དཔལ་ལྡན་འབྲུག་གཞུང་། ཕུན་ཚོགས་གླིང་ཁྲོམ་སྡེ།
ROYAL GOVERNMENT OF BHUTAN
PHUENTSHOLING THROMDE
POST CODE 21101, POST BOX NO. 02, PELKHIL LAM

Procurement of Works

Bidding Document
for
Procurement
of

Construction in the Omchhu River of counterfort RCC flood walls, riverbank protection (including increasing use of large rocks), check dams, scour protection for cross drainages, footpaths & cycling tracks along both riverbanks, and access ramp. (“The Works”)

Volume 1 – Technical Bid

Issued on: 16/02/2026

Invitation for Bids No.: General/Circular/Notification (PT/ADB-CRORBP)/ 01975

OCB No: W-1

Employer: PhuentsholingThromde

Country: Bhutan

Preface

This Bidding Document for the Procurement of Works has been prepared by Phuentsholing Thromde and is based on the Standard Bidding Document for the Procurement of Works–Small Contracts (*SBD Works- Small*) issued by the Asian Development Bank dated December 2021.

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

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Section 1: Instructions to Bidders

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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 the Works as specified in Section 6 (Employer's Requirements). The name, identification, and number of contracts of this bidding 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 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 requires Borrowers (including beneficiaries of ADB-financed activity) and their personnel, as well as firms and individuals participating in an ADB-financed activity, including but not limited to, Bidders, Suppliers, and Contractors, agents, subcontractors, subconsultants, service providers, subsuppliers, manufacturers (including their respective officers, directors, employees and personnel) under ADB-financed contracts to observe the highest standard of ethics during the procurement and execution of such contracts in accordance with ADB's Anticorruption Policy (1998, as amended from time to time). 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; and

(vii) “integrity violation" is any act, as defined under ADB’s Integrity Principles and Guidelines (2015, as amended from time to time), which violates ADB’s Anticorruption Policy, including (i) to (vi) above and the following: obstructive practice, 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 or any of its officers, directors, employees, personnel, subconsultants, subcontractors, service providers, suppliers or manufacturers 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, including by failing to inform ADB in a timely manner at the time they knew of the integrity violations;

(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, including declaring ineligible, either indefinitely or for a stated period of time, to participate[1] 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, administered, or supported by ADB, requiring Bidders, suppliers, and contractors, consultants, manufacturers, service providers and other third

[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).

parties engaged or involved in ADB-related activities, and their respective officers, directors, employees and personnel, to permit ADB or its representative to inspect the site and their assets, accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by ADB.

3.2 All Bidders, consultants, contractors, suppliers, manufacturers, service providers, and other third parties engaged or involved in ADB-related activities, and their respective officers, directors, employees and personnel, are obliged to cooperate fully in any investigation when requested by ADB to do so. As determined on a case by case basis by ADB, 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 Information and Communications Technology (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 require their officers, directors, employees, personnel, agents to ensure that, in its contracts with its subconsultants, Subcontractors and other third parties engaged or involved in ADB-related activities, such subconsultants, Subcontractors and other third parties similarly are obliged to cooperate fully in any 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 provisions of GCC 28.3 and 73.2 (i).

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 this 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 nonconsulting 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; or

(i) a Bidder that has a financial or familial relationship with staff of the Employer including project implementing/executing agency, or of a recipient of a part of the loan who: (i) are directly or indirectly involved in the preparation of the bidding documents or specifications of the contract, and/or the bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to ADB throughout the procurement process and execution of the contract.

4.4 A firm will 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 temporarily suspended or debarred firm will be rejected and such bid may be in breach of debarment conditions, thereby subject to further ADB's investigation.

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 Bidders 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 from, or payments to, a particular country, person or entity in respect of goods or services originating in that country. Where the Borrower's country prohibits payments to a particular person or entity or for particular goods or services by such an act of compliance, that firm shall be excluded.

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 consists 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 prior to the deadline for submission of bids, within a period given in the BDS. 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 risk and 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, at Bidder's option and 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, or as stipulated in the BDS;

(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, and all documents listed under Clause 11, 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 When specified in the BDS pursuant to ITB 13.1, and subject to 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 Schedules shall conform to the requirements specified below.

14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section 4 (Bidding Forms). In case of admeasurement contracts, 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. Unit rates and prices for all items of the Works described in the Bill of Quantities shall be expressed in positive values. If unit rates and prices are expressed in negative values, the bid will be rejected.

14.3 The price to be quoted in the Letter of Price Bid 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 nonresponsive 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 currency(ies) of the Bid and payment shall be as specified in the BDS.

15.2 Bidders may be required by the Employer to justify, to the Employer's satisfaction, their local and foreign currency requirements, and to substantiate that the amounts included in the prices shown in the appropriate form(s) of Section 4, in which case a detailed breakdown of the foreign currency requirements shall be provided by Bidders.

16. Documents Comprising the Technical Proposal

16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule, environmental, health and safety (EHS) management plan commensurate with the proposed scope of works, EHS Code of Conduct, 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 in accordance with ITB 35.

18. Period of Validity of Bids

18.1 Bids shall remain valid for the bid validity period specified in the BDS. The bid validity period starts from the date fixed for the bid submission deadline date prescribed by the Employer in accordance with ITB 22.1. 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 (hard copy of the bank guarantee or in the form of SWIFT message MT760), or

(b) an irrevocable letter of credit, or

(c) a cashier's or certified check.

all from a reputable bank 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 substantially nonresponsive Technical Bids shall be returned before opening the Price Bids. The bid security of unsuccessful Bidders at Price Bid evaluation 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, if

(a) 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) 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 arithmetical corrections in accordance with ITB 34; or

(iv) furnish a domestic preference security, if applicable, in accordance with ITB 45.

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 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 Bid 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 period stated in the Employer’s request shall cause the rejection of the Bid. If either the Letter of Technical Bid or Letter of Price Bid or the Bid-Securing Declaration (if applicable) is 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 shall submit their Bids as specified in the BDS. 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 21.3.

(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 as provided in 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 for withdrawal notices, which 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 for withdrawal notices, which do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION;" and

(b) received by the Employer prior to 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 choose 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 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 and 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 a 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 the 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 a 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 for the opening of Price Bids.

25.8 The Employer will notify in writing Bidders who have been rejected for submitting nonresponsive Technical Bids and return their Price Bids unopened together with their bid securities, before opening the Price Bids of the substantially responsive Bidders.

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 Schedules are to be initialed by at least three representatives of the Employer attending the 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 on the publication of Contract award.

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 omission.

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. Nonmaterial Nonconformities

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, or affiliates.

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 73.2(c). 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) Only for admeasurement contracts, 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 for admeasurement contracts, or Schedule of Prices for lump sum contracts, 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 35;

(e) adjustment for nonmaterial 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 to award multiple contracts to a single Bidder, 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, 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 offered bid price appears to be abnormally low, the Employer shall undertake a three-step review 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, contingencies and profit margins; and

(c) decide 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 the 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 expense 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, but 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 35 to ITB 37 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 40.1, or upon satisfactory resolution of a complaint filed within standstill period, if applicable, the Employer shall transmit the Notification of Award through issuance of Letter of Acceptance using the form included in Section 9 (Contract Forms) to the successful Bidder, in writing, that its Bid has been accepted. At the same time, the Employer shall also notify all other Bidders of the results of the bidding.

43.2 Unless standstill period applies, upon notification of award through issuance of Letter of Acceptance, 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 through issuance of Letter of Acceptance 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 through issuance of Letter of Acceptance from the Employer, the successful Bidder shall furnish the performance security in accordance with the Conditions of Contract, subject to ITB 38 and ITB 39, using for that purpose the Performance Security Form included in Section 9 (Contract Forms), or another form acceptable to the Employer. If the bank issuing performance security is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.

45.2 Failure of the successful Bidder to submit the abovementioned 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: General/Circular/Notification (PT/ADB-CRORBP)/ 01975
ITB 1.1	The Employer is: Phuentsholing Thromde
ITB 1.1	The name of the bidding process is: single stage two envelope The identification number of the bidding process is: W-1 The number and identification of lots comprising this bidding process is: none
ITB 2.1	The Borrower is: Royal Government of Bhutan
ITB 2.1	The name of the Project is: Climate-Resilient Omchhu River Basin Project

B. Contents of Bidding Documents

ITB 6.3	The complete Bidding Documents in English, can be viewed/downloaded free of charge from the portal: http://www.phuenthrom.bt/downloads. Printed copy of bid is not available for sale, only downloaded document is to be used.
ITB 7.1	For **clarification purposes** only, the Employer's address is: Attention: Tshewang Jeipo (Chief Urban Planner) / Pema Leki (Resident Engineer) / Saphal Rai (Resident Engineer) Street address: Pelkhil Lam Floor/Room number: Second floor (Urban Planning Department) City: Phuentsholing ZIP code: 21101 Country: Bhutan Telephone: +975 16936181/ +975 17647389/ +975 77439877 E-mail: tjeipo@phuenthrom.bt/ pleki@phuenthrom.bt/ samrai716@gmail.com Requests for clarification by email to tjeipo@phuenthrom.bt/ pleki@phuenthrom.bt/ samrai716@gmail.com should be received by the Employer no later than: 21 days prior to bid submission date.
ITB 7.4	A Pre-Bid meeting shall take place. Date: 06/03/2026

	Time: 1030 hours (Bhutan Standard Time) Place: Thromde Conference Hall, Phuentsholing Thromde Office, Pelkhil Lam There will also be online (virtual) pre-bid meeting on the same date and at the same time. Bidders interested to attend virtual pre-bid meeting should inform to the Employer through e-mail to: tjeipo@phuenthrom.bt/ pleki@phuenthrom.bt/ samrai716@gmail.com Such interested Bidders should convey their details including name of the Bidder, phone number and e-mail address to connect them at least 24 hours before the date and time specified for pre-bid meeting. A site visit conducted by the Employer shall be organized. It will be between 800 hours to 1000 hours (Bhutan Standard Time) on 06/03/2026.

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 (b)	In accordance with ITB 12 and ITB 14, the following schedules shall be submitted with the bid, including the priced Bill of Quantities for admeasurement contracts and Activity Schedule for lump sum contracts: 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: none
ITB 14.5	The prices quoted by the Bidder are subject to adjustment as per Price Adjustment Schedule during the performance of the Contract. The formula for adjusting the prices and explanatory details are specified in the GCC Clause 54. Bidder shall fill out the Tables of Adjustment Data in Section 4 (Bidding Forms).
ITB 15.1	The prices shall be quoted by the bidder and shall be paid in: Bhutanese Ngultrum
ITB 18.1	The bid validity period shall be 120 days.

