level Inspection Report and the Monthly Evaluation Form for Compliance with Operational Service Levels to the Engineer on the last working day of the respective month. The format of these tables shall be submitted by the Contractor for the Employer's approval within 15 days after the Commencement Date of Phase 2.

For all non-compliances with Operational Service Levels detected by the Contractor during a month and that are rectified during the same month, no payment reductions will be made with the exception of Operational Service Levels of the Category A. In this case Payment Reduction Points will be applied if the contractor does not rectify the non-compliance within the rectification period defined in Table 33.2

The Contractor shall conduct night inspections at least every month at the end of the month to ensure that when driving at night the road is safe and signs are readily visible at night.

b) Inspections by the Engineer

The Engineer may carry out inspections at anytime and anywhere on the roads included in the contract in order to assure that:

- the Contractor is complying with the Operational Service Levels of the Category A,
- the Contractor has reported the compliance with the Operational Service Levels correctly, and
- the Works are executed in accordance with the Contract provisions.

c) Joint Monthly Inspections by the Engineer and the Contractor

Joint Monthly Inspections are carried out by the Contractor (through his Performance Monitoring Unit) under the supervision of the Engineer. The main purpose of the Joint Monthly Inspections is to enable the Employer to verify the information given by the Contractor in his Monthly Evaluation Form for Compliance with Operational Service Levels.

Starting on the first working day of each month the Contractor and the Engineer shall jointly inspect at least 50% of the road length to check the correctness of the Contractor's Monthly Operational Service Level Inspection Report of the previous month. The selection of road sections to be inspected shall be decided by the Engineer. Any additional non-compliance detected during the joint monthly inspection will be recorded. If the Engineer finds more than 20% additional number of non-compliances during this inspection than have been

recorded by the Contractor in his Monthly Operational Service Level Inspection Report for the inspected road sections, the Payment Reduction Points for all non-compliances detected by the Engineer will be multiplied by a factor of four for the respective month.

In every 3 months, the Joint Monthly Inspection shall include an inspection by night.

As a result of the joint monthly inspection a Memorandum of Non-Compliance with Operational Service Levels shall be issued and signed by the Contractor and the Employer. Based on the Memorandum of Non-Compliance with Operational Service Levels, the Employer will, within 21 days, review and correct as necessary the Contractor's monthly statement and issue the corresponding Interim Payment Certificate to the Contractor in accordance with the General Conditions of Contract.

3305 Payments

1) Basis of Payments

All works and services performed in Phase 2 are deemed to be covered and paid for by the Monthly Lump Sum per kilometer indicated in the Bill of Quantities. Only Day works and Emergency Works shall be paid on unit price bases as specified in the Bill of Quantities.

The works and services shall cover all costs associated with Contract obligations during Phase 2, which are not specifically provided for elsewhere, including (but without being limited to) the provision of insurances, security, implementing quality plan requirements, all social, environmental, safety and traffic management requirements, conducting various inspections, surveys, etc.

2) Payment Reductions

In accordance with these Specifications, payment reductions are applied in case of non-compliance with Operational Service Level requirements.

Where the Contractor fails to comply with Management Service Levels or Operational Service Level, the Employer shall deduct moneys from payments due under the Contract. Payment Reduction Points are specified for each non-compliance with Service Levels.

For the Management Service Levels Payment Reduction Points shall be applied when the Contractor does not comply with the Management Service Levels defined in Table 33.1 above.

For Operational Service Levels Category A, the Payment Reductions Points shall be applied when the Engineer detects the non-compliance and communicates the non-compliance to the Contractor. After receipt by the Contractor of the communication of the Engineer concerning the non-compliance, the time starts for the Contractor to rectify the respective non-compliance within the Rectification Period in Table 33.2. Payment Reduction Points shall be applied if the Contractor does not rectify the non-compliance within the Rectification Period. For each additional Rectification Period in which the Contractor does not rectify the non-compliance further Payment Reduction Points shall be applied until the non-compliance has been rectified. If the same non-compliance is not rectified within one month after the date of the first detection, the Employer may contract a third party to rectify the non-compliance at the cost of the Contractor. The same procedure shall be applied if the Contractor detects a non-compliance, except that no Payment Reduction Points shall be applied for the detection of the non-compliance.

For the Operational Service Levels Category B, the Payment Reduction Points shall be applied for any non-compliance of OSL detected by the Contractor at the end of the month or the Joint Monthly Inspection. If any non-compliance has not been rectified before the next Joint Monthly Inspection, the non-compliance will be counted. In addition, 1 Payment Reduction Point shall be applied for each calendar day the non-compliance is not rectified. If the same non-compliance is still not rectified until the following Joint Monthly Inspection, the Employer may contract a third party to rectify the non-compliance at the cost of the

Contractor.

For the Operational Service Levels Category C, The Payment Reduction Points shall be applied when the Contractor does not rectify the non-compliance within the Rectification Period. For any further period of one month, in which the non-compliance is not rectified, the Payment Reductions Points shall be applied again, until the non-compliance is rectified. If the same non-compliance is still not rectified within 6 months of the first detection, the Employer may contract a third party to rectify the non-compliance at the cost of the Contractor.

3306 Emergency Works

(1) Description of Emergency Works

The Contract includes Dayworks and Provisional Sum for Emergency Works to be executed during Phase 2 of the Contract. Emergency Works are designed to repair damage to the roads caused directly by natural or manmade phenomena with consequences occurring either in the area of the roads or elsewhere, but with a direct impact on the roads. Such phenomena may include: tropical depression, rainfall and winds of extraordinary intensity and/or duration, major landslides within or outside the right-of-way, floods with water levels above normal maximum flood levels, earthquake, major accidents or similar events causing considerable damage to the road.

Damage requiring repair by Emergency Works can be generally described as for example:

- (i) complete destruction of a culvert or other similar structure,
- (ii) road washouts or other damage equivalent to more than 50 m³ of material on a road section of 500 meters length,
- (iii) submersion of road along more than 100 meters length provided that the submersion is, in the opinion of the Employer, not the result of deficiencies in the drainage system or of insufficient maintenance of drainage structures, among others.

Eligible damage does not include "normal" damage, such as trees falling on the road, minor erosion of the road and embankments, and minor damage caused by traffic accidents, which shall be made good by the Contractor as part of the Works. Providing full support to the police and road users and arranging of signing and clean-up of the site or similar works as necessary are part of Works.

(2) Obligations of Contractor during Emergencies

During execution of Emergency Works the Contractor shall ensure that Operational Service Levels on the road are maintained. In particular, the Contractor shall ensure the normal use of the road including those sections affected by emergencies.

The Contractor shall take the measures necessary to reopen the road to traffic at the earliest possible time and maintain the road open during Emergency Works, without being entitled to any separate compensation for those measures. If necessary, the Contractor shall provide temporary detour roads as approved by the Employer.

(3) Minor Works

Minor works that are below the thresholds indicated in the following Table 33.5 shall be carried out by the Contractor as part of the normal PBM Works, and a Work Order is not required. The Contractor shall inform the Employer of the damage and the rectification works undertaken.

Table 33.5: Thresholds of Some Activities for the Normal PBM Works

Activity	Unit	Maximum quantity per event to be rectified under normal PBM Works
Slides of material	m ³	50
Asphalt concrete	m ³	7
Sub-base course	m ³	25
Base course	m ³	15
Concrete (of any type)	m ³	5
Stone masonry	m ³	10
Gabion masonry	m ³	15
Embankment	m ³	50

(4) Procedure for Requesting Emergency Works

When damage falling under Emergency Works results in a reduction of any of the Operational Service Levels specified in this Contract, the Contractor shall make a formal request to the Employer to allow him to carry out Emergency Works to rectify that damage.

In such a case, the Contractor shall (i) immediately inform the Employer of his intention to do so by telephone, SMS or other means, (ii) document the circumstances of the event and the damage caused through photographs, video and other suitable means, (iii) prepare a written request stating the type of works he intends to carry out, their exact location, the estimated quantities and costs, the time required to complete the works and any other information as the Contractor may deem necessary. The request for Emergency Works shall be made immediately after the Contractor becomes aware of the existence of the damage.

Within 48 hours after receipt of the request, the Employer shall evaluate the request based on a site visit, and issue a Work Order to carry out the Emergency Works. The Work Order shall specify the type of works, their estimated quantities, estimated valuation, and the time allowed for their execution.

(5) Operational Service Levels

The Emergency Works shall comply with the requirements of the Specifications and/or applicable Standards and be subject to the Employer's approval. There is no individual Operational Service Level requirement for these works.

The Emergency Works are intended to assist the Contractor in bringing the road up to the required Operational Service Levels within the time frame allowed by the Employer in the corresponding Work Order.

Failure to bring the road to the required Operational Service Levels within the stated time frame shall result in deductions of the Monthly Payments to be decided by the Employer. The payment deductions shall not be higher than 15% of the amount for the Emergency Works.

The Contractor shall correct all non-conformances relating to Emergency Works as specified in the Work Order prior to the Time for Completion of Phase 2. If any section of the road does not meet the Operational Service Levels at the Time for Completion due to uncompleted Emergency Works, Liquidated Damages shall apply.

If the maximum amount of Liquidated Damages has been exhausted and the non-conformance on road has not been rectified, the cost of remaining rectifications shall be recovered from Retentions, Performance Security, any/or any other monies due or that may

become due to the Contractor.

(6) Measurement and Payment

The quantities of completed Emergency Works shall be measured net on drawings or measured at Site, whichever is more appropriate as determined and approved by the Employer. Where required by the Employer, the Contractor shall verify both quantity and quality of the completed works.

Valuation of the completed Emergency Works shall be as established in the corresponding Work Order issued by the Employer for the particular work using appropriate BOQ Unit Rates and Prices or Dayworks Rates, if appropriate.

For the emergency works the budget is allocated in the Dayworks and/or the provisional sums, as appropriate for the payment of the works. The payment for emergency works shall be made at existing Bill of Quantities (BoQ) rates or at appropriate Dayworks rates for each corresponding BoQ pay items with the CPA (Change in Price Adjustment). Such payments shall not be subject to additional overhead as per GCC Clause 13.5 (b) (ii) because of the fact that the BoQ and Dayworks rates quoted by the Contractor are with his overhead.

3307 Appendices for Phase 2

Appendix A: Additional Technical Specifications

(a) Patching of Potholes/Delaminating

(i) General

This covers the repair of the potholes, delaminating and the damaged bituminous surface. The area to be repaired shall be located by the Contractor and marked out in square or rectangular shape, 30 mm beyond the extent of the damaged area, and then it shall be excavated with suitable equipment. The edges shall be cut vertically down to the required depth where the lower layer is suitable without any loose material. If the existing road base is damaged, it shall be also excavated to a depth required and removed as directed by the Engineer. The surface of the excavated area shall be thoroughly cleaned with compressed air to remove all dust and loose particles. The patching then shall be carried out as detailed below. On completion, the patch shall have the tolerances of -0 mm/+10 mm, under a straight edge laid across it.

(ii) Shallow Potholes and Delaminating

Shallow patching shall consist of repairs to the bituminous surface to a depth not exceeding 40 mm.

The area to be repaired shall be excavated and prepared as described in (i) above. The cleaned surface shall be primed with MC 30 cutback bitumen. The sides shall also be tacked / primed with cut back bitumen using brush. The excavated area shall, then, be filled with asphalt premix material. The premix shall have a net bitumen content of 5% to 6% by weight or as per design mix. It shall be compacted with approved mechanical tampers/vibratory roller. After compaction, the surface of the patched area shall be true to the lines and levels of the surrounding existing surface (no "skin patches" are allowable). All loose and/or surplus materials on the surface shall be removed.

Potholes of less than 80 mm in diameter or equivalent surface area do not need to be marked out in square or rectangular shape. They may be filled with asphalt premix after careful cleaning with compressed air to remove all dust and loose particles.

(iii) Deep Patching

Deep patching shall consist of repairs to the bituminous surface to a depth exceeding 40

mm.

The area to be repaired shall be excavated and prepared as described in (i) above. The excavation shall be filled with base course material with each layer not exceeding 75 mm in thickness and duly compacted up to the existing crust thickness less 40 mm. The surface of the compacted base after thoroughly cleaned with compressed air to remove all dust and loose particles shall be primed with MC 30 cutback bitumen and the sides shall also be tacked/primed with cut back bitumen using brush. The top 40 mm portion above the repaired pothole shall be filled with asphalt premix material. The premix shall have a net bitumen content of 5% to 6% by weight or as per design mix. It of the patched area shall be true to the lines and levels of the surrounding existing surface (no "skin patches" are allowable). All loose and/or surplus materials on the surface shall be removed.

(b) Bituminous Surface Edge Repair

Where loss of bituminous surfacing exists at the edge without damaging the base, edge repair shall be performed as described for shallow patching.

Where damage of the edge extends into the base/subbase, the edge repair shall generally be carried out as specified for deep patching. Excavation shall be to a minimum width of 750 mm covering not less than 200 mm of the carriageway and not loose less than 500 mm of the shoulder.

The excavated area shall be filled with base material to a level 40 mm of below the existing level of the road and compacted as mentioned in deep patching. The surface of compacted base and sides of the excavated area shall be primed/tacked with MC 30 cut back the area shall be filled with asphalt premix material and compacted as specified for the patching. The final surface shall match with the adjacent surface in line and levels.

(c) Repair of Failed Sections

The depth of all dig outs to repair failed sections shall be a minimum 400 mm and all excavated material shall be removed from the site. Where full depth excavation is required, the limit of excavation shall be 25 mm below the existing sub-grade level.

Work shall include the supply, placement and compaction of base course material and the construction of a surfacing layer of 40 mm asphalt premix material, including prime/tack coat.

(d) Removal of Landslide Material

Material from major land slips or other debris or unsuitable material shall be removed and carted to a spoil site approved by the Employer. Work shall include clearing all debris and material from the site, loading, cartage to spoil and disposal.

Appendix B Environmental Management

(a) General

The Contractor shall be solely responsible for any remedial or mitigation measures required by the environment-related effects of any of his maintenance activities. The Contractor shall demonstrate compliance with all environmental stipulations for this project in his Environmental Management Plan (EMP). In case of an environmental problem, the Contractor shall immediately notify the Employer and seek advice on his proposed corrective action. Among the situations that may arise are complaints or legal actions by third parties on matters such as environmental damage to property and natural resources, ground subsidence, interruption of groundwater flow and surface or groundwater contamination.

The Contractor shall conform to the Environmental Management Plan, which was prepared

by the Employer for this Contract. The Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising from the execution of project activities. This shall, wherever possible, be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated.

The Contractor is encouraged to recruit local skilled and unskilled labour to increase direct benefits in the project area and to minimize potential environmental issues related to construction camps, disease transmission and cultural disputes. Specific requirements in this regard are noted below. In conformance with the Specifications of which this environmental specification is a part, the Employer may withhold payments and/or stop work in the event of serious or repeated violations of the conditions stipulated herein.

(b) Compliance with Environmental Laws and Regulations

The Contractor shall conform to the Government of Nepal's laws for the protection of the environment and other relevant legislation in force, or in the absence of these, with Asian Development Bank requirements.

The Contractor shall comply with all current environmental laws and regulations of the country, be they national or local, relating to (but not limited to) the following:

- Dust
- Noise
- Vibration
- Air pollution
- Water contamination
- Solid waste disposal
- Liquid waste disposal
- Occupational health and safety
- Sanitary conditions (water supply, sewerage, etc.).

(c) Avoidance of Nuisance

The Contractor shall be responsible for ensuring that no earth, rock or debris is deposited on public or private rights-of-way as a result of operations, including any deposits arising from the movement of plant or vehicles. The Contractor shall ensure that vehicles exiting the Site of the works do not carry excessive material on the tires.

All water and waste products arising from the site operation shall be collected and removed from the site via a suitably designed temporary drainage system. They shall be disposed of at a location and in a manner that will not cause pollution problems or other nuisance.

The Contractor shall construct, maintain, remove and reinstate as necessary, temporary drainage works and take all precautions needed to avoid damage by flooding and silt transport in the works. He shall also provide adequate precautions to ensure that no spoil or debris of any kind is allowed to be pushed, washed down or deposited on land adjacent to the site.

In the event that any spoil or debris from maintenance works is deposited on adjacent land or washed into the area, then all such materials shall be immediately removed and the affected land restored to its natural state by the Contractor, to the satisfaction of the Employer.

(d) Air Quality

The Contractor shall not install any furnaces, boilers or other similar plant or equipment using fuel that may produce air pollutants without prior written consent from the Employer.

The Contractor shall not burn debris or other materials on the Site.

The Contractor shall implement dust suppression measures that shall include:

- Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate and other similar materials, when dust is likely to be created and to dampen them during dry, windy weather.
- The Contractor shall require that all vehicles, while parked on the site have their engines turned off.
- The Contractor shall check all equipment and machinery on the site at least once per week and make any necessary corrections or repairs to ensure compliance with safety and air pollution requirements.
- The Contractor shall ensure that vehicles are properly cleaned (bodies and tires free from sand and mud) prior to allowing them to leave the Site.
- The Contractor shall provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site.
- The Contractor shall ensure that trucks used for transporting materials to and from the site are covered with canvas tarpaulins or other type of cover acceptable to the Employer, properly secured to prevent debris and/or materials falling from, or being blown off the vehicle(s).

(e) Water Quality Management

The Contractor shall ensure that no tools or machinery are washed in any water source or areas that drain into a watercourse, canals or channel.

The Contractor shall ensure that all temporary maintenance facilities are located at least 50 m away from any water body.

The Contractor shall check weekly that all equipment is prevented from dripping oil and other lubricants and to ensure that all lubrication and repair operations are carried out only in approved maintenance areas.

(f) Noise and Vibration Control

The Contractor shall consider noise and vibration as an environmental constraint in planning and executing maintenance works.

Noise Control:

The Contractor shall at his own expense, take all appropriate measures to ensure that work carried out by the Contractor, whether on or off the Site, will not cause any unnecessary or excessive noise that may disturb local residents.

Night time work will require the prior written approval of the Employer.

Vibration Control:

The Contractor shall take all necessary measures to ensure that machinery used in the Works will not cause any excessive vibration that may cause damages to any building or structure.

The Contractor shall be responsible for repairing any damage caused by vibrations generated from or by the use of any equipment, plant and machinery.

(g) Environmental Reports

The Contractor shall submit regular environmental reports to the Employer as a requirement of the EMP. A summary report shall be submitted as part of the Monthly Progress Report. Reports shall comprehensively address all relevant aspects of environmental management.

(h) Environmental Inspections

All project locations including maintenance work sites, plant and equipment areas, staff offices, camps and accommodations that are directly or indirectly associated with the Contract shall be regularly inspected for compliance with the requirements of the EMP and related statutory regulations.

FOR REFERENCE ONLY

Add new “Section 3400 – Reinforced Soil Structures with Geostrip” after “Section 3300 – Performance Based Maintenance Works”

Section 3400 – Reinforced Soil Structures with Geostrip

1. Scope

- 1.1.** The work includes reviewing design and drawings for the entire reinforced soil structure for different sectional heights, supply of soil reinforcing elements, fascia panels, accessories and fittings, construction of reinforced soil structure including placement of fascia panels, reinforcing elements, providing and placing earthwork in layers and all associated components in conformity with the specifications and in compliance with the lines, grades, design and dimensions as per approved drawings including supervision by an approved supervising personnel of all work. The work also includes preparing, submitting & getting approval to all the changes made in the designs and drawings and method statement along with program to match with over all completion of the work.
- 1.2.** The reinforced soil structure shall be designed to cater for all the design loads including earth pressure, surcharge, live loads, seismic loads etc., as per National Highway traffic and other design criteria specified in IRC codes. The design of reinforced soil structure shall be based on the actual site conditions and shall match with the approved construction drawings of bridges/flyovers/underpasses/ROB etc. The work shall be done in conformity with the specifications of contract and MORT&H Specifications for Road and Bridge works, Reprint 2002.
(Refer to website:
<http://www.manuneethi.in/FILES/IRC%20CODES%20&%20MORTH%20SPECIFICATIONS/MORTH%205th%20REVISION.pdf>)
- 1.3.** The Contractor shall submit within three months from the date of commencement to the Engineer, the complete review of the design, computation and working drawing, and also the methodology proposed to be adopted for the works. The submission shall include the following:
 - I. Existing ground levels including cross-sections that have been verified by the contractor for each location involving the construction wholly or partially in the original ground.
 - II. Layout of walls, detailed design calculations and drawings, material specifications and construction methodology including quality control and quality assurance of different components.
 - III. Earthwork requirements, and results of tests conducted on selected fill material.
 - IV. Details of drainage systems and any other facilities.
 - V. Test results of soil reinforcing structural element from manufacturers/ suppliers.
 - VI. Test results of various materials from an independent laboratory acceptable to the Engineer.
 - VII. Any other information required in the plans or special provisions or requested by the Engineer.

The Contractor shall furnish design, drawings, method statement, QA plan etc., for approval by the engineer and make his own arrangements to secure the supplies and services needed. The Contractor needs to consider and take due care that the reinforced soil structure is a product of specialized technology.

2. Review of the Design of Reinforced Soil Wall Structure

The review shall necessarily include corrections needed in the design of the reinforced soil wall, considering global stability, external and internal stability under standard and seismic loading as per Federal Highway Administration (FHWA) design guidelines (FHWA-NHI-00-043).

The reinforced soil backfill shall be a select granular fill having high frictional resistance, low compressibility and free draining. Coarse-grained soils with limited fines adequately satisfy these requirements. Thus, the select granular fill shall not contain fines (passing 75 micron

sieve) more than 15%. Co-efficient of uniformity (Cu) of the backfill shall be greater 2 and the peak angle of internal friction should be greater than or equal to 300. The plasticity index shall not exceed 6.

2.1. Design Loads

The following loads shall also be considered while designing the Reinforced Soil Wall structures apart from all applicable loads for its tendered use:-

For Walls

- i. Traffic Live load surcharge: 2.4T/m²
- ii. Dead load surcharge : 1.2T/m² or higher as per design
- iii. Traffic impact load on crash barrier: 7.5kN/m for pullout resistance
30 kN/m for tensile strength
- iv. Seismic loads as per maximum acceleration expected at site. (Zone factor of Table-5, IRC6:2000).

2.2. Design Temperature

For designing the RS wall with geogrid or geostrips, the creep reduction factor should be based on up to design temperature of 40°C and durability reduction factor should be based on design temperature of 30°C.

3. Reinforced Soil Backfill

- 3.1. The reinforced soil backfill shall be a select granular fill having high frictional resistance, low compressibility and free draining. Coarse-grained soils with limited fines adequately satisfy these requirements. Thus, the select granular fill shall not contain fines (passing 75 micron sieve) more than 15%. Co-efficient of uniformity (Cu) of the backfill shall be greater 2 and the peak angle of internal friction should be greater than or equal to 300. The plasticity index shall not exceed 6.

The backfill shall also be free from organic or otherwise deleterious materials so as not to cause corrosion of the soil reinforcement and the facia panels

- 3.2. Where metallic soil reinforcing elements is proposed to be used, the fill material shall confirm to following electrochemical requirements:

The electrical resistivity of fill material shall be 5000 ohm-cm or more determined based on standard test and materials with resistivity less than 1000 ohm-cm are unsuitable and shall not be used.

Materials with resistivity between 5000 & 1000 ohm-cm are acceptable provided that in water extracted from soil-water mix, the content of chlorides does not exceed 200 ppm, the content of Sulphate does not exceed 1000 ppm, and the pH value is in the range of >5<10.

The foundation soil's electrochemical requirements should also meet the above criteria. If not, special consideration will be given to the design of reinforcing element and facing material.

The above criteria applicable only for metal strip reinforcement.

- 3.3. The select backfill shall be compacted to ensure achieving peak angle of friction not lower than 32° as established from test as per Annexure C, BS 8006. For design, effective cohesion of backfill shall be taken as zero.

- 3.4. The compacted layer should not be more than 200mm thick. The compaction of backfill material shall be 95% of maximum dry density obtained from modified Proctor compaction test performed as per IS 2720 (Part-8).

- 3.5. Where metal reinforcement is proposed to be used, water used for compaction of the select fill should have electrical resistivity exceeding 700 ohm-cm.

4. Reinforcing Elements

- 4.1. Reinforcing materials made of geosynthetics shall be used for reinforcing the select fill. Geosynthetics in the form of high tenacity polyester geostrips or geogrids with polyethylene coating shall be used as reinforcing element. The selection of suitable reinforcing element shall be as per specifications given in the document and shall be approved by the Engineer.

4.2. Geosynthetics

The material factors as per the specified design life of reinforced soil wall structure and design temperature for the project, shall be used to determine the long term strength of the geosynthetic reinforcement for design of reinforced soil wall structure. The design life shall be 100 years. The agency should provide independently certified partial material factors to be considered in the design of RS Wall for the geosynthetic reinforcement for design temperature and design life of reinforced soil wall structure.

All quantity control strength of geosynthetics must represent minimum average roll values (MARV) corresponding to 95% confidence limit. Testing of geosynthetic for tensile strength shall be performed in accordance with ISO 10319 for every 5000 m² of geogrid or 20000 m of geostrips and test data for each lot of material shall accompany shipments.

The geogrid and geostrips shall be made from high molecular weight and high tenacity polyester (PET) yarns. The reinforcing elements to be used for the project shall be manufactured at ISO 9001 – 2000 certified production facility only and the system provider should also be ISO 9001:2001 certified. The polyester used for manufacturing geogrid or geostrips should satisfy the following requirements:

- Minimum molecular weight no. > 25000
- Maximum carboxyl end group no. (CEG) < 30

Polyester geogrids and geostrips shall be provided with a protective polyethylene coating to maximize the resistance to hydrolysis and enhance durability and increase survivability during construction and in service.

4.3. Connection

Connection between the fascia and the reinforcing element shall be using galvanised steel loops & toggles bars of appropriate diameter designed as per relevant Indian Standards. If polymeric connections are used or any components of connections are made of polymeric material, the agency shall provide the results of tests carried out on the connection to establish the connection strength between the fascia and reinforcing elements from independent accredited body as per the requirement of BS 8006.

4.4. Handling & Storage of Reinforcing Elements

- i. Reinforcing elements shall not be subjected to rough handling, shock loading or dropping from a height.
- ii. Reinforcing elements shall be stored in such a manner to eliminate the possibility of any damage and shall be clearly labelled to identify items with different dimensions and properties.
- iii. Nylon, rope or padded slings shall be used for lifting galvanized reinforcing elements; bundles of reinforcement shall be lifted with a strong back or with multiple supports to prevent abrasion or excessive bending.
- iv. Polymeric reinforcing elements shall be properly stored and protected from

precipitation, extended ultraviolet radiation, direct sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperature in excess of 50°C, and any other environmental condition that may damage the physical property values.

5. Facia Units

The facia units, which help maintain a vertical face of the reinforced soil structure, avoid erosion of the fill and provide aesthetic appearance to the reinforced soil, shall be of the pre-cast reinforced concrete panels. The type and shape of the facia units to be finally adopted shall be subject to approval by the Engineer.

5.1. Pre-cast Reinforced Concrete Panels

The pre-cast concrete facing units shall be a discrete panel having maximum longitudinal, transversal and rotational flexibility to cater high static and dynamic loads, and ground movements.

Pre-cast concrete facing elements shall conform to the details and dimensions shown on the approved drawing. Concrete shall be of M-35 grade and shall conform to the requirements as specified in section 1700 "Structural Concrete" of MORT&H Specifications.

The minimum thickness of the panel shall be 16 cm excluding facing textures and design.

Reinforcement in panels shall be designed for the connections with soil reinforcing structural elements and shall be placed as shown on the drawing and shall conform to the requirements specified in Section 1600 of the MORT&H Specifications.

5.2. Casting

The elements shall be cast on a flat area. Connecting pins/ loops, PVC pipes and dowel bars and lifting anchors etc., shall be set in the mould to the dimensions and tolerances shown on the drawing prior to casting. The concrete in each unit shall be placed without interruption and shall be compacted by the use of an approved vibrator supplemented by hand-tamping as may be necessary to ensure that the concrete reaches into the corners of the forms and prevent formation of stone pockets. Clear form oil of the same manufacturer shall be used throughout the casting operations.

5.3. Curing

The precast elements shall be cured for a sufficient length of time as approved by Engineer so that the concrete develops the required compressive strength. Only fresh potable water shall be used for curing.

5.4. Scribing

The date of manufacture, batch number and panel designation shall be clearly scribed on the rear face of each unit.

5.5. Concrete Finish

The front (exposed) face of the elements shall have the finish approved by the Engineer and painted with cement based waterproof paint or as decided by the Engineer. The rear face shall have the finish of unformed surface and shall be roughly screened to eliminate open pockets of aggregates.

5.6. Tolerances

All elements shall be manufactured within the following tolerances:

- All dimensions within: $\pm 5\text{mm}$
- Evenness of the front face: $\pm 5\text{ mm}$ over 1500mm
- Diagonals: maximum $\pm 10\text{mm}$.
- Thickness: $\pm 2\text{ mm}$

5.7. Handling, Storage and Transporting

All elements shall be handled, stored and transported in such manner as to eliminate the danger of chipping, cracks, fracture and excessive bending stresses. Elements in storage shall be supported on firm blocks to be located adjacent to the connection to avoid bending.

5.8. Acceptability

Acceptability of the precast elements shall be determined on the basis of compression tests on concrete cubes taken during precasting, as per MORT&H Specifications.

5.9. Rejection

Elements shall be subject to rejection in case of failure to meet any of the requirements specified above. In addition, defects, which indicate imperfect molding, or defects indicating honeycombed or open textured concrete, shall be sufficient cause for rejection.

6. Drainage Material, Bearing Pads and Joint Fillers

6.1. The drainage provision shall be strictly followed as per the approved working drawing. The retained fill shall have a suitably designed drainage bay and associated drainage system to allow for free drainage of the reinforced fill. The minimum drainage gallery width just behind the facing units shall be 600mm with well – graded crushed aggregate (materials of 19.5mm to 9.1mm size as per IS: 383). Alternatively geo composite conforming to IRC 34:2011 which ensure adequate drainage may be provided.

6.2. The main collection drainpipe just behind the precast facing, if used, shall be a minimum of 150mm in diameter. The secondary collection drain pipes should be sloped a minimum of two percent to provide gravity flow into the main collection drainpipe. Drainage laterals shall be spaced at a maximum 15 meters spacing along the wall face. The drainage collection pipe shall be a perforated or slotted, PVC or corrugated HDPE pipe. The drainage pipes shall be wrapped with geotextile.

6.3. A gap of not less than 15 mm shall be maintained all around the facing units after erection. Bearing pads for horizontal joints between panels shall be made of elastomer with vulcanised EPDM. Fillers of vertical joints between panels shall be flexible open/close cell polyurethane foam strips or non-woven fabric strips (the latter used as joint cover instead of filter) as approved by Engineer.

7. Construction Requirements

The construction of Reinforced Soil Structures shall be carried out in accordance with the specifications and in conformity with the lines, grades, design and dimensions shown on the approved drawings.

7.1. Excavation

The plan area of the of Reinforced Soil Structures shall be excavated in accordance with the requirements of General and Special Specifications and in reasonably close conformity to the limits and to the lines and grades during construction stages as shown on the approved drawings. The contractor shall take precautions to minimise over-excavation. Excavation support, if required shall be designed by the Contractor.

7.2. Foundation Preparation

The foundation for Reinforced Soil Structures shall be graded level for width equal to or exceeding the length of reinforcing geosynthetics. Prior to wall construction, the foundation shall be compacted with a smooth wheeled roller. The depth of foundation below the finished ground level shall not be less than as specified in BS 8006-1995 or 1m, whichever is greater.

7.3. Ground Improvement

Where foundation soil is found to be unsuitable, either removal and replacement

technique or ground improvement is required to be carried out, as required by the Engineer. The need for ground improvement, design and ground improvement methodology shall be verified and approved by the Engineer prior to construction.

Suitable ground improvement technique shall be identified based on the results of subsoil exploration. Foundation preparatory works and foundation treatment/ improvement shall be treated as integral part of the reinforced soil structure and accordingly Contractor shall arrange for detailed sub-soil investigation works and employ his resources to design and construct the foundation/ ground improvement treatment, wherever necessary to satisfy the requirements of reinforced soil structure. The design check and validation for foundation treatment/ ground improvement and the methodology shall be verified and approved by the Engineer prior to construction.

7.4. Leveling Concrete

A leveling concrete pad shall be provided under the walls. Concrete shall have a minimum grade M-15. Maximum size of aggregates shall be 20mm and the pad shall be cured for at least 48 hours before placement of panels.

7.5. Erection

7.5.1. Reinforcing elements shall be installed at the proper elevation and orientation as shown in approved drawings or as directed by the Engineer. The reinforcement strips shall be placed normal to the face of the wall unless otherwise shown on the drawings.

7.5.2. Pre-cast Concrete Facia Panels

Pre-cast concrete panels shall be placed vertically with the aid of a light crane. For erection, panels shall be handled by means of lifting devices set into the upper edge of the panels. Panels shall be placed in successive horizontal lifts in the sequence shown on the drawings as backfill placement proceeds.

Panels may be provided with an initial inward batter as specified by the agency or as given in the drawings. Initial inward batter is required to counter the outward tilt that will occur as the wall height is built up and also due to construction process.

As fill materials is placed behind a panel, the panels shall be maintained in positions by means of temporary wooden wedges placed in the joint at the junction of the two adjacent top rows of panels during construction. As construction proceeds, and a fourth row is erected, the lowest row of wedges can be removed and so on.

External bracing may also be needed for the initial lift. However, bracings shall be placed in an area not more than 1.5m wide beyond the outer face of panels.