ITB 19.1	The Bidder shall furnish a bid security in the amount of Bhutanese Ngultrum 4 million
ITB 19.2	Not Applicable
ITB 19.4	Subject to the succeeding sentences, any bid not accompanied by an irrevocable and callable bid security shall be rejected by the Employer as nonresponsive. 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 all future Joint Venture Partners), the Employer shall request the Bidder to submit a compliant bid security within seven 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 Bid, the number of copies is: one
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 shall 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 7 days.

D. Submission and Opening of Bids

ITB 21.1	Bidders shall submit their Bids by hand or post or courier within the bid submission deadline. Phuentsholing Thromde will not accept online or emailed bids and delayed submission of bids.
ITB 22.1	For **bid submission purposes** only, the Employer's address is: Attention: Tshewang Jeipo (Chief Urban Planner) / Pema Leki (Resident Engineer) / Saphal Rai (Resident Engineer) Street address: Phuentsholing Thromde Office, Pelkhil Lam Floor/Room number: Second floor (Urban Planning Department) City: Phuentsholing ZIP code: 21101 Country: Bhutan. **The deadline for bid submission is:** Date: 30/03/2026 Time: 1600 hours (Bhutan Standard Time)

ITB 25.1	The opening of the Technical Bid shall take place at: Phuentsholing, Bhutan Street address: Phuentsholing Thromde Office, Pelkhil Lam Floor/Room number: Thromde Conference Hall, Third Floor City: Phuentsholing Country: Bhutan Date: 30/03/2026 Time: 1630 hours (Bhutan Standard Time)
ITB 25.5	The Letter of Technical Bid shall be initialed by at least two representatives of the Employer attending the Bid opening.
ITB 25.10	The Letter of Price Bid and Schedules shall be initialed by at least two representatives of the Employer attending the Bid opening.

E. Evaluation and Comparison of Bids

ITB 32.2	The qualifications of other firms such as the Bidder's subsidiaries, parent entities, or affiliates 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 35.1	Not applicable.
ITB 36.1	Domestic preference shall not apply.
ITB 41.1	Standstill provisions shall apply. The duration of standstill period will be 5 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 a 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.

F. 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: Mrs. Pema Title/position: Executive Secretary Employer: Phuentsholing Thromde E-mail address: pemapema@phuenthrom.bt

Section 3: Evaluation and Qualification Criteria

Table of Criteria

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 successfully implement the contract considering its proposed site organization, method statement, mobilization, and construction schedule (to be described by the Bidder in sufficient detail to demonstrate the adequacy of its work methods, scheduling, and material sourcing) including the extent to which they are presented in a consistent manner and comply with requirements stipulated in Section 6 (Employer's Requirements) without material deviation, reservation, or omission.

Noncompliance with equipment and personnel requirements described in Section 6 (Employer's Requirements) shall not normally be a ground for bid rejection, and such noncompliance 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 Specialist Subcontractors in contracts of similar size and nature, and their financial resources 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

Not Applicable

1.7 Other Criteria

1.7.1 Environmental, Health and Safety Management Plan (EHSMP)

Any bid not accompanied by the EHSMP may be rejected by the Employer as nonresponsive. If a Bidder submits a EHSMP that is not commensurate with the risks and impacts of the proposed works and activities in the bidding document, the Employer shall issue a request for clarification to request for further information from the Bidder. The Bidder must submit the requested information within 7 days of receiving such a request. Failure to provide a satisfactory response to the request for further information within the prescribed period of receiving such a request may cause the rejection of the Bid.

1.7.2 Sustainable Procurement

Not Applicable

1.7.3 Life Cycle costs (for Financial Evaluation)

Not Applicable

1.8 Multiple Contracts

Not Applicable

2. Qualification

2.1 Eligibility

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

2.1.1 Nationality

Nationality in accordance with ITB 4.2.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Forms ELI – 1; ELI – 2 with attachments

2.1.2 Conflict of Interest

No conflicts of interest in accordance with ITB 4.3.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid

2.1.3 ADB Eligibility

Not having been declared ineligible by ADB, as described in ITB 4.4.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid

2.1.4 Government-Owned Enterprise

Bidder required to meet conditions of ITB 4.5.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Forms ELI - 1, ELI - 2 with attachments

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 4.8.	Must meet requirement	Must meet requirement	Must meet requirement	Not applicable	Letter of Technical Bid

2.2 Historical Contract NonPerformance

2.2.1 History of NonPerforming 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 1 January ……...	Must meet requirement	Must meet requirement	Must meet requirement[b]	Not Applicable	Form CON-1

[a] *Nonperformance, as decided by the Employer, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Nonperformance shall not include contracts where Employers 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 partner.*

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 apply.

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
All pending litigation, arbitration, or other material events impacting the net worth and/or liquidity of the bidder, if any, shall be treated as resolved against the Bidder and so shall in total not represent more than fifty percent of the Bidder's net worth calculated as the difference between total assets and total liabilities.	Must meet requirement	Not applicable	Must meet requirement	Not applicable	Form CON - 1

2.2.4 Declaration: Environmental, Health and Safety Past Performance

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Declare any contracts that have been suspended or terminated and/or performance security called by an employer for reasons related to the non-compliance of any environmental, health and safety contractual obligations in the past five years.	Must make the declaration. If the bidder proposes Specialist Sub-contractor/s to meet EQC 2.4.2, those Specialist Sub-contractor/s must also make the declaration	Not applicable	Each partner must make the declaration. If the bidder proposes Specialist Sub-contractor/s to meet EQC 2.4.2, those Specialist Sub-contractor/s must also make the declaration	Not applicable	Form CON-2

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 three financial years to demonstrate the current soundness of the Bidder's financial position. As a minimum, the Bidder's net worth for the last year, calculated as the difference between total assets and total liabilities should be positive.	Must meet requirement	Not applicable	Must meet requirement	Not applicable	Form FIN - 1 with attachments

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 Bhutanese Ngultrum 434 million, calculated as total certified payments received for contracts in progress or completed, within the last three years.	Must meet requirement	Must meet requirement	Must meet 25% of the requirement	Must meet 50% of the requirement	Form FIN - 2

2.3.3 Financial Resources

If the bid evaluation process and the decision for the award of the Contract takes more than 1 year from the date of bid submission, Bidders may be asked to resubmit their current contract commitments and latest information on financial resources supported by latest audited accounts or audited financial statements, or if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, and the Bidders' financial capacity, will be reassessed on this basis.

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 Bhutanese Ngultrum 72 million	Must meet requirement	Not applicable	Not applicable	Not applicable	Form FIN – 3, FIN-3A 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 50% from the total requirement for the Subject Contract. AND	Not applicable	Not applicable	Not applicable	Must meet requirement	Form FIN – 3 , FIN-3A 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 25% from the total requirement for the Subject Contract. AND	Not applicable	Not applicable	Must meet requirement	Not applicable	Form FIN – 3 , FIN-3A 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 100%	Not applicable	Must meet requirement	Not applicable	Not applicable	Form FIN – 3 , FIN-3A 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, Joint Venture partner, or Subcontractor, in: at least **one contract** that has been satisfactorily and substantially completed within the period from 1 July 2015 up to the bid submission date and that is similar in nature and complexity to the works under this contract and for which the value of the Bidder's participation exceeds **Nu 695 million** or at least **two contracts each of Nu 521 million** or at least **three contracts each of Nu 347 million**. The similarity in nature and complexity of the previous experience shall be based on works such as river protection works, hydropower, bridge and mountain road that involve working in a wet and dynamic environment and involve substantial reinforced cement concrete construction[a, b]	Must meet requirement	In case of one contract, one partner must meet requirement. In case of two contracts, must meet requirement as follows: (i) Either one partner must meet requirement; or (ii) Each partner must each demonstrate one (1) satisfactorily and substantially completed contract of similar size and nature In case of three contracts, must meet requirement as follows: (i) Either one partner must meet requirement; or (ii) Each partner must each demonstrate one (1)/two (2) satisfactorily and substantially completed contract of similar size and nature	Not applicable		Form EXP – 1[c]

[a] *For contracts under which the Bidder participated as a Joint Venture partner or Subcontractor, only the Bidder's share, by value, shall be considered to meet this requirement.*

[b] *For contracts implemented by a Joint Venture contractor, if the Bidder comprises the same Joint Venture, the 'Single Entity' requirements will apply.*

[c] *In addition to the submission requirement Form EXP – 1, the Bidder shall provide the following supporting documents:*

1. Signed Contract Agreement, and

2. Taking-Over Certificate or Contract Completion Certificate or Performance Certificate, in sufficient detail to verify the contract name, value and completion time (or substantial completion). If the documents are other than in English, an accurate certified translation of these documents in English shall be provided

2.4.2 Construction Experience in Key Activities

2.4.2 (a) Must be complied with by the Bidder. In case of a Joint Venture Bidder, the Bidder or at least one of the partners must meet the requirement in the key activity. For contracts under which the Bidder participated as a Joint Venture partner, only the Bidder's designated scope of works under the contracts shall be considered to meet this requirement.

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

Criteria	Compliance Requirements		Documents
Requirement	**Single Entity**	**Joint Venture**	**Submission Requirements**
For the above or other contracts executed during the period stipulated in 2.4.1, a minimum construction experience in the following key activities:	Must meet requirement	Must meet requirement	Form EXP – 2[a]
6000 cubic meters of reinforced cement concrete used in a single contract			

[a] *Submission requirements: Form EXP – 2 shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate or Contract Completion Certificate indicating the contract name, value. completion date (or percentage of substantial completion), activities performed by Joint Venture partners, and other relevant details sufficient to demonstrate compliance with the requirements.*

2.4.3 Specific Experience in Managing Environmental, Health and Safety Aspects

Not applicable

2.5 Organizational Environmental, Health and Safety System

2.5.1 Environmental, Health and Safety Certification

Not applicable

2.5.2 Environmental, Health and Safety Documentation (Form EXP – 5)

To ensure the safety of the labourers and other associated workers, the Bidder shall submit a Health & Safety Plan (2-page limit) covering the relevant health and safety measures that the Bidder may deploy in case of any outbreak of communicable diseases during the execution of the works.

2.5.3 Environmental, Health and Safety Dedicated Personnel

Criteria	Compliance Requirements		Documents
Requirement	**Single Entity or Its Specialist Subcontractors**	**Joint Venture or Its Specialist Subcontractors**	**Submission Requirements**
Availability of in-house personnel dedicated to EHS issues: 1. Environmental Health and Safety Officer	Must meet requirements	One member must meet requirements	Form EXP – 6

Section 4: Bidding Forms

Table of Forms

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: [*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 acknowledge that we have read and understand ADB's Anticorruption Policy (1998) and Integrity Principles and Guidelines (2015), both as amended from time to time.