Vertical tolerances (plumbness) and horizontal alignment tolerance shall not exceed 25mm when measured along a 3 m straight edge. The maximum allowable offset in any panel joint shall be 25mm.

7.6. Reinforced Soil Backfill Placement

The reinforcing elements shall be laid free from all kinks, damage and displacement during deposition, spreading, leveling and compaction of the fill. The programme of filling shall be such that no construction plant runs directly on the reinforcement. It shall be ensured that the exposure of soil reinforcement to ultraviolet rays is minimal and should be covered with fill within one day of placement.

All construction plant having a mass exceeding 1000 kg shall be kept at least 1.5m away from the face of wall. In this area (upto 1.5m from the face of slope or wall), the following compaction plant shall be used.

Vibratory roller having a weight per meter width of roll not exceeding 1300 kg with total weight not exceeding 1000 kg.

Vibratory plate compactor of maximum weight 1000 kg. Vibro tamper having a weight not exceeding 75 kg.

During construction, the retained material beyond the reinforcement at the rear of the structure shall be maintained at the same level as reinforced fill. The entire works related to compaction should be carried out generally in a direction parallel to the facing. Fill placement methods near the facing shall ensure that no voids exist below the reinforcing elements.

At the end of each day's operations, the contractor shall shape the last level of backfill as to permit run-off rainwater away from the wall face.

7.7. Drainage Material Placement

Drainage material shall be placed to finished thickness and widths shown on the construction plans or as modified by the Engineer. During placement and compaction of drainage material, care must be taken to ensure that there is no contamination with undesirable materials. Vertical layers of drainage material shall be brought up at the same level as the adjoining fill material.

Drainage collection pipes shall be installed to maintain gravity flow of water outside of the reinforced soil zone. The drainage collection pipe should discharge into a storm sewer, manhole or along a slope at an elevation lower than the lowest point of the pipe within the aggregate drain.

More efficient drainage system, if possible, may be suggested by the proprietary Supplier/ Contractor for the review and approval of Engineer.

8. Design, Working Drawing & Detailing

The scope of work shall also cover the supply of detailed design, engineering submission of working drawings by the specialized agency for reinforced soil works. The designs and drawings shall be got approved from the Engineer and/or its representative before execution of work.

9. Inspection

Engineer and/or the representative shall verify the materials supplied and quality of work to ensure that all the requirements of the specifications are satisfactorily met with. This includes all submittals and proper installation of the system.

The reinforced soil structure system supplier shall provide one qualified and experienced representative at site on full time basis during the entire working phase to ensure that the quality of the works performed by the Contractor is in accordance with the specifications and to assist the Contractor regarding proper wall installation.

The Contractor's field construction supervisor shall have demonstrated experience and should be qualified to direct all work at the site. All expenses relating to this presence on site shall be deemed to have been included in the rate and no extra claim on this account shall be admissible.

10. Quality Control and Testing of Materials

Testing shall be done as stated elsewhere in this specification on all materials required for reinforced soil structure construction. The tests shall be done from a reputed independent agency or at the manufacturer's facility under the presence of Engineer or his representative as and when required. All tests and testing certificates shall be submitted to the Engineer at least 7 working days prior to use of any material. Tests on materials before and during construction shall not be limited to the following types.

10.1. For Geosynthetic reinforcing elements

- i. Tensile strength certificate from the supplier for each lot.
- ii. Testing at manufacturer's facility witnessed by Engineer's representative to verify the test results.
- iii. Determination of interaction coefficients by shear box test, maximum once in a project, if the values used in design are not as per the codes of practices or as specified by certified body, otherwise at owners costs.
- iv. The following particulars of the proposed geosynthetic reinforcing elements and connections shall be submitted to the Engineer:
 - a. Literature on the proposed reinforcing element and connection.

- b. Copies of valid quality assurance certificate such as ISO 9001 or equivalent certifying the quality system for the manufacturing of the reinforcing elements.
- c. A certificate showing the manufacturer's name, the date and place of manufacture and showing that the reinforcing element complies with the requirements stated in the contract and including the results of tests specified in the contract or as specified by the Engineer.
- v. Samples of the reinforcing elements and connections shall be submitted to the Engineer at the same time as particulars of the material are submitted.

10.2. For fill material:

- I). At source approval, the borrow area shall be divided into grid of 25m c/c (or closer if variability is high) as per Cla. No. 903.2 of MORT&H specifications and trial pit shall be taken to full depth in each grid. These trial pits should be logged and plotted for proper identification of suitable source of fill material. Following tests on representative samples shall be carried out:
 - a. Grain size analysis - 2 tests per 3000 cu.m of fill.
 - b. Plasticity test – 2 tests per 3000 cu.m of fill
 - c. Shear test for ☐Peak as per Appendix C of BS 8006 – one test for every 3000 cu.m of fill material.
 - d. Modified Procter test as per IS: 2720 (Part-8) – 2 tests per 3000 cu.m of fill material.
 - e. Electrochemical properties of soil if steel reinforcing elements are used – 1 test per 3000 cu.m of fill material.
- II). During construction:
 - a. Grain size analysis for every 3000 cu.m of fill
 - b. Shear test for ☐Peak as per Appendix C of BS:8006 for every 10,000 cu.m of fill if the grain size analysis matches with the tests that were carried out during source approval or else one test per 3000 cu.m of fill material.
 - c. Modified Procter test as per IS:2720 (Part-8) – 2 tests per 10,000 cu.m of fill material if the grain size analysis matches with the tests that were carried out during source approval or else two test per 3000 cu.m of fill material.
 - d. Electrochemical properties of soil if steel reinforcing elements are used – 1 test per 10000 cu.m of fill material.
 - e. Density of each compacted layer (>95% of MDD) at frequency as per clause 903.2.2 – one set of 10 tests in every 500 sq.m.
- III). The following particulars of the proposed fill material shall be submitted to the Engineer for approval:
 - a. Statement identifying each source of supply and showing that sufficient suitable material is available for the works.
 - b. For material from borrow areas, a plan showing the location and extent of each proposed borrow area, and the location, depth and test results for each sample obtained.
 - c. Certificates from a laboratory approved by the Engineer which show that each material proposed for use complies with the requirements of the Contract and has been tested in accordance with the appropriate test methods given in this Specification.
- IV). On receipt of the above particulars, the Engineer may require the Contractor to carry out additional sampling and testing to demonstrate that the properties of the proposed sources of fill will meet the requirements of the Contract.

11. Measurement for Payments

11.1. The measurement for Reinforced soil structures shall be as follows:

- a) The measurement shall be for the total face area of each face of RSS wall in square meters measured from top of foundation levelling pad to bottom of crash barrier.
- b) Measurement of backfill placement and compacting for the reinforced soil wall shall be in cubic meters of compacted soil.
- c) For crash barrier and friction slab measurement for concrete shall be in cubic meters.

11.2. The payment for excavation, foundation concrete, reinforcing element, fasteners, filter media, drainage layer, drainpipe, coping beam and other accessories shall not be measured separately. It is deemed to have been included in the facia material rates for the project.

12. Rate

12.1. The overall rate for reinforced soil wall shall include detailed engineering including designs, drawings, all specified quality control tests, approval from Engineer, furnishing, fabricating and providing all materials for the walls including fascia panels, reinforcing elements and all its accessories, excavation and foundation construction; setting out and erection of wall materials including fascia panels with all joint fillers/materials, reinforcement etc., supplying and placing of drainage works, filter medium and filter fabric, foundation pad including any supplementary arrangement to receive the first panel and capping beam etc. Cost involved for any field investigation and sub-soil exploration as directed by the Engineer to determine the extent of ground improvement shall be borne by the Contractor. The rate shall include the cost of labour, plant/ machinery, material storage and handling expenses, as required for all the above activities for completing the works.

The rate shall also cover the cost of all materials, castings, curing, and quality control tests, stacking, transporting and placing of facia. Cost of joints, all necessary temporary formwork, scaffolding and all lifts and leads complete as per approved design/ drawing of the specialised firm shall also be included.

The rate shall also include material cost, all transportation costs and storage of the same as per special provisions for reinforcement element. The rate shall also include cost of quality control tests, laying of the reinforcing elements including all overlaps and accessories.

The rate also shall include all items of excavation, concrete, reinforcing steel, formwork, curing etc for foundation and capping beam.

The rate shall also cover providing, placing and compacting drainage aggregate, filter medium including drainage collection pipe, filter fabric and conducting quality control tests etc for drainage.

The rate shall also include patentee charges (if any) and supervision by the specialised supplier (manufacturer / agency).

12.2. The rate for soil fill shall include selection, supply, placing, compaction, and quality control tests etc. for approved earth fill. The rate shall also include the cost of labour, plant/ machinery, transportation for all leads and lifts etc. as required for the completion of the works, dressing and levelling of slopes, including special measures for edge reinforcement in accordance with the drawings.

12.3. The rate for crash barrier and friction slab shall include the cost of all materials, labour, plant/ machinery, transportation for all leads and lifts etc. as required for completing the work.

Appendices

- Appendix1: List of Standards
- Appendix2: Office and Furniture / Equipment for the Employer
- Appendix3: Accommodation and Furniture / Equipment for the Employer
- Appendix4: Vehicles for the Employer
- Appendix5: Survey Instruments Required at site
- Appendix6: Site Laboratory
- Appendix7: Laboratory Equipment
- Appendix8: Project Signboard

FOR REFERENCE ONLY

Appendix 1: List of Standards

The Contractor shall provide for the use of the Engineer, in accordance with the Specifications, copies of the latest editions of the following Standards, Publications and Codes of Practice; or copies of manuals containing details of these Standards:-

- TRL ORN 3:** A guide to surface dressing in topical and sub-tropical countries
- TRLORN18:** A guide to the pavement evaluation and maintenance of bitumen – surfaced roads in tropical and sub-tropical countries
- TRLORN31:** A guide to the structural design of bitumen – surfaced roads in tropical and sub- tropical countries.
- TRLRR104:** Preparation of cut-back bitumen.

NEPAL STANDARDS (NS)

- NS163-2045(1988) Method of Test for adhesion of galvanising of Gabion Wire
NS169-2045(1988) Requirements for mild steel wire (for Gabions)

INDIAN STANDARDS (IS)

- IS: 73– 1992 Paving Bitumen Specification
IS: 217-1988 Cutback Bitumen-Specification
IS: 1124-1974 Method of Test for water absorption, apparent specific gravity and porosity of natural building stones
IS: 1597–1992 Code of Practice for construction of stonemasonry
Part 1 Rubble stone masonry
Part 2 Ashlar masonry
IS: 2116–1980 Sand for masonry mortars
IS: 2250-1981 Method of Test for cement mortar
IS: 2386-1963 Method of Test for Aggregates
Parts 1-6
IS: 2720 Method of Test for Soils
Parts 1-5, 7, 8, 10, 14, 16, 22, 28, 29, 37& 40

BRITISH STANDARDS (BS)

- BS: 812-1975 Testing Aggregates
Part 1: Methods for determination of particle size and shape.
Part 2: Methods for determination of physical properties
BS: 1377 Methods of test for soil for civil engineering purposes
BS: 1881 Methods of testing concrete
Parts 5,101-122,124,125,127,129,201-207 & 209

AMERICAN PUBLICATIONS & STANDARDS (ASTM/AASHTO).

- AASHTO Part I: Standard Specification for Materials
Part II: Method of Sampling and Testing

All standards provided shall remain the property of the Contractor on completion of the contract.

OTHER PUBLICATIONS

In addition, the Contractor is to be familiar with and be able to provide, in part or in full or photocopies where possible, to the Engineer on a temporary basis the latest editions of the following Standards

And /or Publications, which are mentioned in the most relevant Sections of the Standard Specifications for Road and Bridge Works, when so requested.

NEPAL STANDARDS (NS)

NS: 1 –2035(1978)	Specification for Burnt Clay Bricks
NS: 40-2040(1983)	Specification for High Density Polythene Pipes
NS: 80-2042(1985)	Specification for Reinforced Concrete Pipes
NS: 84-2042(1985)	Specification for Reinforcing Steel
NS: 112-2042(1985)	Specification for Enamel and Non-reflectorised Paint
NS: 163-2045(1988)	Specification for Smooth Wire
NS: 168-2045(1988)	Specification for Barbed Wire
NS: 190-2045(1988)	Specification for Primer Paint
NS: 191-2045(1988)	Specification for Reinforcing Steel
NS: 199-2046(1989)	Specification for Galvanised Iron (GI) Pipe
NS: 408-2054(1997)	Specification for Road Marking Paint

Other relevant NS documents as required by these Specifications.

INDIAN PUBLICATIONS & STANDARDS

IS: 277-1992	Galvanised Steel Sheets (Plain and Corrugated)
IS: 432-1982	Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement
IS456-2000	Code of Practice for plain and reinforced concrete
IS: 1079	Steel plate
IS: 1161	Steel tubes
IS: 1566-1985	Steel mesh fabric (for concrete reinforcement)
IS: 1786-1985	High strength deformed steel bars and wires for concrete reinforcement
IS: 2062-1999	Steel for general structural purpose
IS: 2062-1986	Method of Test for galvanized hardware
IS: 2386	Method of Test for Aggregates Parts 7 & 8
IS2629-1985	Hot-Dip Galvanising of Iron and Steel
IS: 4031	Method of Test for Cement Parts 2, 3, 5& 6
IS: 5758:1992	Pre-cast concrete kerbs, channels, edgings and quadrants

Indian Roads Congress (IRC)

Specifications for Road and Bridge Works (Fourth Revision) 2001	
IRC:89	Stone for Pitching/ Revetment on Slopes (Clause5.5.5.1)

Other relevant IS and IRC documents as required by these Specifications.

BRITISH PUBLICATIONS & STANDARDS

BS: 12	Specification for Portland cement Requirements for composition, strength, physical and chemical properties of four strength classes.
BS: 63	Specification for Single-Sized aggregate for general purposes.
BS: 812	Testing Aggregates Methods for determination of soluble Chloride Content. Part 117
BS: 1707	Specification for hot binder distributors for road surface dressings
BS: 3049	Pedestrian guard rails (metal)
BS: 3148	Methods of test for water for making concrete (including notes on the suitability of water)
BS: 5075	Specification for concrete admixtures/workability agents
BS: 6044	Road Paint

BS: 6088	Reflecting beads (Ballotini)
BS: 6906	Method Of Testing Geotextiles Part 1 - Determination of tensile properties using wide width strips Part 3 - Determination of water flow normal to the plane of geotextile under a constant head. Part 4 - Determination of puncture resistance (CBR puncture test) Part 6 - Determination of resistance to perforation (Cone drop test)
BS: 7263	Part 1:1990 Pre-cast concrete kerbs, channels, edgings and quadrants

Other relevant BS documents as required by these Specifications.

AMERICAN PUBLICATIONS & STANDARDS (Including ASTM/AASHTO)

ASTM: D5	Bitumen Penetration of bitumen/(asphalt)
ASTM:D6/D1754	Loss on heating of bitumen/ (asphalt)
ASTM:D36	Softening point of bitumen/ (asphalt)
ASTM:D92	Flash and fire points of bitumen/(asphalt)
ASTM:D113	Ductility of bitumen/(asphalt)
ASTM: D2026	Standard specification for cutback asphalt (Slow curing type)
ASTM: D2027	Standard specification for cutback asphalt (Medium curing type)
ASTM: D2028	Standard specification for cutback asphalt (Rapid curing type)
ASTM: D4694	Standard specification for Pavement Falling Weight Deflectometer(FWD)
ASTM:E950	Standard specification for Road roughness

Other relevant ASTM documents as required by these Specifications.

Asphalt Institute

Manual SeriesNo.2 (MS-2)-Asphalt concrete hot mix manual
Manual Series No.4 (MS-4) - The Asphalt Handbook
Manual Series No.14 (MS-14) - Asphalt cold mix manual

Other relevant Asphalt Institute documents as required by these Specifications.

Appendix 2: Office and Furniture/ Equipment for the Employer

Office for the Employer

Each room shall be fitted with sufficient fluorescent light fittings, ceiling fans with regulators and electric outlets. The Contractor shall provide one outside telephone line; with necessary extensions for use in the office. The Contractor shall supply and keep replenished all consumable items.

Furniture and Equipment for the Employer's Office

The furniture and equipment to be supplied and installed in the offices shall be new, and of acceptable quality. The furniture may be steel, aluminium, wood or combination of these. The Contractor should forward details of the items he intends to supply and obtain prior approval from the Engineer.

The Contractor shall provide, install and maintain the furniture and equipment detailed in the table below to the satisfaction of the Employer until the Completion of the Contract.

At Contract Completion the Furniture and Office equipment shall become the property of the Employer.