(c) We offer to execute in conformity with the Bidding Documents the following Works: [*insert narrative*]

(d) 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 starts from the date fixed for the bid submission deadline in accordance with ITB 22.1, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

(e) Our firm, including any Subcontractors or Suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.

(f) We, our directors, key officers, key personnel, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 4.3.

If there is any conflict of interest, please state details:
(i) Parties involved in the conflict of interest: _____
(ii) Details about the conflict of interest: _____

(g) 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.

(h) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers 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]

(i) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract, are not under ongoing investigation and/or sanctions proceedings by the Asian Development Bank or any multilateral development bank.

If under ongoing investigation and/or sanction proceedings by the Asian Development Bank or any multilateral development bank, please state details:
(i) Name of the multilateral development bank: _____
(ii) Reason for the ongoing investigation / allegations: _____

(j) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the Contract, are not temporarily suspended, debarred, declared ineligible, or subject to any national and/or international sanctions by any country, any international organization, any multilateral development bank and other donor agency.

If so temporarily suspended, debarred, declared ineligible, or subject to any national and/or international sanctions by any country, any international organization, any multilateral development bank and other donor agency, please state details (as applicable to each Joint Venture partner, their respective direct or indirect shareholders, directors, key officers, key personnel, associate, parent company, affiliate, subsidiaries, Subcontractors, consultants, subconsultants, manufacturers, service providers and/or Suppliers):
(i) Name of Institution: _____
(ii) Period of the temporary suspension, debarment, ineligibility, or national or international sanction [*start and end date*]: _____
(iii) Reason for the temporary suspension, debarment, ineligibility, or national or international sanction: _____

(k) Our firm, Joint Venture partners, associates, parent company affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers, Suppliers, key officers, directors and key personnel have never been charged or convicted with any criminal offense (including felonies but excluding misdemeanors) or infractions and/or violations of ordinance; nor charged or found liable in any civil or administrative proceedings in the last 10 years; or undergoing investigation for such, or subject to any criminal, civil or administrative orders, monitorship or enforcement actions.

If so charged, convicted/found liable, under ongoing investigation, or subject to orders, monitorship or enforcement actions, please state details:
(i) Nature of the offense, violation, proceedings, investigation, and/or monitorship or enforcement actions: _____
(ii) Court, area of jurisdiction and/or the enforcement agency: _____
(iii) Resolution [*i.e. dismissed; settled; or convicted/duration of penalty*]: _____
(iv) Other relevant details [*please specify*]: _____

[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.

(l) Our firm, Joint Venture partners, our respective direct and indirect shareholders, directors, key officers, key personnel, associates, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers, can make and receive electronic fund transfer payments through the international banking system or otherwise discharge the Employer's obligation upon initiation of wire transfer.

If unable to make or receive funds through the international banking system or otherwise discharge the Employer's obligation upon initiation of wire transfer, please state the details:
(i) Nature of the restriction: _____
(ii) Jurisdiction of the restriction: _____
(iii) Other relevant details: _____

(m) Our firm, Joint Venture partners, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers, key officers, directors and key personnel are not from a country which is prohibited to export goods or services to, or receive any payments from the Employer's country and/or are not prohibited to receive payments for particular goods or services by 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.

(n) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract.[2]

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

(o) We understand that it is our obligation to notify the Employer of any changes in connection with the matters described in paragraphs (f), (h), (i), (j), (k), (l), (m) and (n) of this Letter of Technical Bid.

(p) [We are not a government-owned enterprise] / [We are a government-owned enterprise but meet the requirements of ITB 4.5][3]

(q) 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.

(r) At any time following submission of our Bid, we shall permit, and shall cause our Joint Venture partners, directors, key officers, key personnel, associates, parent company, affiliates or subsidiaries, including any Subcontractors, consultants, subconsultants, manufacturers, service providers or Suppliers for any part of the contract to permit ADB or its representative to inspect our site, assets, accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB. We understand that failure of this obligation may constitute obstructive practice that may result in debarment and/or contract termination.

(s) Regardless of whether the contract will be awarded to us, we shall preserve all accounts, records and other documents related to bid submission for at least 3 years from the date of submission of the bid or the period prescribed in applicable law, whichever is longer.

(t) If we are awarded the contract, we shall preserve all accounts, records and other documents related to the procurement and execution of the contract for at least 5 years after completing

[2] If none has been paid or is to be paid, indicate "None".

[3] Use one of the two options as appropriate.

the works contemplated in the relevant contracts or the period prescribed in applicable law, whichever is longer.

(u) 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.

(v) We certify on behalf of the Bidder, that the information provided in the bid has been fully reviewed, given in good faith, and to the best of our knowledge is true and complete. We understand that it is our obligation to inform the Employer of any changes to the information as and when it becomes known to us. 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 (1998, as amended to date) and Integrity Principles and Guidelines (2015, as amended from time to time).

Name .....

In the capacity of .....

Signed .....

Duly authorized to sign the Bid for and on behalf of .....

Date .....

Bid Security

Bank Guarantee

[*Bank's name, and address of issuing branch or office*][4]

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 [*please specify*] (hereinafter called "the Bid") for the execution of [*name of contract*] under Invitation for Bids No. [*please specify*] ("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 Letter of Technical Bid and Letter of 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 the 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; and (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy 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 indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revisions, ICC Publication No. 758.[5]

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

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

[5] Or the employer may use "Uniform Rules for Demand Guarantees (URDG) ICC Publication No. 458" as appropriate.

Technical Proposal

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:

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

-- Note --

All titles of positions will be as listed in Section 6 (Employer's Requirements).

Form PER – 2: Resume of Proposed Personnel

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

Position		
Personnel information	**Full Legal Name**	**Date of birth**
	Known as	**Place of Birth**
	Nationality	**Citizenship**
	Type of Government ID **Attach a copy of ID to this form**	**ID number**
	Professional qualifications	
Present employment	**Name of employer**	
	Address of employer	
	Telephone	**Contact (manager / personnel officer)**
	Fax	**E-mail**
	Job title	**Years with present employer**

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

From	To	Company / Project / Position / Relevant Technical and Management Experience

Equipment

Form EQU: Equipment

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

The Bidder shall include a table of personnel and a chart showing the proposed organization to be established for carrying out the construction works.

Method Statement

The Bidder shall include Implementation Schedule as per scope of works.

Mobilization Schedule

The Bidder shall submit mobilization and de-mobilization schedule of personnel and equipment for execution of entire works. The mobilization schedule should include mobilization of skilled and unskilled manpower, different machineries and equipment, materials, as required.

Construction Schedule

The construction schedule shall include the following key milestones:

Environmental, Health and Safety Code of Conduct

Environmental, Health and Safety Code of Conduct for Contractor's Personnel Form

Note to Bidder

The minimum content of the EHS Code of Conduct form as set out by the Employer shall not be substantially modified. However, the Bidder may add requirements as appropriate, including to take into account Contract-specific issues/risks.

The Bidder shall initial and submit the EHS Code of Conduct form as part of its bid.

ENVIRONMENTAL, HEALTH AND SAFETY CODE OF CONDUCT FOR CONTRACTOR'S PERSONNEL

We are the Contractor, [*enter name of Contractor*]. We have signed a contract with [*enter name of Employer*] for [*enter description of the Works*]. These Works will be carried out at [*enter the Site and other locations where the Works*

will be carried out]. Our contract requires us to implement measures to address environmental, health and safety risks related to the Works.

This EHS Code of Conduct is part of our measures to deal with environmental, health and safety risks related to the Works. It applies to all our staff, labourers and other employees at the Works Site or other places where the Works are being carried out. It also applies to the personnel of each subcontractor and any other personnel assisting us in the execution of the Works. All such persons are referred to as "**Contractor's Personnel"** and are subject to this EHS Code of Conduct.

This EHS Code of Conduct identifies the behavior that we require from all Contractor's Personnel.

Our workplace is an environment where unsafe, offensive, abusive or violent behavior will not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation.

REQUIRED CONDUCT

Contractor's Personnel shall:

1. carry out his/her duties competently and diligently;
2. comply with this EHS Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
3. maintain a safe working environment including by:
   (a) ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
   (b) wearing required personal protective equipment;
   (c) using appropriate measures relating to chemical, physical and biological substances and agents; and
   (d) following applicable emergency operating procedures.
4. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health;
5. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;
6. report violations of this EHS Code of Conduct; and
7. not retaliate against any person who reports violations of this EHS Code of Conduct, whether to us or the Employer, or who makes use of the grievance mechanism for Contractor's Personnel or the project's Grievance Redress Mechanism.

RAISING CONCERNS

If any person observes behavior that he/she believes may represent a violation of this EHS Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done by call [ ] to reach the Contractor's hotline *(if any)* and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate

action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

CONSEQUENCES OF VIOLATING THE ENVIRONMENTAL, HEALTH AND SAFETY CODE OF CONDUCT

Any violation of this EHS Code of Conduct by Contractor's Personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.

FOR CONTRACTOR'S PERSONNEL:

I have received a copy of this EHS Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this EHS Code of Conduct, I can contact [*enter name of Contractor's contact person(s) with relevant experience)*] requesting an explanation.

Name of Contractor's Personnel: [*insert name*]

Signature: _____

Date: [*day month year*]: _____

Countersignature of authorized representative of the Contractor:

Signature: _____

Date: [*day month year*]: _____

Bidders Qualification

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

Form ELI - 1: Bidder's Information Sheet

Bidder's Information			
		Information of the Bidder	**If the Bidder is a subsidiary or branch, information of any parent company/companies**
Names	**Full legal name(s)**		
	Full trading name(s) (if any)		
Addresses	**Registered address(es)**		
	Trading address(es)		
	Postal address(es) (if different from trading address)		
Type of organization			
Country of constitution/incorporation/registration			
Year of constitution/incorporation/ registration			
Corporate or registration number			
In case of a Joint Venture, legal name of each partner			
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 and company incorporation/registration 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 partner of the Joint Venture and Specialist Subcontractor must fill out this form separately.

Joint Venture / Specialist Subcontractor Information			
Bidder's legal name			
		Information of Joint Venture Partner or Specialist Subcontractor	**If any Joint Venture Partner or Specialist Subcontractor is a subsidiary or branch, information of any parent company/companies**
Names	**Full legal name(s)**		
	Full trading name(s) (if any)		
Addresses	**Registered address(es)**		
	Trading address (es)		
	Postal address (es) (if different from trading address)		
Type of organization			
Country of constitution/incorporation/ registration			
Year of constitution/incorporation/ registration			
Corporate or registration number			
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 and company incorporation/registration 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 Nonperformance

Each Bidder must fill out this form in accordance with Criteria 2.2.1 and 2.2.3 of Section 3 (Evaluation and Qualification Criteria) to describe any history of nonperforming 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:

Joint Venture Partner: _____

Table 1: History of Nonperforming Contracts

Choose one of the following:

❑ No nonperforming contracts.

❑ Below is a description of nonperforming contracts involving the Bidder (or each Joint Venture partner if Bidder is a Joint Venture).

Year	Description	Amount of Nonperformed 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]*

Table 2: Pending Litigation and Arbitration

Choose one of the following:

❑ No pending litigation, arbitration or any other material events impacting the net worth and/or liquidity of the bidder.

❑ Below is a description of all pending litigation, arbitration involving the Bidder or any other material events impacting the net worth and/or liquidity of the bidder (or each Joint Venture partner if Bidder is a Joint Venture).

Year	Matter in Dispute	Value of Pending Claim in $ Equivalent	Value of Pending Claim as a Percentage of Net Worth
[insert year]	Contract Identification, as applicable: *[indicate complete contract name/ number, and any other identification]* Name of Employer, parties involved in the material events impacting the net worth and/or liquidity of the bidder: *[insert full name]* Address of Employer, parties involved in the material events impacting the net worth and/or liquidity of the bidder: *[insert street/city/country]* Matter of Dispute: *[indicate full description of dispute]* Party who initiated the dispute: *[indicate "Employer" or "Contractor"]* Status: *[indicate status of dispute]*	*[insert amount]*	*[insert amount]*

Form CON – 2: EHS Performance Declaration

Each Bidder must fill out this form in accordance with Criterion 2.2.4 of Section 3 (Evaluation and Qualification Criteria).

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

Joint Venture Partner: _____

In case of a Specialist Subcontractors, each Specialist Subcontractor must fill out this form and provide the Specialist Subcontractor's name:

Specialist Subcontractor: _____

Environmental and Health and Safety Performance Declaration in accordance with Section 3 (Evaluation and Qualification Criteria)

☐ **No suspension or termination of contract**: An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental or Health and Safety performance since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5.

☐ **Declaration of suspension or termination of contract**: The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental or Health and Safety performance since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5. Details are described below:

☐ **Declaration of request for replacement of Key Environment, Health and Safety Personnel**: The following contract(s) has/have experienced a request by the Employer to replace Environmental, Health and Safety Personnel for reasons related to Environmental or Health and Safety performance since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5. Details are described below:

☐ **Declaration of past fatality resulted from EHS issues on site**: The following contract(s) has/have experienced a fatality resulted from EHS issues on site since the date specified in Section 3 (Evaluation and Qualification Criteria), Criterion 2.5. Details are described below:

Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US$ equivalent)
[insert year]	*[insert amount and percentage]*	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 suspension or termination: *[indicate main reason(s) e.g. discharge over environmental limit, workers did not have required health and safety permits to undertake high risk work, work carried out was not adhered to approved construction methodology and quality control plan]*	*[insert amount]*
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]*	*[insert amount]*

		Name of Employer: *[insert full name]* Address of Employer: *[insert street/city/country]* Reason(s) for suspension or termination: *[indicate main reason(s)]*	
…	…	*[list all applicable contracts]*	…
Performance Security called by an employer(s) for reasons related to EHS performance			
Year	**Contract Identification**		**Total Contract Amount (current value, currency, exchange rate and US$ 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 suspension or termination: *[indicate main reason(s) e.g. discharge over environmental limit, workers did not have required health and safety permits to undertake high risk work, work carried out was not adhered to approved construction methodology and quality control plan]*		*[insert amount]*
Key EHS personnel replacement requested by the Employer for reasons related to EHS performance			
Year	**Contract Identification and Reasons**		**Personnel replacement action and results**
[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 requesting for replacement: *[indicate main reason(s)]*		*[insert description]*
Fatality due to EHS issues on Site			
Year	**Contract Identification**		**Follow-on actions taken by the contractor**
[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]* Description of fatality event: Causation:		*[insert description]*

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:

Joint Venture Partner: _____

Financial Data for Previous 3 Years [Nu Equivalent]		
Year 1:	**Year 2:**	**Year 3:**

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.

1) Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the standalone financial situation of legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries, or affiliates.

2) Historical financial statements must be audited by a certified accountant.

3) Historical financial statements must be complete, including all notes to the financial statements.

4) 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 partner of a Joint Venture for the total certified payments received from the clients for contracts 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:

Joint Venture Partner: _____

Annual Turnover Data for the Last 3 Years (Construction only)			
Year	**Amount Currency**	**Exchange Rate**	**Nu Equivalent**
		Average Annual Construction Turnover	

Form FIN – 3: Availability of Financial Resources

Bidder 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:

Joint Venture Partner: _____

Financial Resources		
No.	**Source of financing**	**Amount (Nu equivalent)**
1	Working Capital (to be taken from FIN - 1)	
2	Credit Line[a]	
3	Contract specific credit facility[b]	
	Total Available Financial Resources	

[a] *To be substantiated by a letter from the nationalized/ scheduled bank issuing the line of credit. Credit line letter shall be within 28 days time from bid submission deadline.*

[b] *To be substantiated by a letter from the bank issuing the line of credits specific for the subject contract, as prescribed in Form FIN-3A. Any letter or document not complying with this requirement shall not be considered as supplementary financial resources.*

Form FIN – 3A: Evidence of Availability of Credit Line Financial Resources

Project Name:

Bidding Package Name and Identification Number: *…… (to be filled in as indicated in ITB 1.1)* …

BANK CERTIFICATE

This is to certify that M/s ..... is a reputed company with a good financial standing.

If the contract for the work, namely..... is awarded to the above firm, we shall be able to provide overdraft / credit facilities to the extent of INR ..... to meet their working capital requirements for executing the above contract.

___Sd.___
Name of Bank: _____
Senior Bank Manager_____
Address of the Bank_____

[In case of Joint Venture, change the text as follows:]

This is to certify that M/s ..... who has formed a Joint Venture with M/s ..... and M/s ..... for participating in this bid, is a reputed company with a good financial standing.

If the contract for the work, namely..... is awarded to the above joint venture, we shall be able to provide overdraft / credit facilities to the extent of INR..... to M/s ..... to meet their working capital requirements for executing the above contract.

___Sd.___
Name of Bank: _____
Senior Bank Manager_____
Address of the Bank_____

Form FIN- 4: Financial Resources Requirement

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:

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 Requirements for Current Contract Commitments						Nu ……

[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 **≥** 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	∑ D = Sum of available financial resources net of current contract commitments for all partners		∑ 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 up one (1) form per contract. Each contract shall be supported by documents such as Signed Contract Agreement or Certificate of Completion of the Works.

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 the Borrower's Central 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	**Nu**	
If partner in a Joint Venture or Subcontractor, specify participation of total contract amount	**Percent of Total**	**Amount**
Employer's Name **Address** **Telephone/Fax Number** **E-mail**		
Description of the Similarity in Accordance with Criterion 2.4.1 of Section 3 (Evaluation and Qualification Criteria)		
Participation as a contractor, Joint Venture partner, or Subcontractor, in: at least **one contract** that has been satisfactorily and substantially completed within the period from 1 July 2015 up to the bid submission date and that is similar in nature and complexity to the works under this contract and for which the value of the Bidder's participation exceeds **Nu 695 million** or at least **two contracts each of Nu 521 million** or at least **three contracts each of Nu 347 million**. The similarity in nature and complexity of the previous experience shall be based on works such as river protection works, hydropower, bridge and mountain road that involve working in a wet and dynamic environment and involve substantial reinforced cement concrete construction		

Form EXP - 2: Construction Experience in Key Activities

Fill up one (1) form per contract. Each contract shall be supported by documents such as Signed Contract Agreement or Certificate of Completion of the Works.

Each Bidder must fill out this form.

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

Specialist Subcontractor: _____

Contract with Similar Key Activities		
Contract No . . . . . **of**	**Contract Identification**	
Award Date		**Completion Date**
Total Contract Amount	**$**	
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)		
For the above or other contracts executed during the period stipulated in section 3, 2.4.1, a minimum construction experience in the following key activities: 6000 cubic meters of reinforced cement concrete used in a single contract		

Form EXP – 3:

Not Applicable

Form EXP – 4:

Not applicable

Form EXP – 5: Environmental, Health and Safety Documentation - Undertaking by Bidder on Occupational Health & Safety Measures

I, Mr/ Ms……..(Name of authorised representative of bidder) hereby submit this undertaking that the bidder……...(Name of the firm/company) has prior experience of complying with relevant Health and Safety guidelines and / or protocols.

Prior experience details is attached (1 page maximum)

For & on behalf of …….(Name of the firm/company)

Signature:……
……

Name:……
(Authorized representative of the bidder)

Designation……..

Seal (Firm/Company)…….

Form EXP – 6: Environmental, Health and Safety Dedicated Personnel

Please provide CV {Form PER-2] of the in-house personnel of the main contractor/Joint Venture partners for the following EHS positions specified in Section 3, 2.5.3 (Evaluation and Qualification Criteria):

- Environmental Health and Safety Officer

Schedules

Schedule of Payment Currencies:

Not Applicable

Bill of Quantities

[Admeasurement Contract]

(Provided separately in Volume 2)

Section 5: Eligible Countries

Afghanistan
Armenia
Australia
Azerbaijan
Bangladesh
Bhutan
Brunei Darussalam
Cambodia
People's Republic of China
Cook Islands
Fiji
Georgia
Hong Kong, China
India
Indonesia
Japan
Kazakhstan
Kiribati
Republic of Korea
Kyrgyz Republic
Lao People's Democratic Republic
Malaysia
Maldives
Marshall Islands
Federated States of Micronesia
Mongolia
Myanmar
Nauru
Nepal
New Zealand
Niue
Pakistan
Palau
Papua New Guinea
Philippines
Samoa
Singapore
Solomon Islands
Sri Lanka
Taipei,China
Tajikistan
Thailand
Timor-Leste
Tonga
Türkiye
Turkmenistan
Tuvalu
Uzbekistan
Vanuatu
Viet Nam
Austria
Belgium
Canada
Denmark
Finland
France
Germany
Ireland
Israel
Italy
Luxembourg
Netherlands
Norway
Portugal
Spain
Sweden
Switzerland
United Kingdom
United States

Section 6 - Employer's Requirements

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

Table of Contents

1. General

1.1. Project Background

Located in a seismically active landslide-prone region of the Himalayan Arc,[1] Bhutan is a small, landlocked, and mountainous country with abundant forests and water resources, including glaciers and alpine meadows.[2] Its estimated population of 782,000 spreads over 38,394 square kilometers.[3] Bhutan's geologically fragile and steep topography makes it highly vulnerable to geophysical risks and climate impacts.4 Bhutan's disaster risk profile is significant with earthquakes, flash floods, glacial lake outburst floods, landslides, and wildland fires. These are heightened because of climate impacts and a greater concentration of infrastructure and population in urban areas. Towns in Bhutan experience annual flooding and riverbank erosion during the monsoon season. Flooding is considered the most significant climate-related hazard faced by Bhutan. Higher temperatures are projected to increase snowmelt which could change patterns of river discharge and water availability. Impacts on infrastructure are likely to increase significantly from 2050 onwards. Out of 187 countries, Bhutan was ranked as 93rd in country index, 148th for vulnerability to climate change and other global challenges, and 62nd for readiness to improve resilience.[5]

Bhutan's economy is predominantly dependent on climate-sensitive sectors such as agriculture and hydropower. Over 60% of the rural population depends on agriculture for their livelihood. Bhutan has limited suitable and safe space for urban growth because of a high prevalence of steep slopes and narrow V-shaped valleys which is exacerbated by encroachment into land designated for agricultural use. [6] About 8% of Bhutan's area is arable land and only 2.75% is cultivated.[7] Agriculture is the largest sector in terms of employment, accounting for 43.5% of Bhutan's workforce in 2023.