Furniture and Equipment for the Office of the Employer

S. No.	Item	Description	Unit	Quantity
1.	Executive table	750 mm x 1500 mm with two drawer on either side	No	3
2.	Clerk table	750 mm x 1250 mm with two drawer on either side	No	4
3.	Typist/secretary table	750 mm x 1250 mm with two drawer on one side	No	1
4.	Computer table	Purpose made	No	3
5.	Conference Table	1250 mm x 3000 mm	No.	1
6.	Cushion Chairs		No.	4
7.	Arm Chairs with cushion		No.	10
8.	Typist Chairs with cushion		No.	1
9.	Swivel Chairs		No.	3
10.	Steel Almirah	2.0 m high x 1.0 m wide x 0.35m deep with shelves and two doors	No.	3
11.	Steel Filing Cabinet	With four drawers	No.	3
12.	Book Shelves	1 m x 2 m x 0.3 m 3 shelves	No.	3
13.	Gas Heater with cylinders	3 Kw	No.	3
14.	Electric Heater	3 Kw	No.	3
15.	Office Safe	0.125 cum. Secured to the building	No.	1
16.	Bulletin Board	1.2 m x 2.4 m		1
17.	White Magic Board	1.5 m x 1.0 m	No.	1
18.	Telephone System EPABX	One independent outside line	No.	1
19.	Cell Phone	Complete Set with SIM	No.	3

S. No.	Item	Description	Unit	Quantity
20.	Facsimile Machine		No.	1
21.	3 in 1 Printer, photocopier and scanner	A4 LaserJet Printer or equivalent complete with connecting cables, software etc	No.	1
22.	Stapler	No 56 size heavy duty	No.	1
23.	Punch	2 holes heavy duty	No.	2
24.	Pencil Sharpener	Table Type	No.	4
25.	Camera	Automatic Digital Camera with 10 x Zoom, UV filter, power flash and carrying case with extra 32 GB memory stick	No.	3
26.	Scientific Calculator		No.	3
27.	Commercial Calculator		No.	2
28.	Office Bag		No.	4
29.	Rain Coats		No.	4
30.	Desktop Computer of Acceptable Brand	Processor:-Core i5 or above, Memory:- 2 GB or above, Hard Drive:-500 GB or above, Mouse:-USB Optical Mouse, Keyboard:-USB Standard, Monitor:-18.5" wide LCD Monitor	No.	3
31.	Flat Bed Scanner	Cannon Scan D646UeX	No.	1
32.	Laptop	Processor:-Core i5 or above, Display :- 14" Diagonal Bright view Widescreen Display, Memory:- 8 GB or above, HDD:- 500 GB or above, Power backup: minimum 6 Cell Battery	No.	2
33.	External hard drive	1 TB Capacity	No.	1
34.	Color Printer	A4 size, HP color, LaserJet 2600 or equivalent	No.	1
35.	UPS	500 VA, Uninterrupted Power Supply for the above computer equipment	No.	3
36.	Switch and Server	Network Hub, Lintec Fe 2400 R	No.	1
37.	Networking for 6 nos		No.	1
38.	Air Conditioner	1.5 ton capacity	No.	3
39.	Electric Fan		No.	4
40.	Fire Extinguisher		No.	2
41.	First Aid Box		No.	1
42.	Filing Trays		No.	4
43.	Stationery	Provision of Consumable Items	No.	As required
44.	Waste Paper Basket		No.	4
45.	Refrigerator	8 cu.ft Capacity	No.	1
46.	Gas Hub	With two gas rings complete with two gas cylinders	No.	1

S. No.	Item	Description	Unit	Quantity
47.	Cooking Utensils	Complete Sets	No.	1
48.	Sink Unit Double Basin	With cold water taps and waste water outlet	No.	1
49.	Crockery	Complete set for 12 persons	No.	1
50.	Cutlery	Complete set for 12 persons	No.	1
51.	Tea Service	Complete set for 24 persons	No.	1
52.	Electric Kettle	2 Liter capacity	No.	1
53.	Emergency Lantern	Rechargeable	No.	4
54.	Doormats	Complete Set	No.	1
55.	Curtains	Complete Set	No.	1
56.	Cleaning Equipment Toilets	Complete Set	No.	1
57.	Cleaning Equipment Kitchen	Complete Set	No.	1
58.	Micro oven	Complete Set	No.	1
59.	Multi-media projector	Complete Set with screen and stand	No.	1
60.	Diesel Generator/Solar	Sound Proof min 15 KVA	No.	1

Note: The consumables required for smooth running and maintaining the Office shall be supplied by the Contractor as per the requirement, and to the satisfaction, of the Employer and the Engineer.

Appendix 3: Accommodation and Furniture / Equipment for the Employer

The Contractor shall provide, install and maintain the furniture, equipment and fittings as shown in the following table to the satisfaction of the Employer. The items shall be new and subject to the approval of the Employer.

The Contractor shall provide, install and maintain the furniture and equipment detailed in the table below to the satisfaction of the Employer until the Contract Completion.

At Contract Completion the Furniture and equipment shall become the property of the Employer.

Furniture and Equipment for the Accommodation of the Employer

S. No.	Item	Description	Unit	Quantity
A	Verandah			
1.	Verandah Table	2.0 m X 1.0 m	No	1
2.	Veranda Chair		No	8
B	Living / Dining Room			
3.	Lounge Suite	1 No. 3 seater, 2 No. 1 seater, 1 No. coffee table and 2 Nos. side tables.	No	2
4.	Dining Table	Formica Topped 2.0 m x 1.2 m	No	1
5.	Dining Room Chairs	Cushioned	No	6
6.	Book case	1.0 m x 2.0 m x 0.35 m x 3 shelves	No	2
7.	Occasional table		No	2
8.	Air Condition	1.0 Ton Capacity	No	1
C	Study Room			
9.	Writing Desk	1.5 m x 0.75 m	No	1
10.	Chairs		No	2
11.	Book case	1.0 m x 2.0 m x 0.35 m x 3 shelves	No	1
12.	Desk top Computer	IBM compatible assembled Computer or equivalent. Intel Pentium - I5 at 2.66 Ghz core to due processor, 4 MB Advanced Transfer L2 Cache 965 Intel Original 1GB DDR-2 RAM 667 MHZ Intel Extreme Graphics 129 MB Interated ADI Audio with Internal Speaker.	No	1
13.	Computer Table	Purpose made	No	1
14.	Steel Almirah	2.0m high x 1.0m wide x 0.35m deep with shelves and two doors	No	1
15.	Steel Filling Cabinet	With four drawers	No	1
D	Bed Rooms			
16.	Beds (double)	With mattress and two pillows.	No	1
17.	Beds (single)	With mattress and two pillows.	No	5
18.	Bedside Cabinet		No	6
19.	Wardrobe with fittings	2 m high, 1.0 m wide, 0.35 m deep, with shelves and two doors	No	6

S. No.	Item	Description	Unit	Quantity
20.	Bedside Lamp		No	6
21.	Mattress covers		No	6
22.	Pillow Cases		No	12
23.	Mosquito Nets		No	6
24.	Waste paper basket		No	6
25.	Air Condition	1.0 Ton Capacity	No	4
E	Pantry			
26.	Store shelves set		No	1
27.	Electric Iron and ironing board		No	4
28.	Pantry Cupboards set		No	1
29.	Glass Cabinet		No	2
30.	Refrigerator	8 cu.ft Capacity	No	1
31.	Water Filter	8 litre capacity	No	1
32.	Sink Unit with draining board	with cold water taps and waste water outlet	No	1
F	Kitchen			
33.	Kitchen Cupboards set		No	1
34.	Kitchen Table		No	1
35.	Chairs		No	2
36.	Sink Unit with draining board	with cold water taps and waste water outlet	No	1
37.	Electric or Gas Cooker	with 3 - Heater Rings , Grill and Oven complete (with two gas cylinders if gas).	No	2
38.	Electric Kettle	2 - litre capacity.	No	1
39.	Microwave Oven	Complete Set	No	1
40.	Cooking Utensils	Complete set for 8 persons	No	1
41.	Crockery	Complete set for 8 persons	No	1
42.	Cutlery	Complete set for 8 persons	No	1
43.	Tea Service	Complete set for 12 persons	No	1
44.	Plate Rack		No	4
G	Watch Person Accommodation		No	
45.	Bed	Single with mattress and two pillows.	No	2
46.	Wardrobe with fittings	2 m high, 1.0 m wide, 0.35 m deep, with shelves and two doors	No	2
47.	Armless Chairs		No	4
48.	Occasional Table		No	1
49.	Mattress covers		No	2
50.	Pillow Cases		No	4
51.	Mosquito Nets		No	2
H	General			
52.	Rugs/blankets		No	6

S. No.	Item	Description	Unit	Quantity
53.	Doormats		No	6
54.	Curtains	Complete Set	No	1
55.	Cleaning Equipment Toilet	Complete Set	No	1
56.	Cleaning Equipment Kitchen	Complete Set	No	1
57.	Cleaning Equipment General	Complete Set	No	1
58.	Diesel Generator/Solar	Minimum 10 KVA complete set	No	1

Note: The consumables required for smooth running and maintaining the Accommodation shall be supplied by the Contractor as per the requirement, and to the satisfaction, of the Employer and the Engineer.

FOR REFERENCE ONLY

Appendix 4: Vehicle for the Employer

The type of vehicles the Contractor is required to provide for the exclusive use of the Employer and his staff shall be in accordance with the Specification and Bill of Quantities and shall be as shown below:

Vehicle Type 1

New, or nearly new (not more than one year old), five door Station Wagon (including one rear door) with a diesel engine of at least 2.2 litre capacity, 110 BHP, 28 kgm torque, four wheel drive, a minimum ground clearance (unladen) of 180 mm, Air Conditioner, cloth seats, seat belts, locking fuel cap, spare wheel, power window, central locking, tool kit, tow rope, jump leads, fire extinguisher and first aid kit.

Vehicle Type 2

New, or nearly new (not more than one year old), "Double Cab" Pick-Up with a diesel engine of at least 2.2 litre capacity, 110 BHP, 28 kgm torque, four wheel drive, a minimum ground clearance (unladen) of 180 mm, Air Conditioner, cloth seats, seat belts, locking fuel cap, spare wheel, power window, central locking, tool kit, tow rope, jump leads, fire extinguisher and first aid kit.

"Nearly new" means less than one (1) year old and with less than 30,000 km travelled and in general good condition.

All vehicles shall be of current manufacture and shall be registered in the name of the Contractor and shall have a guarantee/warranty for a minimum period of one year. It is assumed that the average running distance is 5,000 km per month for vehicles Type - 1 and Type - 2.

Vehicles will revert to the Contractor when no longer required by the Employer.

Vehicle Type 3

New motorcycle with minimum 150 cc and 4 –stroke engine, with accessories like helmet with visor, leg guard, gloves, jacket, utility box raincoat and boot.

All motorcycles shall be of current manufacture and shall be registered in the name of the Contractor and shall have a guarantee/warranty for a minimum period of one year. It is assumed that the average running distance is 3,000 km per month for motorcycles.

Motorcycles will revert to the Contractor when no longer required by the Employer.

Appendix 5: Survey Instrument Required at Site

The Contractor shall provide and maintain the following survey instruments and equipment until Contract Completion or as instructed by the Engineer. The items shall be new or nearly new and subject to the approval of the Engineer.

At Contract Completion the survey instruments and equipment shall become the property of the Contractor.

The survey instruments shall also be for the use of the Engineer's Representative until Contract Completion.

The Contractor shall supply immediately replacement for damaged/lost items and be responsible for insurance against theft.

Survey Equipment Required at Site

S. No	Description	Quantity
1	Total Station with Standard Accessories and Aluminum Tripod	1 Set
2	Single Prism with Tribrach Complete Set	2 Set
3	3 mtr. 3 Section Aluminum Ranging Rod	2 Set
4	GPS	2 Set
5	Auto Level with Tripod	2 Set
6	5 mtr 5 Section Levelling Staff	2 Set
7	Clip on Bubble	2 Set
8	50 mtr Nylon Coated Steel Tape	1 Set
9	50 mtr Fiberglass Tape	1 Set
10	30 mtr Fiberglass Tape	1 Set
11	5 mtr Steel Tape	5 Set
12	Field Books	As required
13	Other miscellaneous accessories	As required

The above equipment are minimum numbers required. Depending upon the actual requirements at site, the Contractor shall arrange for other and/or additional survey equipment as instructed by the Engineer.

Appendix 6: Site Laboratory

1. Scope

The Contractor shall provide and maintain an adequately equipped site laboratory complete with all manpower, utility services, apparatus, furniture and fittings to undertake the required testing to assure the quality of the materials and the works.

Site Laboratory shall be fully equipped with a complete set of equipment as indicated in Appendix – 7. The Contractor is responsible for the cost of undertaking all testing necessary for Quality Assurance purposes. Tests which cannot be carried out in Site Laboratory shall be undertaken by an outside laboratory acceptable to the Engineer. The Contractor shall be responsible for providing the vehicles required carrying out day to day (regular) process control testing and collecting the samples to be tested in Site Laboratory at his own cost.

The Site Laboratory shall be located within 500 m of the site and the laboratory building may be located at the rented building or newly constructed on rented land or constructed on land on lease whatsoever shall be available up to the end of the project.

The working table with shelves for storing the equipment, heavy duty working table, and other racks shall be provided by the Contractor at the laboratory as per the instruction of the Engineer. The Contractor shall supply desktop computer and A-4 size printer at laboratory for sole use of the laboratory. First aid kit box, fire extinguisher and other safety appliances shall also be provided at the laboratory by the Contractor.

In order to operate the site laboratory the Contractor shall deploy at least the following:

- Generator 20 KVA minimum
- Pickup truck
- Quality Control Engineer – 1No
- Laboratory technician – 1No
- Laboratory helpers – 6 Nos (minimum but shall supply additional numbers as required)
- Office boy – 1No
- Security guards (day and night)

2. Description

The Site laboratory shall be newly constructed or rented and furnished to be a laboratory and provided with amenities including water supply, electric supply etc. as indicated below:

- The laboratory shall be provided with 240 volt, 50 HZ electricity. Lighting and sufficient electrical outlets shall be provided to the satisfaction and approval of the Engineer.
- A continuous supply of water with a minimum of two sinks with faucets shall be provided.
- The floor of the building shall be concrete suitably sealed and adequate to support operating test equipment without vibration and undue noise.
- A minimum of 10 metres of work benches, 900 mm high by 750 mm wide, shall be provided. The work benches shall have tops covered with approved plastic laminate or equivalent shall contain adjustable shelves and drawers and shall be constructed of concrete / 19 mm plywood. A minimum of 6 metres of cupboards shall be constructed approximately 600 mm above the workbenches. These cupboards shall have a minimum of two 450 mm high shelves approximately 300 mm deep. All cupboards shall be provided with doors.
- A minimum of four exhaust fans, three ceiling fans with regulators and three opening windows with blinds.
- The laboratory shall be provided with double entrance doors wide enough to unload materials from site vehicles into the laboratory. A minimum clear opening of 2 metres shall be provided.

The laboratory shall be operated strictly under the supervision of the Consultant's Material Engineer. The manpower supplied by the contractor for the operation of the site laboratory shall work to the satisfaction of the Consultant's Material Engineer and they will use the facilities detailed above together with the Consultant's Material Engineer. The Contractor shall provide additional office space/accommodation for his other staff in addition to the designated laboratory to the Engineer. The Contractor's other staff shall strictly be prohibited in using the laboratory space for their office/accommodation.

Prior to the construction of the laboratory, the Contractor shall obtain written approval from the Engineer for the proposed construction and arrangement of the laboratory.

Office for Material Engineer

Each room shall be fitted with two 40 watt fluorescent light fittings, ceiling fans with regulators. The laboratories shall have at least five 5A and two 15A electric outlets. The Material Engineer's office shall have minimum required furniture and equipment for the operation of the day to day office works.

The Contractor shall provide the facility for communications between the Consultant's staff and the Contractor's staff.

The Contractor shall supply and keep replenished all consumable items.