Phuentsholing is a border city located in southwestern Bhutan within the Chukha Dzongkhag (district). The city is the gateway to western and central Bhutan, opening the country to the Indian state of West Bengal.8 It is one of the major national economic hubs; and hence, caters to the significant influx of transient population and Indian tourists. Phuentsholing has a high classification for landslides and wildfires; and a medium risk classification for river flooding, urban flooding, and earthquakes.[9] The challenges of climate change and disasters disproportionately affect women, exacerbating their risk and exposure. Evidence indicates that women and other vulnerable groups are at heightened risk during disasters and emergencies.

The Phuentsholing area has historically been exposed to flood risk from two river systems: Amochhu River in the west, and Omchhu River which runs through the city. The two rivers pose significant threats to lives and properties when their flows increase under the influence of summer monsoon. Direct flooding from the

[1] The Himalayan mountain range is called the "Himalayan arc" because its geographical shape resembles a curved arc, stretching across a large portion of Asia.
[2] Asian Development Bank (ADB) and the World Bank Group. 2021. Climate Risk Country Profile: Bhutan.
[3] Government of Bhutan, National Statistics Bureau. 2023. *Statistical Yearbook of Bhutan 2023*.
[4] Stevens, V.L., De Risi, R., Le Roux-Mallouf, R. et al. 2020. *Seismic hazard and risk in Bhutan. Nat Hazards 104, 2339–2367*.
[5] University of Notre Dame. 2021. Notre Dame Global Adaptation Initiative. The ND-GAIN country index summarizes a country's vulnerability to climate change and other global challenges combined with its readiness to improve resilience. Vulnerability measures a country's exposure, sensitivity, and ability to adapt to climate impacts; the overall vulnerability reflects vulnerability in six life-supporting sectors: food, water, health, ecosystem service, human habitat, and infrastructure. Readiness measures a country's ability to leverage investments and convert them to adaptation-related actions; the readiness considers three components: economic readiness, governance readiness, and social readiness.
[6] About 71.5% of Bhutan's land area is covered by forests which is a major factor for Bhutan in achieving its carbon neutral status. Bhutan's Constitution mandates that it maintains 60% of its land under forest cover.
[7] Government of Bhutan, National Environment Commission. 2021. *Assessment of Climate Risks on Agriculture*.
[8] Close to 68% of the imports from India and 47% of the exports to India go through the Phuentsholing region.
[9] The World Bank Group, Global Facility for Disaster Reduction and Recovery. 2024. *Thinkhazard for Phuentsholing*. *ThinkHazard!* is a web-based tool which enables to consider the impacts of disasters on development projects.

Amochhu River is now mitigated through the ADB-financed Phuentsholing Township Development Project (PTDP).[10] Flood risk, significantly exacerbated by debris flows, from the Omchhu River remains high.

Omchhu River has a relatively small and steep basin (22 km^2), and high riverbed gradient passing through Phuentsholing; and receives high monsoon rainfall (5,000–6,500 millimeters during monsoon season). It also experiences intense storms which result in relatively large and high-velocity floods. The basin is also underlain by weak geology and has degraded vegetative cover in places that have been subject to urbanization and inappropriate development control. Hence, landslides and large sediment inflows contribute significantly to flash floods which frequently damage the flood protection system. They leave large sediment deposits and/or boulders in the lower reaches near the confluence of the Amochhu and Omchhu rivers. [11]

The Phuentsholing Thromde (municipality)(PT) is responsible for managing flood risk and bears high annual maintenance costs for debris removal and repair of damage to infrastructure and assets. Detailed analysis highlighted that the river channel's movement remains a very real risk in certain areas of Phuentsholing. This highlights the significance of the proposed project to manage river erosion and flood risk.

Phuentsholing is the cradle of modern Bhutan. The first motorable road was built between Phuentsholing and Thimphu in 1961 and opened Bhutan's door to the rest of the world. Bhutan has since gone through a myriad of changes and Phuentsholing has been the first stepping stone for all those changes. Phuentsholing is a historic city which demands special attention.

The historic Phuentsholing city is at the receiving end of climate impacts. The erratic monsoon season threatens settlements along the Omchhu River (which joins the Amochhu River at the edge of the city); major floods occurred in 2000, 2016, 2017, 2019 and 2023. This warranted detailed investigations for safeguarding and protecting the city. Thus, in 2018, a detailed project report (DPR) was prepared and was subsequently revised in 2022 and 2023. The DPR 2023 version is available for download at PT website www.pcc.bt and is being currently updated by an addendum.

Proposed to be financed through an Asian Development Bank (ADB) loan and grant and counterpart funds from the Government of Bhutan, the Climate-Resilient Omchhu River Basin Project (CROBP)(the project) will cover the entire Omchhu river basin stretching broadly from upstream of the Khareyphu Local Area Plan to the confluence of the Omchhu River with the Amochhu River.

The project will focus on climate and disaster resilience through an integrated river basin approach to flood and erosion risk management and on the Omchhu River in Phuentsholing and its river basin upstream. Building upon the ADB-financed PTDP and the Northern Bypass Road Project12, the project will tackle one of the critical economic development inhibitors of Phuentsholing: flood risk from the Omchhu, exacerbated by unpredictable erosion of its riverbanks and worsening climate impacts. River erosion has been causing flood damage when it undercuts existing flood defenses during the monsoon season. The project will combine structural and nonstructural solutions.

[10] ADB. 2018. *Bhutan: Phuentsholing Township Development Project*; and ADB. 2020. *Bhutan: Phuentsholing Township Development Project—Additional Financing*. The flood defence has been built to mitigate flooding up to the 1% annual exceedance probability event.

[11] Worsening landslides occur in upstream rural parts of the basin. Deposits' height reached about 6 meters in 2019 and 2023.

[12] Loan 3668-BHU and Grant 0573-BHU: Phuentsholing Township Development Project, https:/www.adb.org/projects/50165-002/main, Loan 4019-BHU and Grant 0765-BHU: Phuentsholing Township Development Project – Additional Financing https://www.adb.org/projects/documents/bhu-50165-003-pra and Loan 3421 and Grant 0492-BHU: South Asia Subregional Economic Cooperation Transport, Trade Facilitation and Logistics Project https://www.adb.org/projects/47284-001/main

PT will be the project's executing and implementing agency, including project works within the administrative boundary of Dungkhag Administration (DA). The implementation period will be 6 years from around October 2025.

The project is aligned with the government's adaptation priorities. It also supports the goals of the (i) Paris Agreement; (ii) ADB's country partnership strategy, 2024–2028 for Bhutan, especially the Strategic Priority 2: Build climate-adaptive and resilient infrastructure and systems; the ADB Strategy 2030's operational priorities 1–5; the ADB Water Sector Directional Guide; the ADB Climate Change Action Plan; and the sustainable development goals 9, 13, and 15. It will follow the green, resilient, and inclusive development approach.

Scope of Contract Works

The scope of works of this contract package includes construction of approximately 1.040 km of river training works along the Omchhu River in Phuentsholing. In the following summary descriptions of the Works included in this Contract, all dimensions given are approximate and the execution of the Works shall be in accordance with the Employer's Requirements and the approved Drawings:

Description	**Quantities (approximate)**
River Training, Bank Protection & Embankment	
RCC Counterfort walls	31,000 m^3
Back filling of RCC structures	111,100 m^3
Providing and fixing Thermo Mechanically Treated bars	3.3million kilograms
Boulder pitching	8000 m^3
Formwork for RCC structures	28,400 m^2
Construction of Embankment	21,000 m^3
Other	
Access Ramps	2 Nos.

The Contractor is expected to fulfill all other contractual obligations inter alia in respect of such matters as construction programming, quality control, training, health and safety, environmental protection, coordination and liaison requirements including with Employer's other contractors, etc.

2. Specifications and Drawings

2.1. Specifications

The specification section contains two parts: General Specifications and Technical Specifications.

2.1.1. Part 1: General Specifications

The term *Bhutan/Indian standard specification*, herein after referred to as BS/BIS, means the relevant Bhutan/Indian standards and specification with all amendments published up to the date of submission of tenders. A table of relevant BS/BIS codes (not necessarily covering all applicable codes) is presented. All codes / standards applicable are the latest version published even if earlier versions have been listed in General and Technical Specifications.

List of Bhutan Standards (BS)

All the standard specifications documents published by Bhutan Standard Bureau (BSB), Royal Government of Bhutan available at the website www.bsb.gov.bt.