FOR REFERENCE ONLY

Appendix 7: Laboratory Equipment

The following items of laboratory equipment shall be provided in the laboratory, as a minimum, however, this does not relieve the Contractor of his responsibility to equip the laboratory with all equipment needed to perform the full range of tests required by the Specifications:

S. No.	Particulars	Quantity
	General	
1	Oven 18" x 18" x 18" Aluminum Chamber	1
2	Platform balance 300 kg	1
3	Electronic Balance Model CH30R11 Capacity 30 kg x 5 gm preferably OHAUS or equivalent	1
4	Electronic Balance Model CT6000 Capacity 6010 gm x 0.5 gm preferably OHAUS or equivalent	1
5	Electronic Balance Model NDB110 Capacity 2100 gm x 0.1 gm preferably OHAUS or equivalent	1
6	Water bath serological 2 rack solar	1
7	Mercury Thermometer 250°C	2
8	Dial Thermometer 400°C	2
9	Mercury Thermometer 50°C	2
	Glassware: containers and small tools including;	
10	Wet and Dry Thermometer	1
11	Spatulas 200 mm	2
12	GI Wire Zinc coating and diameter test	1
13	GI Tray	
	300 mm x 300 mm x 75 mm	6
	400 mm x 400 mm x 75 mm	6
	600 mm x 600 mm x 75 mm	6
14	Aluminum Moisture Container 75 mm x 50 mm	50
15	Rubber Mallet	1
16	Aggregate Steel Scoop (690 mm x 300 mm x 100 mm)	1
17	Aluminum Scoop (125 mm x 200mm x 75 mm)	1
18	Gauging Trowel	2
19	S.S Bowl 2 Lit	2
20	Volumetric Flasks	
	1000 ml	2
	500 ml	2
	250 ml	2
21	Measuring Cylinders	
	1000 ml	2

S. No.	Particulars	Quantity
	500 ml	2
	250 ml	2
22	Beakers	
	1000 ml	2
	500 ml	2
	250 ml	3
23	Evaporating Disc 100 mm	3
24	Vernier Caliper 150 mm	1
25	Steel Ruler 300 mm	1
26	Pairs of heat resistant Asbestos hand gloves	2
27	Set of sampling tools all materials	1
28	Set of crowbar, pick, spade and 5 kg hammer, GI Tray	2
29	Gunny bags and plastic bags	50
30	GI Sieve 450 mm dia Size; 75, 69, 63,50, 37.5, 31.5, 25, 20, 14, 16, 12.5, 9.5, 6.3, 4.75, Lid and pan set of 16 pcs	1
31	Brass Sieve 200 mm dia Size; 4, 2.8, 2.36, 2, 1.18mm, 600, 425, 300, 150,170, 75 mic,90 mic ,Lid and pan set of 14 pcs	1
32	Dynamic Cone Penetrometer equipment complete with 2 extra cones and 2 extension rods (set)	1
33	Water Testing kit (set)	1
34	Organic Content testing kit (set)	1
	Soil and Aggregate	
35	Sample Splitters (Rifle boxes) 50 mm	1
36	Liquid limit device with grooving tools and counter	1
37	Glass Plate 400mm x 600 mm x 6 mm	2
38	Specific Gravity Bottle 100 ml	1
39	Compaction Mould 100 mm, 150 mm and Rammer 2.5 kg and 4 kg	1
40	Sand Pouring Apparatus 200 mm (sand replacement test)	2
41	Sand Pouring Apparatus 100 mm (sand replacement test)	1
42	Core Cutter Apparatus	1
43	Aggregate Impact Value Test Apparatus	1
44	Los Angeles Abrasion Test Apparatus	1
45	Flakiness	1
46	Elongation Test Gauge	1
47	Standard Measure 30 lit, 15 lit and 3 lit	1
48	Tamping Rod	1
49	Aggregate Crushing Value Test Mould	1
50	Set equipment for specific gravity determination of both course and fine graded soils, including ancillary glass ware including pycnometers, and Guy Lussure type density bottles of Capacity 100 ml.	1 set
	CBR Apparatus	1

S.No.	Particulars	Quantity
51	CBR Load Frame – 1	
	Dial Gauge (0.01 - 0.25 mm) – 5	
	Annular Weight 2.5 kg – 3	
	Central Hole Weight 2.5 kg – 3	
	CBR Mould 150 mm – 9	
	Perforated Plate Brass – 9	
	Space Disc – 9	
	Penetration Piston – 1	
	Tripod – 9	
	Rammer 2.6 kg – 3	
	Rammer 4.89 kg – 3	
52	Unconfined Compression Test Apparatus (5 Tonne Capacity plus 5 kN, 10 kN and 20 kN Proving Rings)	1
	Bitumen and Bituminous Mixes	
53	Penetrometer with standard needle automatic	1
54	Viscometer	1
55	Standard spray trays	12
56	Centrifuge Type land operated bitumen extractor 500 ml	1
57	3 m straight edge	1
58	Camber board and spirit level	2
59	Marshall Stability test Apparatus, complete	1 Set
60	Softening point test (Ring and Ball)	1 Set
61	Flash point Apparatus	1 Set
62	Ductility test Apparatus	1 Set
	Cement and Cement Concrete / Mortar	
63	Vicat Apparatus	1
64	Slump Test Apparatus	1
65	Concrete Cube Mould 150 mm	18
66	Mortar Cube Mould 75 mm	42
67	Compression Strength Testing Machine 200 tonne capacity	1
68	Compression Strength Testing Machine 50 tonne capacity	1
69	Sand equivalent test set, complete with graduate plastic cylinder, manual or mechanical shaker and stock solution	1
70	Curing tank for test cubes (2 m x 2 m x 0.75 m) with controlled heating facilities	1
71	Light weight hammer test	1

The site laboratory equipment and furniture shall become the property of the Contractor when no longer required by the Engineer unless stated to the contrary elsewhere in the contract.

Appendix 8: Project Signboard

The Contractor shall provide and erect at the beginning and end of each section of Project road a signboard approx. 2.50 m wide by 1.80 m high with the wording in Nepali or English.

Final details to be agreed with the Engineer (see drawing).

The board is to be made of galvanised steel; the lettering and border are to be in black on yellow background. The lower edge of the board shall be at approx. 1.20 m above adjacent ground and shall be mounted on suitable posts with struts on concrete foundations. The paint to be used shall be sunshine resistant paint.

The Contractor will be responsible for the repair and maintenance of the signboards up to the completion of all construction works.

The Engineer will direct the location and placing of the signboards.

GOVERNMENT OF NEPAL	
MINISTRY OF PHYSICAL INFRASTRUCTURE AND TRANSPORT	
DEPARTMENT OF ROADS	
PROJECT DIRECTORATE (ADB)	
SASEC Highway Improvement Project (SHIP)	
ASIAN DEVELOPMENT BANK	
ADB Loan No. 52097- 001	
KANCHANPUR-KAMALA ROAD (SECTION – 2)	
CONTRACT NO.	: SHIP/OCB/KK/02
CHAINAGE	: Km 189+300 to Km 236+703
CONTRACTOR	: xxxxxxxxxxxxxxxxxxxxxxxxx
	: xxxxxxxxxxxxxxxxxxxxxxxxx
CONSULTANTS	: xxxxxxxxxxxxxxxxxxxxxxxxx
	: xxxxxxxxxxxxxxxxxxxxxxxxx

Section 6D – Drawings

Provided as Section 6D in a separate volume.

FOR REFERENCE ONLY

Section 6E – Personnel Requirements: Phase1

Phase 1: Upgrading Works

Using Form PER-1 and PER-2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has Personnel who meet the following requirements:

S. No.	Position	Required Nos.	Minimum Qualification	Total Similar Work Experience [years]	Experience in Similar Position[years]
1	Contract Manager / Contractor's Representative ¹	1	Bachelor's degree in Civil Engineering	10	3
2	Site Engineer	3	Bachelor's degree in Civil Engineering	7	3
3	Quality Control Engineer	2	Bachelor's degree in Civil Engineering	7	3
4	Environment Safeguard/ Safety Engineer	1	Bachelor's degree in Civil / Environment Engineering	5	3
5	Sub Engineers	6	Diploma in Civil Engineering or equivalent	5	3
6	Senior Laboratory Technician	4	Senior Lab Technician or Sub-engineer	5	3

The Bidder shall provide details of the proposed personnel and their experience records in the relevant Information Forms included in Section 4 (Bidding Forms).

All submitted curriculum Vitae should be duly signed by the concerned person.

1 Note:

- In case of joint venture, the partner who meets the major requirement of experience in Contracts of Similar Size and Nature shall be present at the Work Site throughout the contract duration; and
- The Contract Manager / Contractor's Representative shall require being the Senior Employee from the Bidder and working with the firm for at least one year prior to the bid submission deadline.
- The Contract Manager / Contractor's Representative shall be at the work site substantially during the contract duration.

Section 6E – Personnel Requirements: Phase 2

Phase 2: Performance Based Maintenance Works

Using Form PER-1 and PER-2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has Personnel who meet the following requirements:

S. No.	Position	Required Nos.	Minimum Qualification	Total Similar Work Experience [years]	Experience in Similar Position[years]
1	Contract Manager / Contractor's Representative	1	Bachelor's degree in Civil Engineering	7	5
2	Performance Manager	1	Bachelor's degree in Civil Engineering	5	2
3	Maintenance Engineer	1	Bachelor's degree in Civil Engineering	5	2
4	Sub Engineers	2	Diploma in Civil Engineering or equivalent	3	2
5**	Performance Based Road Maintenance Expert (part time)	1			

The Bidder shall provide details of the proposed personnel and their experience records in the relevant Information Forms included in Section 4 (Bidding Forms).

All submitted curriculum Vitae should be duly signed by the concerned person.

** The successful bidder shall deploy a Performance Based Road Maintenance Expert (part time), who has extensive experience in PBM Works to coach and train the staff of the contractor and subcontractors in the planning, execution and monitoring of the performance based maintenance works.

Section 6F – Equipment Requirements: Phase1

Phase 1: Upgrading Works

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

S. No.	Equipment Type and Characteristics	Minimum Number Required
1	Excavator (> 0.50 m3)	4
2	Loader (> 1.5 m3)	3
3	Motor Grader (> 100 HP)	3
4	Two Stage Stone Crusher Plant (production > 60 cu m per Hr)	3
5	Water Bowser (> 5,000 litres)	4
6	Bitumen Distributor (> 4,000 litres)	3
7	Pneumatic Roller (> 8 Ton)	3
8	Steel Roller (> 8 Ton)	2
9	Tipper Truck (> 5 cu m)	16
10	Vibrating Roller (> 10 Ton at static condition)	3
11	Concrete Batch Plant (> 50 m3/hour)	2
12	Concrete Mixer Truck: (> 6 m3)	8
13	Asphalt Plant (> 100 tonne/hour)	2
14	Asphalt Paver with Electronic Sensor (> 3.0 m)	2
15	Tandem Roller (> 8 tonne)	2
16	Crane (> 50 tonne)	2
17	Cone Crusher Plant (production > 60 cu m per Hr)	2

The Bidder shall provide further details of proposed items of equipment using the relevant Form in Section 4 (Bidding Forms).

Ownership attestation documentation for each item of equipment and, where, relevant, the original leasing agreements should be attached.

Resources committed by the Bidder should be physically mobilised at site throughout the contract period.

Section 6F – Equipment Requirements: Phase2

Phase 2: Performance Based Maintenance Works

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

S. No.	Equipment Type and Characteristics	Minimum Number Required
1	Excavator (> 0.50 m3)	1
2	Water Bowser (> 5,000 litres)	1
3	Bitumen Distributor (> 2,000 litres)	1
4	Tipper Truck (> 5 cu m)	3
5	Vibrating Roller (> 10 Ton at static condition)	1
6	Tandem Roller (> 8 tonne)	1
7	Mini Asphalt Plant	1
8	Concrete Mixer Portable (1 bag)	1
9	Portable Air Compressor	1
10	Rammer Compactor	1
11	Generator Set	1
12	Flood Lights set	1
13	Truck Mounted Crane (> 20 tonne)	1

The Bidder shall provide further details of proposed items of equipment using the relevant Form in Section 4 (Bidding Forms).

Ownership attestation documentation for each item of equipment and, where, relevant, the original leasing agreements should be attached.

Resources committed by Bidder should be physically mobilized at site throughout the contract period.

**Government of Nepal
Ministry of Physical Infrastructure and
Transport Department of Roads
Project Directorate (ADB)
Kathmandu, Nepal**

**SASEC Highway Improvement Project (SHIP)
(ADB Loan No. 52097- 001)**

**Kanchanpur- Kamala Road (Section-2)
From Km 189+300 to km 236+703**

Contract No. SHIP/OCB/KK/02

Phase 1: Upgrading Works

(Upgrading of existing road from 2-Lanes to 4 Lanes and Service Lanes, Structures, Bridges, etc. including Defect Notification Period)

Phase 2: Performance Based Maintenance Works

(Maintenance works consisting of all activities to be carried out to achieve and keep the road assets as defined in the PBM Specifications)

Bidding Document

Part III Conditions of Contract

Section 7	General Conditions of Contract
Section 8	Particular Conditions of Contract
Section 9	Contract Forms

August, 2018

Preface

This Bidding Document for the Procurement of Works (Single Stage – Two Envelope) has been prepared by the Government of Nepal, Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB) and is based on the Standard Bidding Document for the Procurement of Works (SBD Works) issued by the Asian Development Bank dated May 2018.

ADB's SBD Works has the structure and the provisions of the Master Procurement Document entitled "Bidding Documents for the Procurement of Works", prepared by multilateral development banks and other public international financial institutions, except where ADB-specific considerations have required a change.

FOR REFERENCE ONLY

Table of Contents - Summary Description

PART I BIDDING PROCEDURES

Section 1 - Instructions to Bidders (ITB) ----- 1-1

This Section specifies the procedures to be followed by Bidders in the preparation and submission of their Bids. Information is also provided on the submission, opening, and evaluation of bids and on the award of contract.

Section 2 - Bid Data Sheet (BDS) ----- 2-1

This Section consists of provisions that are specific to each procurement and supplement the information or requirements included in Section 1 - Instructions to Bidders.

Section 3 - Evaluation and Qualification Criteria (EQC) ----- 3-1

This Section contains the criteria to determine the lowest evaluated bid and the qualifications of the Bidder to perform the contract.

Section 4 - Bidding Forms (BDF) ----- 4-1

This Section contains the forms which are to be completed by the Bidder and submitted as part of his Bid.

Section 5 - Eligible Countries (ELC) ----- 5-1

This Section contains the list of eligible countries.

PART II EMPLOYERS REQUIREMENTS

Section 6 -Employer's Requirements (ERQ) ----- 6-1

This Section contains the Specifications, Drawings, and Supplementary Information that describe the Works to be procured, Personnel Requirements, and Equipment Requirements.

Section 6A – Summary of Description of Works

This Section contains the summary list of main works to be executed under the contract. Specification, Special provisions and, the Drawings, that describe the Works to be procured.

Section 6B – Standard Specifications

This document has been issued under the authority of the Government of Nepal, Ministry of Physical Planning and Works, Department of Roads (July 2001), it can be purchased from the Central Road Laboratory, Kupandole, Lalitpur.

Section 6C – Special Provisions

This section contains amendments, supplements, etc. to the standard specifications to suit the specific requirements of the project, including sections regarding Minor Bridges and PBM works.

Section 6D – Drawings

The drawings are presented in a separate volume.

Section 6E – Personnel Requirements

This section provides the information on Personnel Requirements.

Section 6F – Equipment Requirements

This section provides the information on Equipment Requirements.

PART III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 7 - General Conditions of Contract (GCC) ----- 7-1

This Section contains the general clauses that govern the Contract. These General Conditions shall be the Conditions of Contract for Construction, Multilateral Development Bank Harmonized Edition, prepared by the Fédération Internationale des Ingénieurs-Conseil (FIDIC June 2010 MDB version). These Conditions are subject to the variations and additions set out in Section 8 (Particular Conditions of Contract).

Section 8 - Particular Conditions of Contract (PCC) ----- 8-1

This Section contains provisions which are specific to each contract and which modify or supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Section 9 - Contract Forms (COF) ----- 9-1

This Section contains forms, which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

FOR REFERENCE ONLY

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Section 7 - General Conditions of Contract

Project Directorate (ADB); Department of Roads,
Ministry of Physical Infrastructure and Transport

Kanchanpur – Kamala Road (Section – 2)
(Km 189+300 to km 236+703)

Contract No. SHIP/OCB/KK/02

The Conditions of Contract comprise two parts, this Section 7 - General Conditions of Contract (GCC) and the following Section 8 - Particular Conditions of Contract (PCC).

The General Conditions that follow are Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer, Multilateral Development Bank Harmonized Edition, prepared by the Fédération Internationale des Ingénieurs-Conseil, or FIDIC (FIDIC MDB Harmonized Construction Contract) available at FIDIC MDB June 2010. The FIDIC MDB Harmonized Construction Contract is exclusive for the use of ADB Borrowers and their project implementing agencies as provided under the License Agreement dated 09 June, 2005, between the ADB and FIDIC, and, consequently, no part of this publication may be reproduced, translated, adapted, stored in a retrieval system or communicated, in any form or by any means, whether mechanical, electronic, magnetic, photocopying, recording or otherwise, without prior permission in writing from FIDIC, except by the Employer identified in the contract and only for the exclusive purpose of preparing bidding documents for ADB financed contracts.

The standard text of the General Conditions chosen must be retained intact to facilitate its reading and interpretation by Bidders and its review by ADB. Any amendments and additions to the GCC, specific to the contract in hand, should be introduced in Section 8 (Particular Conditions of Contract), Part A (Contract Data) and Part B (Special Provisions). Clause numbers in the PCC correspond to those in the GCC. As per GCC 1.5 (Priority of Documents), the PCC takes precedence over the GCC.

Part A (Contract Data) of the PCC includes data to complement the GCC in a manner similar to the way in which the Bid Data Sheet (BDS) complements the Instructions to Bidders (ITB).

Part B (Specific Provisions) is to be used to introduce country- or project-specific provisions, if so required. Whoever drafts the Specific Provisions should be thoroughly familiar with the provisions of the GCC and with any specific requirements of the Contract. Legal advice is recommended when amending provisions or drafting new ones.

The Conditions of Contract have been prepared for an ad measurement (unit price or unit rate) type of contract and cannot be used for other types of contract.

Section 8 - Particular Conditions of Contract

The following Particular Conditions of Contract (PCC) shall supplement the General Conditions of Contract (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Part A – Contract Data

Subject	Ref. GCC	Data
Employer's name and address	1.1.2.2 & 1.3	Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB), Kathmandu, Nepal.
Engineer's name and address	1.1.2.4 & 1.3	To be Notified later.
Bank's name	1.1.2.11	Asian Development Bank (ADB)
Borrower's name	1.1.2.12	Nepal
Time for Completion	1.1.3.3	Phase 1: Upgrading Works 1,095 days plus 365 days of Defect Notification Period Phase 2: Performance Based Maintenance Works 1,825 days (This Phase will start at the end of the Defects Notification Period for Phase 1).
Defects Notification Period	1.1.3.7	Phase 1: Upgrading Works 365 days Phase 2: Performance Based Maintenance Works Not applicable
Sections	1.1.5.6	Not Applicable
Electronic transmission systems	1.3	Email, fax supplemented by original hard copy through post, courier or hand delivered.
Governing Law	1.4	The Law of Nepal
Ruling language	1.4	English
Language for communications	1.4	English
Time for access to the Site	2.1	14 days after the Commencement Date
Engineer's Duties and Authority	3.1(B)(ii)	A Variation having a value of more than 0.1% of the Accepted Contract Amount shall require approval of the Employer. Similarly, when the cumulative sum of Variations results in an increase of the Accepted Contract Amount by more than 2 %, any Variation thereafter shall require approval of the Employer.

Subject	Ref. GCC	Data
Performance Security	4.2	The performance security will be in the form of an unconditional bank guarantee in the amount(s) of Ten (10) percent of the Accepted Contract Amount and denominated in the proportions of currencies mentioned in the schedule of currencies and issued by a reputable financial institution/bank. When additional performance security is required due to seriously unbalanced or front-loaded bid in accordance with ITB 36.5, the Employer shall specify the percentage of the performance security and the terms for its release. If the Performance Security is issued by a bank located outside Nepal, it shall be counter guaranteed by a commercial bank established in Nepal.
Normal working hours	6.5	Phase 1: Upgrading Works Normal working hours shall be as per labor act 2074 of Nepal. Phase 2: Performance Based Maintenance Works Normal working hours shall not be applicable. Daily Inspections and emergency response needs to be done on Saturdays and Public Holidays as well.
Respectful Work Environment	6.25	The following sentence shall apply: The Contractor shall ensure that its employees and sub-contractors observe the highest ethical standards and refrain from any form of bullying, discrimination, misconduct and harassment, including sexual harassment and shall, at all times, behave in a manner that creates an environment free of unethical behavior, bullying, misconduct and harassment, including sexual harassment. The Contractor shall take appropriate action against any employees or sub-contractors, including suspension or termination of employment or sub-contract, if any form of unethical or inappropriate behavior is identified. The Contractor shall conduct training programs for its employees and sub-contractors to raise awareness on and prevent any form of bullying, discrimination, misconduct and harassment including sexual harassment, and to promote a respectful work environment. The Contractor shall keep an up to date record of its employees and subcontractors who have attended and completed such training programs and provide such records to the Employer or the Engineer at their first written request.

Subject	Ref. GCC	Data
Delay damages for the Works	8.7 & 14.15(b)	Phase 1: Upgrading Works 0.05 % of the Contract Price for Phase 1: Upgrading Works per day, in the currencies and proportions in which the Contract Price is payable. Phase 2: Performance Based Maintenance Works Not Applicable
Maximum amount of delay damages	8.7	Ten (10) percent of the Contract Price.
Provisional Sums	13.5(b)(ii)	Five (5) percent
Adjustments for Changes in Cost	13.8	The Contract Price shall be adjustable during Contract Execution.
The Contract Price	14.1	<i>Delete the last sentence of the Sub-clause 14.1 and replace with the text below relating with the exemption on construction equipment:</i> Notwithstanding the provisions in this document, the Contractor's construction equipment, including essential tools thereof, imported for the sole purpose of executing the contract on condition of re-export upon completion of the Works, shall be exempt from the payment of custom duties. However, the Contractor shall deposit the amount or provide a bank guarantee to the Government of Nepal, Customs Office equal to the amount of custom duties as per the prevailing laws, rules and regulations of Nepal for those imported equipment at the time of import. Such deposited amount shall be refunded, or the bank guarantee be cancelled by the Custom Office after re-export of those imported equipment. The construction equipment imported by the Contractor for the performance of the Works shall be taken out of the Country within 90 days after issuance of Taking-Over Certificate.
Total advance payment	14.2	Fifteen (15) Percentage of the Accepted Contract Amount less Provisional sum and VAT payable in the currencies and proportions in which the Accepted Contract Amount is payable. The total advance payment shall be made in Two (2) installments as follows: - First (1st) installment of 7.5% within 28 days after the submission of Advance Payment bank guarantee;

Subject	Ref. GCC	Data
		- Second (2nd) installment of 7.5% after the completion of the Contractor's mobilization of all required resources to the Site and upon submission of bank guarantee as agreed in the Contract document and within 28 days of the date of certification by the Project Manager. The Advance Payment Guarantee shall be valid until the date of Completion of the Phase 1: Upgrading Works. If the Advance Payment Guarantee is issued by a bank located outside Nepal, it shall be counter guaranteed by a commercial bank established in Nepal.
Repayment of advance payment	14.2(a)	Delete "exceeds thirty percent (30%) of the Accepted Contract Amount less Provisional Sums" in third line and replace with: "exceeds thirty percent (30%) of the Accepted Contract Amount less Provisional sum and VAT"
Repayment amortization of advance payment	14.2(b)	Amortization Rate shall be: 30% Delete "when 90 percent (90%) of the Accepted Contract Amount less Provisional Sums" in fifth and sixth lines and replace with: "when 80 percent (80%) of the Accepted Contract Amount less Provisional Sum and VAT"
Percentage of Retention	14.3(c)	Phase 1: Upgrading Works Ten percent (10%) Phase 2: Performance Based Maintenance Works Not applicable
Limit of Retention Money	14.3 (c)	Phase 1: Upgrading Works Five Percent (5%) of the Accepted Contract Amount Phase 2: Performance Based Maintenance Works Not applicable
Plant and Materials	14.5(b)(i)	Not Applicable
	14.5(c)(i)	Not Applicable

Subject	Ref. GCC	Data
Minimum Amount of Interim Payment Certificates	14.6	Phase 1: Upgrading Works One percent (1%) of the Accepted Contract Amount. Phase 2: Performance Based Maintenance Works Not Applicable
Termination by Employer	15.2	This sentence will apply as Subclause 15.2(g): (g) the Engineer gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with Subclause 8.2 (Time for Completion) and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Engineer;
Corrupt and Fraudulent Practices	15.6	The following sentence shall apply: [For contracts financed by the Asian Development Bank] For the purposes of this Subclause: ADB's Anticorruption Policy requires Borrowers (including beneficiaries of ADB-financed activity), as well as Contractors, Subcontractors, manufacturers, and Consultants under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, ADB
		(a) defines, for the purposes of this provision, the terms set forth below as follows: (i) "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party; (ii) "fraudulent practice" means any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation; (iii) "coercive practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party; (iv) "collusive practice" means an arrangement between two or more parties designed to achieve an

Subject	Ref. GCC	Data
		improper purpose, including influencing improperly the actions of another party; (v) "abuse" means theft, waste or improper use of assets related to ADB-related activity, either committed intentionally or through reckless disregard; (vi) "conflict of interest" means any situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations; (vii) "obstructive practice" means (a) deliberately destroying, falsifying, altering or concealing of evidence material to an ADB investigation, or deliberately making false statements to investigators, with the intent to impede an ADB investigation; (b) threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to a Bank investigation or from pursuing the investigation; or (c) deliberate acts intended to impede the exercise of ADB's contractual rights of audit or inspection or access to information; and (viii) "integrity violation" is any act, as defined under ADB's Integrity Principles and Guidelines, which violates ADB's Anticorruption Policy, including (i) to (vii) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard. (b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract; (c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the borrower or of a beneficiary of ADB-financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations

Subject	Ref. GCC	Data
		during the procurement or the execution of that contract, without the borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation; and (d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate in ADB-financed, -administered, or -supported activities or to benefit from an ADB-financed, -administered, or -supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations. All Bidders, consultants, contractors, suppliers and other third parties engaged or involved in ADB-related activities have a duty to cooperate fully in any screening or investigation when requested by ADB to do so. Such cooperation includes, but is not limited to, the following: (a) being available to be interviewed and replying fully and truthfully to all questions asked; (b) providing ADB with any items requested that are within the party's control including, but not limited to, documents and other physical objects; (c) upon written request by ADB, authorizing other related entities to release directly to ADB such information that is specifically and materially related, directly or indirectly, to the said entities or issues which are the subject of the investigation; (d) cooperating with all reasonable requests to search or physically inspect their person and/or work areas, including files, electronic databases, and personal property used on ADB activities, or that utilizes ADB's ICT resources or systems (including mobile phones, personal electronic devices, and electronic storage devices such as external disk drives); (e) cooperating in any testing requested by ADB, including but not limited to, fingerprint identification, handwriting

Subject	Ref. GCC	Data
		analysis, and physical examination and analysis; and (f) preserving and protecting confidentiality of all information discussed with, and as required by, ADB. All Bidders, consultants, contractors and suppliers shall ensure that, in its contract with its sub-consultants, sub-contractors and other third parties engaged or involved in ADB-related activities, such sub-consultants, sub-contractors and other third parties similarly undertake the foregoing duty to cooperate fully in any screening or investigation when requested by ADB to do so.
Maximum total liability of the Contractor to the Employer	17.6	The product of 1.10 times the Accepted Contract Amount
Periods for submission of insurance:	18.1 (a)	a. evidence of insurance: 14 days
	18.1 (b)	b. copies of relevant policies: 21 days
Insurance of Contractor's Equipment	18.2 (b)	Contractor's Equipment shall be insured before mobilizing to the Site. The insurance shall be in the name of the legal owner of the Equipment. Insurance in the joint name of the Employer and the Contractor shall not be required for the insurance against loss or damage to the Contractor's Equipment.
Maximum amount of deductibles for insurance of the Employer's risks	18.2 (d)	NRs. 500,000.00 (Five hundred thousand only)
Minimum amount of third party insurance	18.3	NRs. Fifteen (15.00) Million with no limit on the number of occurrences.
Date by which the DB shall be appointed	20.2	28 days after the Commencement
The DB shall be comprised of	20.2	Three Members
Appointment (if not agreed) to be made by	20.3	"Executive Committee of FIDIC (International Federation of Consulting Engineers) World Trade Center II –Geneva Airport Box 311 29 route de Pres-Bois CH-1215 Geneva 115 Switzerland"

Subject	Ref. GCC	Data
International arbitration shall be administered by	20.6 (a)	International arbitration shall be: (i) Administered by: Singapore International Arbitration Centre (SIAC) shall be the institution to administer the arbitration. (ii) Conducted in accordance with the rules of: Singapore International Arbitration Centre (SIAC)
Place of Arbitration	20.6	Singapore (or any other neutral venue agreed upon by both parties.)

FOR REFERENCE ONLY

Part B – Specific Provisions

Subject	Ref. GCC	Data
Definitions	1.1	
Specifications	1.1.1.5	The Specifications mean: (a) Standard Specifications issued under the authority of the Government of Nepal, Ministry of Physical Planning and Works, Department of Roads (July 2001) (b) Special Provisions to the Standard Specifications
Commencement Date	1.1.3.2	<i>At the end of the Sub-Clause add the followings paragraph.</i> “Commencement Date of the Phase 2: Performance Based Maintenance Works” means the day immediately following the conclusion of the Defects Notification Period of the Phase 1: Upgrading Works.
Time for Completion	1.1.3.3	<i>At the end of the Sub-Clause add the followings paragraphs.</i> “Time for Completion of the Phase 1: Upgrading Works” means the time for completing the Phase 1: Upgrading Works under Sub-Clause 8.2 [Time for Completion], as stated in the Contract Data (with any extension under Sub- Clause 8.4 [Extension of Time for Completion]), calculated from the Commencement Date including Defect Notification Period. “Time for Completion of the Phase 2: Performance Based Maintenance Works” means the time for completing the Phase 2: Performance Based Maintenance Works which will start at the end of the DNP for Phase 1.”
Defects Notification Period	1.1.3.7	In the fifth line immediately after “calculated” delete the remaining texts and add “from the date on which the Phase 1: Upgrading Works is completed as certified under Sub-Clause 10.1 [Taking Over of the Works and Sections] and as stated in the Taking-Over Certificate of the Phase 1: Upgrading Works.”
Additional Sub Clause:	1.1.3	Add the following Sub-clause to Clause 1.1.3 [Dates, Tests, Periods and Completion]

Subject	Ref. GCC	Data
Completion Date of Phase 1: Upgrading Works	1.1.3.10	"Completion Date of Phase 1: Upgrading Works" means the date of completing the Phase 1: Upgrading Works including Defect Notification period.
Accepted Contract Amount	1.1.4.1	Immediately after "execution" delete "and" and replace with "," and immediately after "completion" add "and performance based maintenance".
Works	1.1.5.8	<i>Delete the sentence and insert the following:</i> "Works" means the Permanent Works, the Temporary Works and Performance Based Maintenance Works.
Additional Sub Clauses:		<i>Add the following Sub-Clauses to Clause 1.1.5 [Works and Goods]</i>
Maintenance Phase Works	1.1.5.9	"Maintenance Phase Works" means the Phase 2: Performance Based Maintenance Works to be executed by the Contractor.
Construction Phase Works	1.1.5.10	"Construction Phase Works" means the Phase 1: Upgrading Works to be executed by the Contractor including Defect Notification Period.
Domestic Preference Security	1.1.6.11	<i>Add the following Sub-clause:</i> "Domestic preference Security" means an unconditional on demand bank guarantee for an amount in a convertible currency equivalent to the difference between the joint venture's bid price and the bid price of the lowest foreign bid.
Care and Supply of Documents	1.8	<i>Add the following text at the end of Sub-clause 1.8:</i> Irrespective of the above, the Contractor shall be responsible for the production of detailed construction drawings as may be necessitated by his work programme pursuant to Sub-Clause 8.3 and as the Engineer may deem necessary for the proper execution of the Works. The Contractor shall supply two copies of draft prints of all such detailed construction drawings for the Engineer's review and when approved by the Engineer shall supply six final prints together with a reproducible copy on computer disk or as may be otherwise approved by the Engineer.

Subject	Ref. GCC	Data
Determination	3.5	<i>Add the end of the second paragraph, add the following:</i> "Each Party shall give effect to each agreement or determination, unless the either Party gives notice, to the Engineer with copies to the other Party, of his dissatisfaction with a determination within 14 days of receiving it. Either Party may then refer the dispute to the DB in accordance with Sub-Clause 20.4 [Obtaining Dispute Board's Decision]."
Contractor's General Obligations	4.1	In the fourth paragraph immediately after "construction" add "and maintenance" In the fifth paragraph delete "whenever required by the Engineer" and replace with "as part of his quality assurance obligations". <i>After the fifth paragraph, add the following paragraph:</i> "The Contractor shall prepare and submit working drawings, shop drawings and schedules for all works to be constructed and maintained under the Contract and shall be fully responsible for the accuracy of these working drawings, shop drawings and schedules which shall be deemed to be Contractor's Documents in accordance with the Contract and be submitted in accordance with the provisions for the same. The working drawings, shop drawings and schedules shall be based on the Drawings and the actual site conditions as surveyed by the Contractor and agreed with the Engineer." <i>At the end of this Sub-Clause add the following paragraph:</i> "On or before completion of the Construction Phase Works, the Contractor shall arrange to furnish to the Engineer, as part of Contractor's Documents, "as-built" drawings of the permanent works of the construction phase works (not limited to works designed by the Contractor), in the quality and detail to be approved by the Engineer. The "as-built" drawings shall be prepared, and submitted for the Engineer's checking and acceptance, progressively with the progress of the construction phase works. The Taking-Over Certificate for the construction phase works shall not be issued by the Engineer until the "as-built" drawings of the

Subject	Ref. GCC	Data
		permanent works of the construction phase works are submitted and accepted.
Performance Security	4.2	In the third paragraph immediately after "Certificate" add "for the Phase 1: Upgrading Works and Phase 2: Performance Based Maintenance Works". <i>Add the following paragraph after the sixth paragraph</i> The Contractor may prepare two separate performance securities: (i) One bearing the value of 5% of the Accepted Contract Amount with the validity period of 9.0 years and (ii) Other bearing the remaining 5% of the Accepted Contract Amount with the validity period of 4.0 years, hence totaling 10% of the Accepted Contract Amount. At the completion of the Defects Notification Period of the Phase 1: Upgrading Works, the Contractor may be released with the performance security of 5% of the Accepted Contract Amount with the validity period of 4.0 years. The remaining 5% Performance Security may be released during PBM phase in the manner described below: If the Contractor complies with the Operational Service Levels defined in Table 33.4 Pavement Roughness in Section 3300 of Part 2 Employers Requirements, the Performance Security may be reduced by one percent (1%) of the Accepted Contract Amount after the completion of each year of Phase 2. Performance Security of remaining two percent (2%) of the Accepted Contract Amount shall be retained until the Contractor has complied with all obligations of the Contract. Add the following text at the end of Sub-clause 4.2: A Joint Venture that is awarded the Contract as a result of the application of the domestic preference provisions, shall furnish the Employer, together with the Performance Security, a "Domestic Preference Security" to guarantee that the profit and loss distribution and work-sharing arrangements with which the joint venture satisfied the domestic preference criteria will not be modified throughout the execution of the Contract.