List of Indian Standards (BIS)

SI No.	Short title	B.I.S. Number
I	**CEMENT**	
1	Specification for ordinary and low heat Portland Cement Third revision with amendment Nos 1 to 5	269 – 1976, 8112-1989, 12269-1987
2	Specification for Portland Pozzolana Cement	1489 - 1987
3	High strength ordinary Portland Cement Amendment Nos 1 'to 4	8112 - 1976
4	Rapid hardening Portland Cement (First revision with amendment No. 1 to 4)	8041 - 1978
II	**AGGREGATES**	
1	Specification for coarse and fine aggregate from natural source for concrete	383 - 1970
2	Specification for sand for Masonry Mortars	2116 – 1980
3	Method of tests for aggregates for concrete	2386 – 1963 (Part I to VIII)
III	**BUILDING STONES**	
1	Method of Test for Determination of strength properties of natural building stones	1121 – 1974 Part – 1 to Part IV
2	Method of Measurement of Buildings and Civil Engineer Works	1200 – 1976 (Part – IV)
IV	**STEEL**	
1	Code of Practice for bending and fixing of bars for concrete reinforcement	2502 -1963
2	Specifications for High Strength Deformed steel bars and Wires for concrete reinforcement.	1786 - 1985

SI No.	Short title	B.I.S. Number
3	Code of Practice for Welding of M.S. Bars used for reinforced concrete Construction	2751 - 1979
4	Code of practice for use of Metal and welding for general construction in mild steel	816 – 1969
5	Specification for hot rolled mild steel, medium tensile steel and high yield, strength steel deformed bars for concrete reinforcements (revised)	1139 – 1966
6	Recommendation for detailing for reinforcement in reinforced cement concrete works	5625 – 1969
7	Specification for Mild Steel and Medium tensile bars for concrete reinforcement	432 – 1966 (Part – I)
8	Code of practice for safety and health requirement in Electric and Gas welding and Cutting operations	818 – 1968
9	Code for practice for fire precautions in welding and cutting operations	3016 – 1987
10	Measurement of Building and Civil Engineering Works. Part – VIII steel work and Iron work	1700 – 1974 (Part – VIII)
11	Code of practice for manual of metal and welding of mild steel.	823 – 1964
12	Specification for filler rods and wires for gas welding	1778 – 1977
13	Structural Steel (Standard quality) (5^{th} revision with amendment Nos 1 to 5)	226 – 1975
14	Code of Practice for corrosion Protection of Steel reinforcement in RB and RCC Construction	9077 – 1979
V	**MASONRY**	
1	Code of practice for construction of stone Masonry part – I Rubble Stone Masonry	1597 – 1967
2	Code of Practice for construction of stone masonry Part – I ashlar masonry	1597 – 1967
3	Specification for fly-ash for use as pozzolana and admixture	3812 – 1981(Part – II)
4	Method of measurement of building and civil Engineering works	1200 – 1976 (Part I)
5	Test for compressive strength of mortar	2250
6	Sand for Masonry work	2116 -1965
7	Code of practice for construction of masonry in dams	8605 – 1977
8	Code of Practice for permeability test for masonry work during and after construction	11216 – 1985
9	Water absorption, apparent specific gravity and porosity of stones Method of test for determination (First revision)	11024 – 1974
10	Durability of natural stones, Method test (First revision)	11026 – 1984
11	Recommendation for pressure gravity of rock foundation in river valley projects. (First revision)	6066 – 1984
VI	**CONCRETE**	

Sl No.	Short title	B.I.S. Number
1	Method of Measurement of building and Civil Engineering works Part – II concrete works	1700 – 1974 (Part – II)
2	Concrete works: Code of practice in plain and reinforced concrete	456 – 2000
3	Specification for precast concrete blocks	5751- 1969
4	Method of test for strength of concrete	516 – 1959
5	Code of practice for lining in situ cement concrete lining of rivers	3873 – 1978
6	Specification for Admixtures for concrete	9103 – 1979
7	Method of test for Autoclaved cellular concrete products	6441 – 1977 (1973 part – I to IX)
8	Method of sampling and analysis of concrete	1199 – 1976
9	Specification for Batch type concrete mixers (Second revision)	1991 – 1968
10	General requirements for concrete vibrators – immersion type	7595 – 1989
11	Specification for concrete vibrating tables	7514 – 1963
12	Method of test for permeability of cement mortar and concrete	3917 – 1965
13	Specification for fly-ash for use as pozzolana as admixture for concrete	3817 – 1966 (Part – II)
14.	Specification for portable swing weight batch for concrete (Single and double bucket type)	7777 -1964
15	Code of practice for installation of joints in concrete movements.	4509 – 1977
16	Form vibrators for concrete	4656- 1968
17	Code of practice for general construction of plain and reinforced concrete for dams and other massive structure	457 – 1957
18	Standard sand for testing of cement (first revision) with amendments 1 to 2 (Reaffirmed 1980)	650 – 1966
19	Code of practice for use of immersion vibrators for consolidating concrete	3558 – 1983
20	Method of sampling of aggregates for concrete	21130 – 1969
21	General requirements for concrete vibrators screed boxed type (I revision)	250 – 1985
22	Concrete transit mixers and agitators	5892 – 1970
23	Plywood for concrete shuttering works	4990 – 1981
24	Code of practice for extreme weather concreting	7861- (Part I & II)
VII	**EARTH WORKS**	

SI No.	Short title	B.I.S. Number
1	Method of measurement of building and Civil Engineering works Part – I Earth work	1200 – 974 (Part – I)
2	Safety code for piling and other deep foundations	5221 – 1969
3	Code of practice for Design. Installation observation and maintenance of uplift pressure pipes for Hydraulic structures on permeable foundation	6532 – 1972
4	Safety code excavation works	3764 – 1966
5	Protection of stone for Reservoir embankments	8237- 1976
6	Code of practice for earth work on rivers	4701 – 1982
7	Guidelines for lining for rivers in expansive soils	9451 – 1985
8	Method of test for soils Part – II Determination of water content	2720 – 1973 (Part II)
9	Method of test for soils Determination of moisture content Dry density relation using light compaction	2720 – 1974 (Part VII)
10	Method of test for soils determination of dry density of soils in place by the core cutter method	2720 -1975 (Part – XXVIII)
11	Method of test for soils determination or dry density of soils in place by the core cutter method	2720 – 1975 (Pat – XXIX)
12	Safety code for blasting and related drilling operations	1981 – 1967
VIII	**OTHER SUBJECTS**	
1	Safety code for scaffolds and ladders Part I scaffolds	3696 – 1966 (Part – I)
2	Safety code for scaffolds and ladders Part II ladders	3696 – 1966 (Part II)
3	Recommendations on stacking and storages of construction materials at site	4082 – 1977
4	Conversion factors	IS:786
5	Method of measurement of building works	IS:1200
6	Code of practice for measurement of civil engineering works	IS:3385
7	Materials and workmanship for earthwork and excavation	IS:1200 (PART I)
8	Safety code for blasting and related drilling operations	IS:4081
9	Safety code for excavation work	IS:3764
10	Moisture content in sand for filling	IS:2720
11	Determination of moisture content	IS:2720 (PART II)
13	Determination of moisture content & dry density relation using light compaction	IS: 2720 (PART VIII)
14	Determination of dry density of soils in-place by the sand replacement method	IS:2720(PART XXVIII)
15	Determination of dry density of soils in-place by the core cutter method	IS:2720 (PART XXIX)
16	Construction water	IS:456
17	Methods of sapling and test (physical and chemical water used in industry)	IS:3025
18	Ordinary (33 grade)/low heat Portland cement	IS:269
19	Ordinary Portland cement (43 grade)	IS:8112
	Ordinary Portland cement (53 grade)	IS:12269
21	White Portland cement	IS:8042-E

SI No.	Short title	B.I.S. Number
22	Portland Pozzolana cement	IS:1489
23	Rapid hardening Portland cement	IS:8041, IS:269
24	Portland (blast furnace) slag cement	IS:455
25	Hydrophobic cement	IS:8043
26	High alumina cement	IS:6452
27	Super sulphated cement	IS:6909
28	Oil well cement	IS:8229E
29	Standard for testing of cement	IS:650
30	Methods of physical tests for hydraulic cement	IS:4031
31	Specification for standard sand for testing of cement	IS:650
32	Coarse and fine aggregates for concrete	IS:383, IS:515
33	Gradation of coarse aggregates	IS:383(TABLEII)
34	Gradation of fine aggregates	IS:383 (TABLE III)
35	All-in-aggregates	IS:383 (TABLE IV)
36	Method of tests for aggregates for concrete	IS:2386 (PART I TO VIII)
37	Methods of determination the maximum qty. of deleterious materials in aggregate	IS:2386 (PART II)
38	Limiting values of the maximum quantities of deleterious materials in aggregate	IS:383 (TABLE I)
39	Flakiness index of aggregates	IS:2396 (PART I), IS:5640
40	Moisture content test for aggregates	IS:2386 (PART III)
41	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	IS:432 (PART I & II)
42	Specification for plain hard drawn steel wire fabric for cement concrete	IS:1566
43	Specification for cold twisted steel bars for concrete reinforcement	IS:1786
44	Specifications for hot rolled mild steel and medium tensile steel deformed bars	IS:1139, IS:1739
45	Code of practice for bending and fixing of bars for concrete reinforcement	IS:2502
46	Mild steel binding wire	IS:280
47	Code of practice for welding of mild steel bars used for RCC	IS:2751
48	Code of practice for plain and reinforced concrete	IS:456
49	Code of practice for general construction of plain and RCC for dams	IS:457
50	Testing of reinforced cement concrete	IS:516
51	Method of tests for strength of concrete	IS:516
52	Methods of sampling & analysis of concrete	IS:1199
53	Code of practice for concrete structures for storage of liquids	IS:3370 (PART I TO IV)
54	Code of practice for composite construction	IS:3935
55	Code of practice for construction of reinforced concrete shell roof	IS:2204
56	Criteria for the design of RCC shell structures and folded plates	IS:2210
57	Specification for batch type concrete mixers	IS:1791
58	Specification for portable swing weigh batchers for concrete	IS:2722
59	Specification for roller pan mixer	IS:2438
60	Specification for concrete vibrators immersion type	IS:2505

SI No.	Short title	B.I.S. Number
61	Specification for screed board concrete vibrators	IS:2506
62	Specification for concrete vibrating tables	IS:2514
63	Specification for pan vibrators	IS:3366
64	Specification for form vibrators for concrete	IS:4656
65	Code of practice for use of immersion vibrators for consolidated concrete	IS:3558
66	Air entraining agent	ASTM:6260
67	Criteria for design and construction of precast concrete trusses	IS:3201
68	Prestressed concrete	IS:1343
69	Specification for high tensile steel bars used in code of practice for pre-stressed concrete	IS:2090
70	Specification for plain hard drawn steel wire for pre-stressed concrete	IS:1785 (PART I)
71	Specification for plywood for concrete	
72	Shuttering work	IS:4990
73	Code of practice for steel tubular scaffolding	IS:4014 (PART I & II)
74	Specification for steel scaffolding	IS:2750
75	Safety code for scaffolds and ladders	IS:3696
76	Common burnt clay building bricks	IS:1077
77	Classification of burnt clay bricks	IS:3102
78	Burnt clay building bricks, heavy duty	IS:2180
79	Burnt clay facing bricks	IS:2691, IS:1077
80	Method of sampling and testing clay building bricks	IS:3495 (PART I - IV)
81	Mortar for brick work	IS:2250
82	Code of practice for brick work	IS:2221
83	Masonry works	IS:3466
84	Structural safety etc. Of building masonry walls	IS:1905
85	Load bearing hollow concrete blocks	IS:2185
86	Lime - cement - cinder hollow concrete blocks	IS:5498
87	Lime - cement - cinder solid blocks	IS:3115
88	Code of practice for construction of stone masonry	IS:1597 (PART I)
89	Stone tests	IS:1124
90	Code of practice for design and installation of joints in buildings	IS:3414
91	Joint sealing compound	IS:834
92	Pre-molded bituminous joint filler	IS:1838
93	Timber door, window and ventilator frames	IS:4021
94	Material & workmanship for wood work	IS:883, IS:4021
95	Plywood & tests	IS:303
96	General tests for wood work	IS:1659
97	Red lead for wood knot	IS:103
98	Oil type wood preservative	IS:218
99	Anodizing	BS:1616
100	Hydraulic lime & storage	IS:712
101	General tests for lime	IS:6932 (PART I TO X)
102	Field tests for lime	IS:1624
103	Lime mortar preparation	IS:1625
104	Slacked lime	IS:1639
105	Surkhi	IS:1344