Subject	Ref. GCC	Data
		The domestic preference security shall be in the form of an unconditional on-demand bank guarantee acceptable to the Employer, for an amount in a convertible currency equivalent to the difference between the Joint Venture's bid price and the bid price of the lowest foreign bid. The domestic preference security shall be issued either (a) by a bank located in Nepal, or (b) directly by a foreign bank acceptable to Employer. If the Domestic preference Security is issued by a bank located outside Nepal, it shall be counter guaranteed by a commercial bank established in Nepal. The domestic preference security shall be valid until the Contractor has substantially completed the Works and a Taking-Over Certificate has been issued by the Engineer in accordance with the provisions of GCC 10 and such security shall be returned to the Contractor together with the Taking - Over Certificate.
Contractor's Representative	4.3	Add the following at the end of the sub-Clauses. The Contract Manager / Contractor's Representative shall require being the Senior Employee from the Bidder and working with the firm for at least one year prior to the bid submission deadline. The Contract Manager / Contractor's Representative shall be at the work site during the contract duration.

Subject	Ref. GCC	Data
Subcontractors	4.4	<i>Add the following at the end of the Sub-clause 4.4 :</i> Maximum percentage of Subcontracting permitted is: 40% of the Accepted Contract Amount. The proposed Subcontractor shall meet, on a pro rata basis, the following criteria as specified in Section 3 Evaluation and Qualification Criteria: (i) Average Annual Construction Turnover; (ii) Financial Resources; (iii) Construction Experience in Contract of Similar Size and Nature that is similar to the proposed subcontract; and (iv) Construction Experience in Key Activities, if the subcontractor is proposed for key activities. <i>Add new text to this Sub-clause 4.4, after item (d) as follows:</i> (e) In the event of approved subcontracting the Contractor shall ensure that Subcontractors do not further subcontract their contract; (f) The Contractor shall keep a log showing the following information on all Subcontractors, suppliers and transporters engaged in the Contract Works: (a) Name and address (b) Copy of Subcontracting agreement (c) Works and value of Subcontract (d) Commencement and completion dates (e) Copy of payments and Interim payments made to Subcontractor The Contractor shall submit a copy of the above log monthly to the Engineer's representative.
Co-operation	4.6	<i>Add new text to this Sub-clause 4.6 at the end as follows:</i> There may be other contractors working on the similar and/or adjacent road. The Contractor shall at all times allow the free passage of all traffic, including vehicles and equipment of other Contractors. The maintenance for the road or way shall be the responsibility of the Contractor.

Subject	Ref. GCC	Data
Setting Out	4.7	<i>At the end of the second paragraph, add the following:</i> "For this purpose, before commencement of the work on the site, the Contractor shall carry out a check survey, in the presence of the Engineer, to verify the accuracy of the items of reference and submit the results of the verification survey to the Engineer for his acceptance."
Safety Procedures	4.8	<i>At the end of this Sub-Clause, add the following paragraph:</i> "Within twenty-eight (28) days of the Commencement Date, and before commencing any construction on Site, the Contractor shall provide a Site Safety Manual, which shall be subject to the Engineer's consent, specifically for the Site which shall establish all of the requirements for effecting and maintaining a safe working environment for Contractor's and Employer's Personnel and any other authorized personnel entering the Site in accordance with the Contractor's obligations. The Site Safety Manual shall include all of safety obligations of the Contractor including safe traffic management for all Site activities and personal protective equipment required for each working area. The Manual shall be revised as deemed necessary to suit with the changed site situation by the Contractor with the consent of the Engineer."
Unforeseeable Physical Conditions	4.12	<i>Add the following subparagraph at the end of GCC Sub- clause 4.12:</i> In addition to notice of any unforeseeable physical conditions, the Contractor shall provide the Engineer with a written notice of any unanticipated environmental, resettlement risks or impacts that arise during construction, implementation or operation of the Project that were not considered in applicable IEE, EMP and RP; attached hereto as Appendix 1 through Appendix 4.

Subject	Ref. GCC	Data
Rights of Way and Facilities	4.13	<i>Add the following paragraphs as first paragraphs of Sub- clause 4.13:</i> The Contractor shall ascertain the location of all access paths, watercourses, irrigation channels, sewers, drains, water pipes, electricity and telecommunication cables and other services, and structures etc. which may be encountered during the execution of the Works. He shall temporarily support or divert and subsequently reinstate all such services and structures as necessary and to the satisfaction of the Engineer. As soon as any such service or structure is encountered on, over, under, in or through the Site during the performance of the Contract, the Contractor shall make a record of the location and description of such service or structure and shall send the same forthwith to the Engineer. Where permanent diversion or support of such service or structure is rendered necessary as the unavoidable result of the execution and maintenance of the Works in accordance with the Contract, the Engineer after consultation with the Employer will instruct the Contractor as to the diversion or support to be provided and the Contractor shall be paid the costs thereof in accordance with Clause 13 hereof. <i>Add the following paragraphs at the end of Sub-clause 4.13:</i> The Contractor shall comply with (i) the measures and requirements set forth in the Resettlement Plan ("RP"), to the extent it concerns impacts on affected people during construction; and (ii) any corrective or preventive actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the RP. The Contractor shall allocate a budget at his own cost for compliance with these measures, requirements and actions

Subject	Ref. GCC	Data
Avoidance of Interference	4.14	<i>After the first paragraph of this Sub-Clause, add the following paragraph:</i> "Without in any way limiting the Contractor's obligations and responsibilities under the Contract, because the Site or part thereof is used by the public, the Contractor shall programme and execute the Works to avoid inconvenience or disruption of the public. No work on any part of the Site used by the public shall be permitted until such time as alternate routes in the form of roads, diversions, footpaths, accesses and the like (whether permanent or temporary) have been provided by the Contractor, together with all necessary safety features and devices and appurtenant drainage, and the alternate route(s) have been deemed acceptable for public use by the Engineer."
Transport of Goods	4.16	<i>Add the following paragraph at the end of Sub-clause 4.16:</i> The Contractor shall agree with the Engineer and adequately record the condition of roads, agricultural land and other infrastructure prior to the start of transporting materials, goods and equipment, and construction.

Subject	Ref. GCC	Data
Protection of the Environment	4.18	<i>Add the following paragraphs at the end of Sub-clause 4.18:</i> The Contractor shall, to the satisfaction of the Engineer, take all necessary precautions for the efficient protection of all surface and sub-surface watercourses against all kinds of pollution arising from the execution of the works. The Contractor shall ensure that at all locations where his labour force are living or working, other than labour living in their own homes, adequate facilities are provided to collect and treat all sewage and wastewater and to ensure that the outflows from such treatment facilities comply with recognized national or international standards for sewage treatment discharges. The Contractor shall ensure that fuel wood is not used as firewood and as a means of heating during the preparation or processing of any materials forming part of the Works. The Contractor shall take special precautions in connection with the establishment of storage facilities for diesel fuel, petrol, lubricants, bitumen and bituminous materials. Storage facilities shall not be placed in rock- fall prone areas. They shall have barriers and impervious surfaces preventing leakages of spilt material outside the storage area or into the underlying soils. The Contractor shall ensure that any cut or fill slopes are planted with grass or other approved plant cover as soon as possible to protect them from erosion. This planting shall follow the recommendations in the Nepali manual entitled "Vegetative Structures for Stabilizing Highway Slopes" (DoR), or the requirements of the Specification as directed by the Engineer. The water used in the construction shall not be allowed to affect water availability in the local communities. Where a scarcity of water is expected to arise, the Contractor shall explore and tap alternative sources of safe water. In case of interference with the water supply of a settlement, the Contractor is liable to provide the affected population with potable drinking water from alternative sources at no extra cost to the Contract or the local people.

Subject	Ref. GCC	Data
		The Contractor shall also comply with all applicable national, regional and local environment laws and regulations. The Contractor shall (a) establish an operational system for managing environmental impacts, (b) carry out all of the monitoring and mitigation measures set forth in the EMP attached hereto as Appendix 2 and IEE, and (c) allocate the budget required to ensure that such measures are carried out. The Contractor shall submit quarterly reports on the carrying out of such measures to the Employer. The Contractor shall allocate a budget at his own cost for compliance with these measures, requirements and actions.
Progress Reports	4.21	In the sub-paragraph (g) just after "relations;" delete "and" At the end of sub-paragraph (h), delete "." and replace with ";", and add the following sub-paragraphs (i), (j), (k) and (l): (i) the status of all Variations; (j) details of all matters affecting, or likely to affect, the progress or cost of the Works and particulars of the preventative and remedial measures which have been, are being, or may be taken in respect of those matters; (k) any other particulars reasonably required by the Engineer and (l) monitoring of the obligations in Sub-Clauses 4.7, 4.13, 4.18, 6.4, 6.7, 6.20, 6.21 and 6.23.
Labour Laws	6.4	Add at the end following sentence The Contractor shall comply with the Employer's applicable Labour Laws and regulations and incorporate applicable workplace occupational Safety norms.
Health and Safety	6.7	The Contractor shall disseminate, or engage appropriate service providers to disseminate, information on the risks of sexually transmitted diseases, including HIV/AIDS, to its employees engaged under the project and to members of the local communities surrounding the Project area, particularly women.

Subject	Ref. GCC	Data
Keeping Records of Contractor's Materials, Equipment and Incidents	6.26	<i>Add new GCC Sub-clause 6.26:</i> The Contractor shall prepare and submit to the Engineer on a monthly basis detailed records showing: (i) materials delivered to the Site and materials consumed in the Works; (ii) plant and equipment on Site together with number of hours worked by and current condition of each item (iii) all incidents affecting the safety and the health and welfare of persons and causing damage to property together with such other records as the Engineer may from time to time require to be kept and provided.
Contractor's Employees	6.27	<i>Add new GCC Sub-clause 6.27:</i> To the maximum extent possible, the Contractor's unskilled labour shall be drawn from the area of influence of the road, defined as within 2 hours walk of the place of work. Every effort shall be made to establish a gender balance within the local labour force with the employment of 50% female labour. The Contractor is required to give preference for employment as unskilled labour to one member per household of those households identified as losing land or livelihood as a result of the land acquisition process. The Engineer may identify such people to the Contractor and he shall be required to offer them employment on the same terms and conditions as the rest of his local labour force.
Inspection	7.3	In sub-paragraph (b) delete "and construction" and replace with ", construction and performance based maintenance".
Programme	8.3	In sub-paragraph (a) immediately after "erection" insert ", performance based maintenance".

Subject	Ref. GCC	Data
Taking Over of the Works and Sections	10.1	After the third paragraph, add the following paragraph: "Pursuant to sub-paragraph (a) above, any works related to road, traffic or public safety or which may affect the protection of the Works in any respect, as determined by the Engineer, shall not be deemed to be minor outstanding works or defects which will not substantially affect the use of the Works within the meaning of this Sub-Clause."
Taking Over Parts of the Works	10.2	<i>Add the following paragraph at the end of Sub-clause 10.2:</i> In the operation of this Sub-clause the passage over or through the Works by the public or the agents or servants of the Employer or by public traffic or by vehicles of the Employer, whether connected with the Contract or not, shall not constitute use or occupation by the Employer.
Interference with Tests on Completion	10.3	In the second paragraph immediately after "Period" add "of the Phase 1: Upgrading Works".
Completion of Outstanding Work and Remedying Defects	11.1	In sub-paragraph (a), after "Taking-Over Certificate" insert "for Phase 1: Upgrading Works".
Cost of Remedying Defects	11.2	Add the following at the end of Sub-clause 11.2: Upon the completion of construction, the Contractor shall fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition as recorded by the Contractor in consonance with its obligation in Sub-clause 4.16.
Extension of Defects Notification Period	11.3	In the first paragraph immediately after "taking over" add "for Phase 1: Upgrading Works".
Performance Certificate	11.9	Delete the second paragraph and replace with the following: "Separate Performance Certificate shall be issued for Phase 1: Upgrading Works and Phase 2: Performance Based Maintenance Works. The Engineer shall issue Performance Certificate for Phase 1 within 28 days after the latest of the expiry dates of the Defect Notification Periods, or as soon thereafter as the

Subject	Ref. GCC	Data
		Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. The Engineer shall issue Performance Certificate for Phase 2 after completing all the works specified in Special Provisions to the Standard Specifications for Performance Based Maintenance. A copy of the Performance Certificates shall be issued to the Employer."
Provisional Sums	13.5 (b) (ii)	<i>Add the following paragraphs at the end of (b) (ii) of Sub-clause 13.5:</i> For the emergency works as determined by the Engineer during Phase 2, the budget is allocated in the provisional sums for the payment of the works. The payment for emergency works shall be made at existing Bill of Quantities (BoQ) rates or at appropriate Dayworks rates for each corresponding BoQ pay items with the Adjustments for Changes in Cost in accordance with Sub-clause 13.8. Such payments shall not be subject to additional overhead because of the fact that the BoQ and Dayworks rates quoted by the Contractor are with his overhead.
The Contract Price	14.1	<i>Add the following paragraph at the end of Sub-clause 14.1:</i> The Contractor shall also pay royalties, tolls, value added tax and income tax. With respect to the income taxes including taxes on the Contractor's staff, personnel and labour, the Contractor shall perform such duties in regard to Tax Deductions at Source (TDS) thereof as may be applicable by the laws and regulations of Nepal.

Subject	Ref. GCC	Data
Payment of Retention Money	14.9	In the first paragraph in the first and second sentence after "Taking-Over Certificate" insert "for Phase 1: Upgrading Works". <i>Delete the second paragraph and replace with the following:</i> "Promptly after the expiry date of the Defects Notification Period of Phase 1: Upgrading Works, out of the 50% outstanding balance of the Retention money, the Engineer shall certify 25% of it for payment to the Contractor." In the fifth paragraph in the first sentence after "Taking- Over Certificate" and insert "for Phase 1: Upgrading Works". <i>Delete the sixth (last) paragraph of the Sub-clause 14.9.</i> <i>Add the following paragraph at the end of Sub-clause 14.9:</i> If the Contractor complies with the Operational Service Levels defined in Table 33.4 Pavement Roughness in Section 3300 of Part 2 Employers Requirements; the outstanding 25% of the Retention Money after the Defects notification Period of Phase 1: Upgrading Works shall be repaid to the Contractor in the following manner: At the end of each completed year of the Phase 2: Performance Based Maintenance Works by 5 % of the Retention Money at the end of year, so that the Retention Money will be reduced to nil at the completion of 5 (five) years of Phase 2: Performance Based Maintenance Works.
Payment Reduction	14.16 (Additional Clause)	Add additional Clause 14.16 "Payment Reduction" as below: Reduction of monthly payments for performance based maintenance works shall be applied in case of non- compliance with Service Levels by means of Payment Reduction Points (PRP), as indicated in the Section 3300 of Part 2: Employers Requirements. The value of each Payment Reduction Point (PRP) is NRs. 600.00 during the first full six (6) months of Phase 2 and NRs. 1,000.00 thereafter. The Payment Reduction Points are subject to price adjustment in a manner as

Subject	Ref. GCC	Data
		described in Clause 13.8 for Phase 2 works.
Eligibility	21	<i>Add New GCC Clause 21 "Eligibility"</i>
	21.1	<i>Add new GCC Sub-clause 21.1 as follows:</i> The Contractor shall have the nationality of an ADB member country. The Contractor shall be deemed to have the nationality of a country if the Contractor is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.
	21.2	<i>Add new GCC Sub-clause 21.2 as follows:</i> The materials, equipment and services to be supplied under the Contract shall have their origin in eligible source countries and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, the Contractor may be required to provide evidence of the origin of materials, equipment and services.

FOR REFERENCE ONLY

**Appendix 1 – Initial Environmental Examination
(In separate Volume)**

FOR REFERENCE ONLY

Appendix 2 – Environmental Management Plan

FOR REFERENCE ONLY

Appendix 3 – Resettlement Plan
(In separate Volume)

FOR REFERENCE ONLY

Appendix 4 – Gender Equity and Social Inclusion Plan

FOR REFERENCE ONLY

Section 9 - Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Table of Forms

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FOR REFERENCE ONLY

Notice of Intention for Award of Contract

---- on letterhead paper of the employer ----

..... date of notification

To: name of the bidder

Attention: insert name of the bidder's authorized representative

Address: insert address of the bidder's authorized representative

Telephone/Fax numbers: insert telephone/fax numbers of the bidder's authorized representative

E-mail Address: insert e-mail address of the bidder's authorized representative

This is to notify you of our intention to award the contract [. insert name of the contract and identification number, as given in the Bid Data Sheet]. You have [. . . insert number of days as specified in ITB 41.1 of the BDS . . .] days, from the date of this notification to (i) request for a debriefing in relation to the evaluation of your Bid, and/or (ii) submit a bidding-related complaint in relation to the intention for award of contract, in accordance with the procedures specified in ITB 46.1.

The summary of the evaluation are as follows:

1. List of Bidders

Name of Bidder	Bid Price as read out at opening	Evaluated Bid Price

2. Reason/s why your Bid was unsuccessful

.....
.....
.....

3. The successful Bidder

Name of Bidder:	
Address:	
Contract Price:	
Duration of Contract:	
Scope of the Contract Awarded:	
Amount Performance Security Required:	

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Notification of Award

[on letterhead paper of the employer]

Letter of Acceptance

..... date.

To: Name and address of the contractor

Subject: Notification of Award Contract No.

This is to notify you that your Bid dated date for execution of the name of the contract and identification number, as given in the Bid Data Sheet for the Accepted Contract Amount of the equivalent of amount in words and figures and name of currency, as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract and any additional security required as a result of the evaluation of your bid, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the day of, between *name of the employer*. (hereinafter “the Employer”), of the one part, and *name of the contractor*. (hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as *name of the contract*. should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein.

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.
 - (a) the Contract Agreement,
 - (b) the Letter of Acceptance,
 - (c) the Letter of Technical Bid,
 - (d) the Letter of Price Bid,
 - (e) the Addenda Nos *insert Addenda numbers if any*.
 - (f) the Particular Conditions of Contract – Part A,
 - (g) the Particular Conditions of Contract – Part B,
 - (h) the List of Eligible Countries that was specified in Section 5 of the Bidding Document
 - (i) the General Conditions of Contract,
 - (j) the Specifications,
 - (k) the Drawings,
 - (l) the completed Schedules including Bill of Quantities, and
 - (m) any other documents shall be added here. ¹
3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

¹ Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 13.8).

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of *name of the borrowing country*. . . . on the day, month and year indicated above.

Signed by

Signed by.....

for and on behalf of the Employer
in the presence of

for and on behalf the Contractor
in the presence of

Witness, Name, Signature, Address, Date

Witness, Name, Signature, Address, Date

FOR REFERENCE ONLY

Performance Security

.....*Bank's name, and address of issuing branch or office*.....

Beneficiary:*Name and address of the employer*

Date:

Performance Guarantee No.:

We have been informed that *name of the contractor* (hereinafter called "the Contractor") has entered into Contract No. *reference number of the contract* dated with you, for the execution of *name of contract and brief description of works* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Contractor, we *name of the bank* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *name of the currency and amount in words*² (..... *amount in figures*) such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the Day of³, and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458 (*or ICC Publication No. 758 as applicable*), except that subparagraph (ii) of Sub-article 20(a) is hereby excluded.⁴

.....
Signature(s) and seal of bank (where appropriate)

If the institution issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.

² The guarantor shall insert an amount representing the percentage of the contract price specified in the contract and denominated either in the currency(ies) of the contract or a freely convertible currency acceptable to the employer.

³ Insert the date 28 days after the expected completion date. The employer should note that in the event of an extension of the time for completion of the contract, the employer would need to request an extension of this guarantee from the guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [6 months][1 year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

⁴ Or the same or similar to this clause specified in the Uniform Rules for Demand Guarantees, ICC Publication No. 758 where applicable.

Advance Payment Security

.....*Bank's name, and address of issuing branch or office*.....

Beneficiary:*Name and address of the employer*

Date:

Advance Payment Guarantee No.:

We have been informed that *name of the contractor* (hereinafter called "the Contractor") has entered into Contract No. *reference number of the contract* dated with you, for the execution of *name of contract and brief description of works* (hereinafter called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum *name of the currency and amount in words*⁵ (*amount in figures*) is to be made against an advance payment guarantee.

At the request of the Contractor, we *name of the bank* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *name of the currency and amount in words*⁶ (*amount in figures*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor:

- (a) used the advance payment for purposes other than the costs of mobilization and cash flow support in respect of the Works; or
- (b) has failed to repay the advance payment when it has become due and payable in accordance with the conditions of the Contract, specifying the amount payable by the Contractor.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number *Contractor's account number* at *name and address of the bank*

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that ninety percent (90%) of the Contract Price has been certified for payment, or on the ... day of⁷, whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458 (*or ICC Publication No. 758 as applicable*).

.....
Signature(s) and seal of bank (where appropriate)

Note to Bidder

If the institution issuing the advance payment security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.

⁵ The guarantor shall insert an amount representing the amount of the advance payment denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the employer.

⁶ Footnote 1.

⁷ Insert the expected expiration date of the time for completion. The employer should note that in the event of an extension of the time for completion of the contract, the employer would need to request an extension of this guarantee from the guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [6 months][1 year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

Annex 2: Environmental Management Plan for Kanchanpur – Kamala Road (Section - 2) from Km 189 + 300 to Km 236 + 703

Environmental issues / Components	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
				Implementation	Supervision
Air, Noise and Water Quality	Monitoring of air, noise and water quality parameters	Throughout the road corridor	During Construction Stage	Supervision Consultant and Contractor	SC, DOR/PD
Landslide and Soil Erosion Occurrence of landslide and soil erosion due to natural and induced phenomena.	- Apply civil and bioengineering techniques to stabilize slopes and soil erosion.	Throughout the road corridor of impact(COI) at landslide and erosion prone area	During Construction Stage	Contractor	SC, DOR/PD
Borrow Pits and Quarry Sites Likelihood of slope failure, sedimentation, water logging, change in the aesthetic values of the landscape, damage to sensitive areas	- Operate borrow pits and quarry sites avoiding protected and sensitive areas, nearby settlements, water sources, forest areas and fertile agriculture lands and - Rehabilitate properly after their usage.	Throughout the sub-project corridor	During Construction Stage	Contractor	SC, DOR/PD
Management of Construction Spoils/Wastes Generation of spoils due to the excavation of existing roads that constitute bitumen and other pavement materials	- Prepare a detailed management plan including suitable disposal locations for spoils/waste and receive approval from the SC, and implement accordingly.	Throughout the road COI wherever spoils need to be managed	During Construction Stage	Contractor	SC, DOR/PD
Safety of Construction Workers and Accident Risks to Local Community Increased risk of accidents to construction workers and local community	- Arrange all personal protective equipment (PPE) for workers, including first aid facilities at construction sites. - Restrict entry of unauthorized persons to the construction sites and equipment storage sites. - Prepare and implement comprehensive traffic	All construction camps and throughout the road alignment	During Construction Stage	Contractor	SC, DOR/PD

Environmental issues / Components	Mitigation Measures	Location	Time Frame	Institutional Responsibility	
				Implementation	Supervision
	management plan to avoid disruption of the existing traffic due to construction activities. - Conduct regular safety audit on safety measures during construction. The audit shall cover manpower and their safety, machinery, temporary works, equipment and vehicles, materials storage and handling, construction procedures and environment, site safety guidelines, and miscellaneous services.				
Forestry and Biodiversity Clearance of trees (5627 nos.), shrubs and bushes along the roadside and compensatory Plantation	- The Contractor will determine number and types of trees to be felled through the detailed design/or its verification and will coordinate with DFOs then apply to DFO for clearance process	Throughout the road alignment especially at forest areas	At the beginning of construction	Contractor	SC, DOR/PD
Impact on Common Property Resources Likely damage to common properties such as public utilities and facilities, etc.	- Reinstate the services damaged by the project implementation	Throughout the road COI	During Construction	Contractor	SC, DOR/PD

Note:

COI = Corridor of Impact, CFUG = Community Forest Users Group, DFO = District Forest Officer, SC = Supervision Consultant, DOR/PD = Department of Roads/Project Directorate (ADB)

Annex 4: Gender Equality and Social Inclusion Plan for Kanchanpur –Kamala Road (Section-2) from Km 189+300 to Km 236+703

Activity	Performance Targets / Indicators	Responsibility
Output1. Road network upgraded and maintained		
1.1 Safety and pedestrian-friendly design features	• 26 zebra crossings with warning signs • 2 foot-over bridges in Lahan • 26.42 km of disabled-friendly footpaths (both sides) in built-up areas • Total 1.45 km of pedestrian footpaths in 24 new bridges. • 27. 2 km of service lanes segregating slow moving vehicles • 26. km of improved drainages • 36 sheltered bus stops	• Contractor • CSC
1.2 Pilot capacity-building program of women groups/cooperatives along the project road. ¹	• Two collectives of registered women groups in two different municipalities established to receive trainings • 7 women groups/cooperatives in each collective trained in managerial, financial and entrepreneurship skills • USD 1,000 seed money provided to 7 women groups/cooperatives upon training completion and approval of investment proposal	• CSC • external trainers outsourced by CSC
1.3 Encourage the participation of women in tree plantation program	• At least 30% laborers of road side tree plantation and maintenance under the responsibility of contractor are women • Provision in bidding document and contract specifying participation of women	• Contractor • DOR • CSC
1.4 Encourage participation of women in construction activities	• Target of 10% of unskilled laborers are women • Payroll with names, sex, work done, working period, and wages received, are established by contractor and subcontractor responsible of hiring unskilled labor and made available for inspection by CSC • Clause in bidding document and contract with contractor encouraging recruitment of women • Subcontractor responsible for recruitment of unskilled worker trained by CSC in recruiting women and establishing sex-segregated monitoring data	• DOR • CSC • Contractor • Subcontractor responsible of hiring unskilled labor
1.5 Conduct public human trafficking prevention and HIV/AIDS awareness-raising sessions to communities along the road corridor	• At least 550 community members [Target: at least 40% women] from all municipalities have participated to HIV/AIDS sessions • At least 50 HIV/AIDS & STI preventative awareness signs are set up in strategic places along the corridor prior to the start of construction activities • At least 1,000 community members [Target: 75% women] from all municipalities and rural	• CSC • NGO recruited by DOR

¹ The project road crosses 12 municipalities in two districts. Saptari District: Kanchanrup Municipality, Agnisaer Krishna Sawaran Rural Municipality, Rupani Rural Municipality, Shambhunath Municipality, Khadak Municipality, Surunga Municipality. Siraha: Lahan Municipality, Dhangadimai Municipality, Narha Rural Municipality, Golbazar Municipality, Mirchaiya Municipality and Karjanha Municipality.

Activity	Performance Targets / Indicators	Responsibility
	municipalities have participated in human trafficking awareness sessions and been informed about referral services	
1.6 Conduct HIV/AIDS awareness-raising sessions to workforce	- HIV/AIDS awareness sessions are conducted once a month - Voluntary testing, guidance and referral is provided to laborers on site on a monthly basis - No. of sessions and participants monitored by CSC	- Agency subcontracted by Contractor - Monitored by CSC
1.7 Ensure that construction activities abide by core labor standards (CLS) ²	- Bidding documents and contracts with contractor contain CLS provisions - Contractual documents of all subcontractors contain CLS provisions - CLS compliance of contractors and subcontractors monitored by CSC	- DOR - CSC - subcontractors
Output 2: Planning and management for road safety improved		
2.1. Conduct road safety awareness campaigns to communities along corridor (audience: pedestrians, drivers, parents, schoolchildren, professional drivers)	- At least 550 [with at least 40% women] from municipalities and rural municipalities crossed by the alignment participated in road safety awareness sessions - At least 50% of the student population , 75% of teachers, of the 18 schools within 1 km and 50 school within 10 km of the alignment participated in road safety awareness sessions - At least 600 professional bus and truck drivers attended a session on road safety measures	Road safety community awareness expert and staff outsourced by CSC
2.2. Support the implementation of gender equality and social inclusion (GESI) operational guidelines	100 divisional officers, engineers, administrators and data managers of all divisional and regional offices trained on the approved <i>Gender Equality and Social Inclusion Operational Guidelines</i>	- TA consultant - Monitored by CSC
2.3. Inclusion of universal and gender best practices in the preliminary design of 20 service areas	Prefeasibility study and design standards developed, with at least 20 service areas identified, which includes socially inclusive and gender-friendly	TA consultant

CLS = Core Labor Standards; CSC = Construction Supervision Consultant; DOR= Department of Roads;

² i.e.: equal wages for work of equal value, prohibition of child labor, no bonded labor; no work discrimination regardless of gender, race, and ethnicity; and freedom of association and collective bargaining.



Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Project Directorate (ADB)
Bishalnagar, Kathmandu

Date:	12 th September 2018
Project No. and Title:	52097-001: South Asia Sub-regional Economic Cooperation (SASEC) Highway Improvement Project
Contract No. and Title:	SHIP/OCB/KK-01 and SHIP/OCB/KK-02: Kanchanpur-Kamala Road
Deadline for Submission of Bids:	26 October 2018, 12:00 hours (local time)

- The Government of Nepal has received financing from the Asian Development Bank (ADB) towards the cost of **SASEC Highway Improvement Project (SHIP)**. Part of this financing will be used for payments under the Contract(s) named above. Bidding is open to Bidders from eligible source countries of the ADB.
- The **Ministry of Physical Infrastructure and Transport, Department of Roads, Project Directorate (ADB), Kathmandu, Nepal** ("the Employer") invites sealed bids from eligible Bidders for the construction and completion of **Kanchanpur – Kamala Road** from Km 149+880 to Km 236+703 with the road sections and contracts as below at Saptari and Siraha districts of Nepal (the "Works"). Works include under Phase 1: Upgrading Works (Upgrading of existing road from 2-Lanes to 4 Lanes and Service Lanes, Structures, Bridges, etc. including Defect Notification Period) and Phase 2: Performance Based Maintenance Works (Maintenance works consisting of all activities to be carried out to achieve and keep the road assets as defined in the PBM Specifications.)

Contract ID No.	Road Section	Chainage	
		From	To
SHIP/OCB/KK/01	Section – 1	Km 149+880	Km 189+300
SHIP/OCB/KK/02	Section – 2	Km 189+300	Km 236+703

Bidders may bid for one or several contracts, as further defined in the bidding document. Bidders wishing to offer discounts in case they are awarded more than one contract will be allowed to do so, provided those discounts are included in the Letter of Price Bid.

- Bidders are requested to specify the total price of the Bid in the Letter of Price Bid or the Total Bid Price in the Summary of Bill of Quantities. Failure to specify the total price of the Bid in the Letter of Price Bid or in the Summary of Bill of Quantities may be ground for declaring the Bid nonresponsive.
- Open competitive bidding (International Advertisement)** will be conducted in accordance with ADB's **Single - Stage: Two – Envelope** bidding procedure and is open to all Bidders from eligible countries as described in the Bidding Document.

- To obtain further information and inspect the bidding documents, Bidders should contact:

Project Directorate (ADB), Department of Roads
Bishalnagar, Kathmandu, Nepal
Tel No.: +977 1 4437492 / 4437493 / 4414239
E-mail: pdadb@wlink.com.np
Attention: The Project Director

Fax No.: +977 1 4437488

- To purchase the bidding documents in English, eligible Bidders should

- write to address above requesting the bidding documents for SHIP/OCB/KK/01 and/or 02: Kanchanpur – Kamala Road.
- pay a nonrefundable fee of NRs. 20,000.00 for one set of bidding document of each contract by depositing in the following Revenue Account

Name of Bank	Name of Office	Revenue Account No.	Office Code	Revenue Heading No.
Rastriya Banijya Bank Thamel Branch	Department of Roads, Project Directorate (ADB)	1000200010000	337003502	14229

Or USD 200.00 (USD two hundred only) plus USD 200.00 (USD two hundred only) as courier charge in the form of bank draft in favor of the Project Directorate (ADB), Department of Roads, Ministry of Physical Infrastructure and Transport, Bishalnagar, Kathmandu, Nepal for one set of bidding document of each contract. Cash payment shall be accepted in the case of local currency only. The Employer accepts no liability for loss or late delivery.

- Deliver your bid

- ☐ to the address above
- ☐ **on or before the deadline: Date: 26th October 2018, 12:00 hours (local time)**
- ☐ together with a Bid Security as described in the Bidding Document

Bids will be opened immediately after the deadline for bid submission in the presence of Bidders' representatives who choose to attend.

- A Pre-Bid Meeting will be held on **01st October 2018** at 13:00 hours (local time) at Department of Roads, Project Directorate (ADB), Bishalnagar, Kathmandu, Nepal.
- When comparing Bids, ADB's Domestic Preference Scheme will be applied in accordance with the provisions stipulated in the Bidding Document.

Project Director

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Act. Project Director