SI No.	Short title	B.I.S. Number
106	Code of practice for application of lime plaster finish	IS:2394
107	Rough cast plaster	IS:1661(CLAUSE-165)
108	Specification for integral cement water proofing compounds	IS:2645
109	Water proofing asphalt/maxphalt	IS:702
110	Bitumen saturated layer	IS:1322
111	Bitumen felt	IS:1322
112	Bitumen	IS:702
113	Glazed earthenware tiles	IS:777
114	Marble chips & marble mosaic terrazzo	IS:2114
115	Plain cement tiles & tests	IS:1237
116	Oxy-chloride	IS:658
117	Magnesium chloride	IS:657
118	C.I. grid tiles	IS:210
119	Rivets	IS:1148
120	Electrodes for welding	IS:814
121	Code of practice for use of electric arc welding for general construction in steel	IS:813
122	Tests for welding works	IS:1181
123	Welding works	IS:816
124	Bolts and nuts	IS:1367
125	Tests for bolts and nuts	IS:1608
126	Structural steel sections & tests	IS:226
127	Structural steel plates	IS:2062
128	Defects in structural steel	IS:229
129	Dimension & properties of steel section	IS:808
130	Structural steel work	IS:226, IS:4948
131	Expanded metal steel sheet	IS:412
132	Mild steel wire gauze jali	IS:280
133	Welding procedure & edge preparation	IS:823
134	Washers	IS:2016
135	Storage of welding wire & electrodes	IS:816
136	Primer to structural surface for bolts	IS:2074
137	Checkered plates	IS:3502
138	Code of practice for painting of ferrous metal in building and allied finishes	IS:1477 (PART I & II)
139	Distemper and dry color	IS:427
140	Code of practice for painting concrete, masonry and plaster surfaces	IS:2395
141	Distemper and oil emulsion	IS:428
142	Enamel paints	IS:2933
143	Coat of zinc chromate	IS:104
144	GI pipes & MS tubes	IS:1239 (PART I)
145	Concrete pipes	IS:458
146	Concrete mix design	IS:10262
147	Chemical composition of ordinary Portland cement	IS:4032
148	Sulphate resistant cement	BS:4027 & ASTMC-150 TYPE II
149	Specifications for circular hollow sections	IS:1161

SI No.	Short title	B.I.S. Number
150	Properties of rectangular & square hollow sections	IS:4923
151	Cold formed welded & seamless carbon steel structural tubing	ASTMA 500
152	Cold but not formed welded & seamless carbon steel structural tubing	ASTMA 501
153	Hot formed welded & seamless high strength low alloy tubing	ASTMA 618
154	Hot rolled structural steel hollow section	BS:4848/
155	Recommendation for detailing of Reinforcement in Reinforced Concrete Works.	IS: 5525
156	Guidelines for dewatering during construction	IS:9759: 1981

In addition to the *Bhutan/Indian standard specifications*, the *Specifications for Roads and Bridges* published by Ministry of Road Transport & Highways (MORTH), India, and Indian Roads Congress (IRC) specifications shall be followed where Bhutan/BIS specifications are not available for work items. If specifications are unavailable in any of these, equivalent or better international specifications such as British Standards would be applicable.

The order of precedence is provided in the preamble to the Technical Specifications.

The Contractor shall familiarize himself with the contents of the above General Specifications and shall maintain a copy of the necessary ones (relevant to the work) in his site office at all times.

2.1.2. Part 2: Technical Specifications

The technical specifications applicable to this contract are included in Appendix I – **Part 2: *Technical Specification*** of the Bidding Document.

2.2. Drawings

The Drawings that are applicable to this Contract at this stage are included in Appendix II - ***Drawings*** of the Bidding Document.

A. Project Base MAP
   Right of Way and Project Boundary

B. River Training works (Architecture Drawings)
   a. Counterfort RCC walls
   b. Embankment works
   c. Check dams
   d. Access Ramps

C. River Training works (Structure Drawings)
   a. Counterfort RCC walls
   b. Check dams
   c. Access Ramps

3. Personnel Requirements

Using Form PER -1 and PER- 2 in Section 4 (Bidding Forms) of the issued Bidding Document, the Bidder must demonstrate that it has key personnel that meet the minimum following requirements:

No.	Position	Total Work Experience [years]	Qualification
1	Project Manager	12 years	Master Degree in Civil/Water Resources Engineering or equivalent
2	Sr. Civil Engineer	12 years	Master Degree in Civil/Water Engineering or equivalent
3	Geo-Tech Engineer	8 years	Bachelor in Civil, and Masters in Geo-tech or equivalent
4	Material & Quality Control Engineers (2 numbers)	8 years	Bachelor in Material Science/Civil Engineering
5	Civil Engineers (2 numbers)	8 years	Bachelors Degree in Civil Engineering
6	Quantity Surveyor	8 years	Bachelor Degree in Civil Engineering
7	Surveyor	5 years	Bachelor Degree or diploma (Surveying), Licensed Surveyor or equivalent
8	CAD Engineer	5 years	Bachelors Degree or Diploma in CAD

Using Form EXP-6 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has EHS personnel who meet the following requirements:

Key Personnel as determined by the EMP and other safeguard management plans

Item No.	Position/specialization	Relevant academic qualifications	Minimum years of relevant work experience	Minimum time on-site (%FTE)
1	*Safety Health and Environmental Officer*			
2	*Social Safeguards Officer*			

Key personnel are, for this purpose defined as the personnel in all positions in the Organization Chart, without exception, which have responsibility either (a) for supervision or management of any work activities down to section level or (b) have a special technical or administrative capability.

4. Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that he has, and proposes to mobilize to Site, as a minimum the basic key equipment listed hereafter, and provide all the information for each item of equipment required by Form EQU.

The Bidder shall present proof of ownership or lease agreement or rental agreement (with a provision that the equipment will remain on site or be vested in the Employer in the event of default of the Contractor), thereby ensuring more timely continuity of work by a replacement contractor and an undertaking to mobilize this equipment in case of award of contract to him.

Sl. no	Equipment Type and Characteristics	Min. number Required
1	Bull dozer – 310 horse power	1
2	Excavator-(30T) Bucket Capacity 4-6m^3	4
3	Backhoe Loader- Bucket 3-6m^3	2
4	Dumper Truck – 10T-20T	8
5	Concrete Batching plant (20m^3/hr)	1
6	Concrete Truck mixer (>=6 m^3 capacity)	2

5. Environment, Health and Safety Management Requirements

To minimize and mitigate the environmental impacts and potential environmental risks, mitigation and safeguard measures are proposed in the following report:

ENVIRONMENT IMPACT ASSESSMENT (EIA) REPORT
Climate Resilient Omchhu River Basin Project

The activities required for the implementation of these measures have been consolidated in the **Environmental Management Plan (EMP)**, which is incorporated into the **EIA**. The Contractor is requested to familiarize himself with EIA report, which is available at **www.adb.org** or at the Executing Agency's office in Phuentsholing.

The required environmental monitoring and mitigation measures are set out clearly and in greater detail in the Environmental Management Plan (EMP). The Contractor shall familiarize himself with all the environmental monitoring requirements and mitigation measures specified in the EMP.

Environment, Health and Safety Management Requirement

The following Environmental Management Plan (EMP) provisions contain specific actions to be carried out by the Contractor which are mandatory.

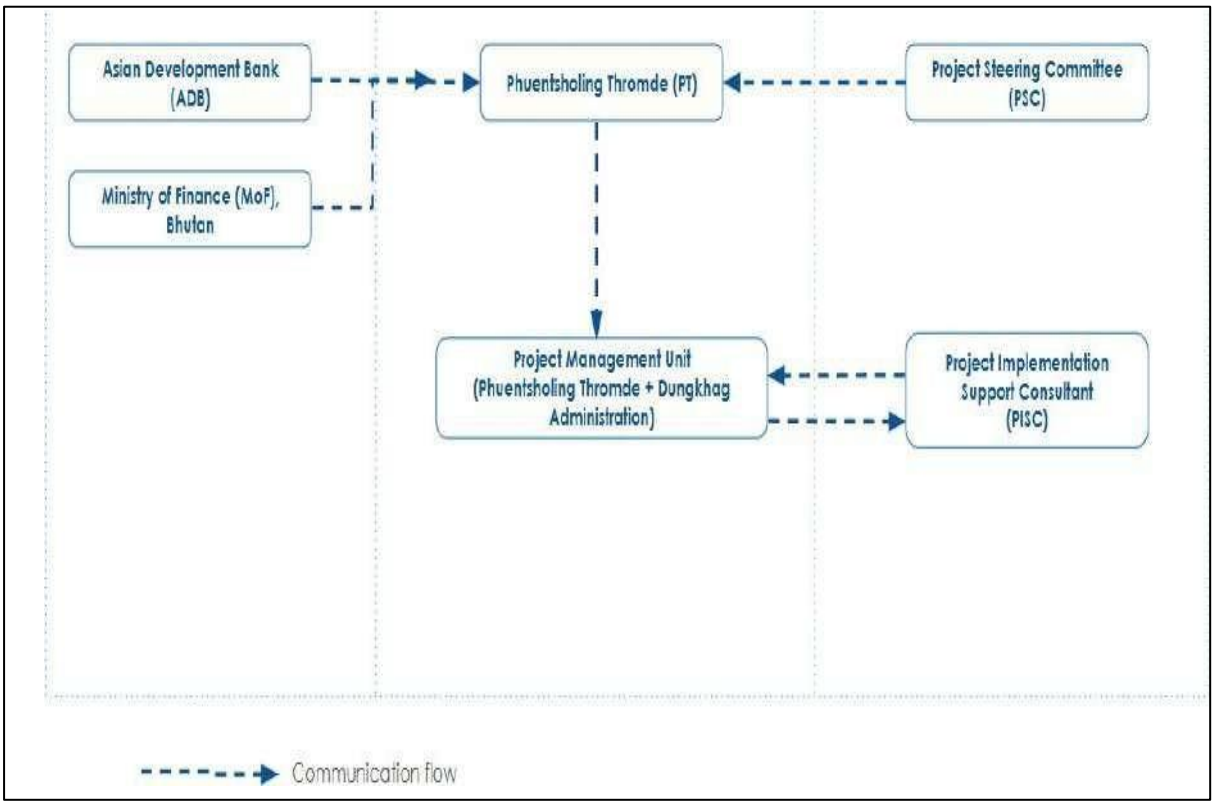
ENVIRONMENTAL MANAGEMENT PLAN

A. Project Implementation Arrangement

I. The Phuentsholing Thromde will be the implementing agency of all outputs. It will be responsible for management, coordination and execution of all activities funded under the loan. A central PMU at the Thromde will be responsible for implementing the project with the support of Project Implementation Consultant - Figure below details the responsibilities for the project preparation, construction and operation. The Project Management Unit will comprise of the following officers:

- Project Director
- Deputy Project Director
- Project Manager
- Admin Officer
- Legal Officer
- Environment Officer

Figure 27. Project Implementation Arrangement



Source: Phuentsholing Thromde 2025

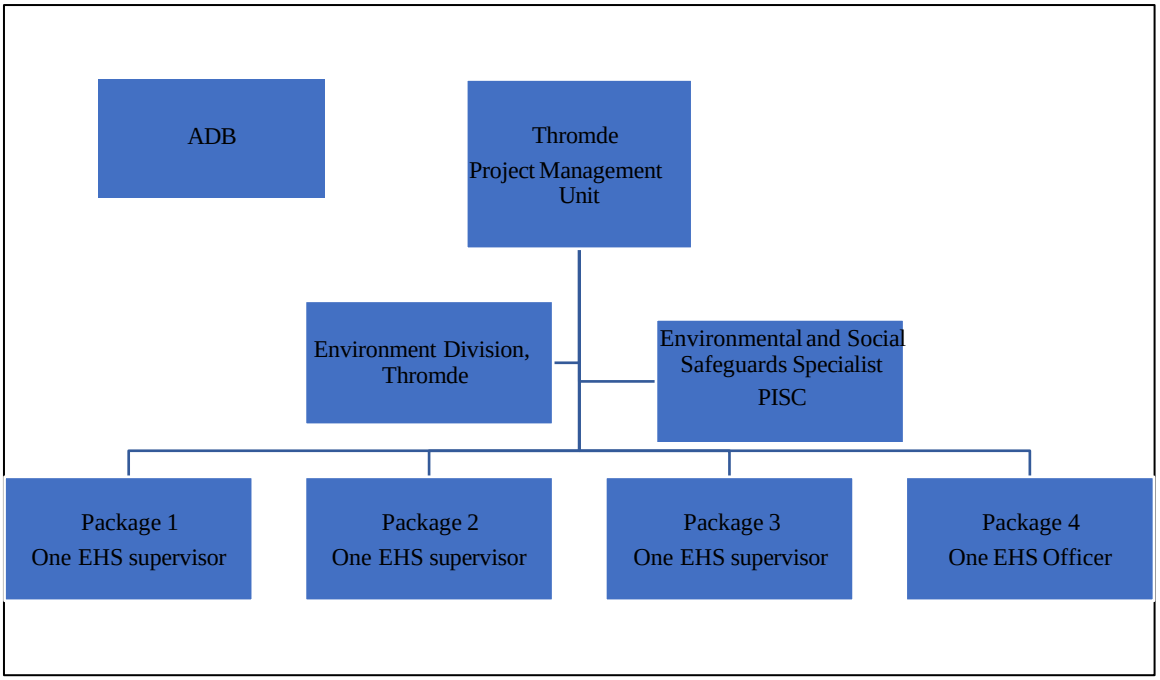
B. Specific Institutional Arrangement for Environmental Safeguards

II. The Environment Division is mandated to issue and renew environmental clearances, monitor project compliance, and enforce regulations through fines. It manages municipal waste, including landfill operation, construction and demolition waste disposal, and waste collection schedules, and maintaining cleanliness within the Thromde.

III. It is also responsible for conducting awareness to the public on environmental issues such as waste management and implementation of the Zero Waste Hour. Additionally, the division facilitates tree cutting in public spaces, manages parks and gardens, and organizes plantations.

IV. The Division has an Assistant Environmental Officer, 4 technicians, 3 sanitary inspectors and one lab assistant. As the Division has multiples responsibilities and only one Environment Officer, the Division will be assisted by an Environment and Social Specialist of the PISC that will be responsible for supporting the Division in ensuring that EMP provisions are incorporated into bidding documents and costed, conduct contractor training, conduct compliance monitoring, guide contractors and their EHS officers, advise on corrective actions and in case of unanticipated incidents, and prepare all necessary environmental reports per requirement during implementation of the civil works contracts.

Figure 1: Implementation Arrangement for Environmental Safeguards



V. **Environment Division.** Within the Thromde, the Environment Division will be responsible for the following:

- update the final IEE including EMPs if changes in detailed design that may occur during implementation phase
- ensure that EMPs are included in bidding documents and civil works contracts
- review and provide recommendations on the approval of Contractors site-specific EMPs (CEMPs) of contractors
- provide oversight on environmental management aspects of the project, and ensure CEMPs and EMPs are implemented by contractors
- ensure overall compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements as relevant
- ensure timely disclosure of final IEEs/EMPs in project website and in a form accessible to the public
- ensure compliance with the grievance redress mechanism (GRM) in a timely manner
- ensure compliance with ADB loan covenant and Environmental Clearances and Forest Clearances,
- with support from Environmental and Social Specialist (PISC) organize periodic capacity building and training programs for the contractors and their EHS officers

VI. **Environment Specialist Consultant**. The Environment Specialist Consultant under the PISC will assist PMU in implementing the EMPs, review and update of all necessary environmental safeguard documentation as required by ADB SPS and national laws, regulations, policies and guidelines applicable to each project. Specific tasks of the consultant are to assist PMU and the Environment Division in:

(i) Ensuring that the relevant provisions of EMPs, including costs of implementing the EMPs, are fully included in bid and contract documents, particularly in the bill of quantities and cost line items
(ii) Reviewing designs, bidding documents, BOQ, and safeguard documents to ensure health and safety considerations are adequately covered and coste
(iii) Assisting with any capacity building activities on environment safeguards and nature-based solutions
(iv) Implementing proposed environmental mitigation measures and ensuring the implementation of EMPs during construction phase

(v) Monitoring of EMP and EMOP implementation
(vi) Preparing all necessary environmental reports per requirement during implementation of the civil works contracts.

VII. **Civil Works Contracts and Contractors.** Each contractor will be required to designate an environment, health and safety officer (or equivalent) to ensure implementation of EMP during civil works. The contractor will be required to submit to PMU, for review and approval, a CEMP including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program per EMP; and (iv) budget for CEMP and EMP implementation. No works can commence until CEMP is approved by PMU. Non-compliance with, or any deviation from, the conditions set out in the EMP/CEMP constitutes a failure in compliance and will require corrective actions. Additionally, contractors shall be primarily responsible for the following:

(vii) obtaining the necessary environmental license(s), permits, etc. from relevant agencies
(viii) ensuring the construction site complies with all relevant environmental, health, and safety regulations, standards, and codes of practice;
(ix) before the start of physical works, collect baseline data on the environmental quality of the construction sites and continue the collection of information (e.g., air quality, noise level, and water quality) during civil works as specified in the approved CEMP;
(x) conducting risk assessments and hazard identification to identify potential environmental, health, and safety risks associated with construction activities. This involves assessing workplace hazards, environmental hazards, and potential exposure pathways for workers and the surrounding community;
(xi) developing safety plans, procedures, and protocols to mitigate identified risks and hazards based on risk assessments. The contractor will revise and finalize the CEMP and environmental quality monitoring plan based on site-specific conditions;
(xii) implementing and documenting all mitigation measures in the EMP and EMOP;
(xiii) ensuring that all workers and site agents, including site supervisors and management, participate in all environmental safeguard related training sessions; provides training and awareness sessions to construction workers, subcontractors, and other staff on environmental, health, and safety practices and procedures;
(xiv) conducting regular inspections and audits of the construction site to monitor compliance with environmental, health, and safety requirements.
(xv) ensuring compliance with environmental statutory requirements and contractual obligations;
(xvi) conducting investigations to determine the root causes and contributing factors in the event of accidents, incidents, or near misses. This includes documenting incidents, analyzing data, and developing corrective actions to prevent recurrence. Contractor will ensure that all incidents are documented and reported to relevant authorities as required by regulations;
(xvii) maintaining an on-site environmental logbook and records, documenting inspections, training, EMP implementation, and grievance redress actions for review by the PMU and PISC as needed;
(xviii) participating in resolving issues as part of the GRM;
(xix) responding promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional environmental mitigation measures as necessary and inform PMU;
(xx) based on the results of EMP/EMOP monitoring, cooperate with PMU in implementing environmental corrective actions plans, as necessary;
(xxi) developing and implementing health promotion and wellness programs to support the physical and mental well-being of construction workers;
(xxii) engaging with local communities, regulatory agencies, and other stakeholders to address concerns, communicate project related information, and promote transparency and accountability;
(xxiii) promoting a culture of continuous improvement in environmental, health, and safety performance on the construction site; and
(xxiv) providing other environment safeguards activities as indicated in the contract.

C. Environmental Management Plan Matrices

VIII. The table below summarizes the potential impacts and mitigation and management measures to be taken during pre-construction, construction and operation phases to avoid, reduce, mitigate, or compensate for adverse environmental impacts.

IX. It is a commitment by the project to implement the proposed management measure and therefore must be incorporated into the bidding documents, project construction contracts and monitored during operation and maintenance.

Table 1. Environment Management Plan

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
Pre- construction phase				
	Social impacts- land acquisition and resettlement	None required as no land acquisition and resettlement will be required.	NA	NA
	Impact on protected area, critical habitats and endangered species	None required as the project site is located within the city limit, at a distance of more than 80km from the nearest protected area.	NA	NA
	Biodiversity (terrestrial and aquatic)	No mitigation required as the project site is not located near any significant PCR	NA	NA
	Change in land use	No mitigation required as there will be no change in land use	NA	NA
	Physical Cultural Resources	No mitigation required as there are no PCR near the project sites	NA	NA
	Natural Hazards and Disasters	Choice of construction materials must be based on climatic conditions and suitable for heavy monsoon rains	Design team	PMU
Project site selection	Climate Change Considerations	No mitigation required as Climate Change impacts	PISC	PMU
Construction phase				
Land lease, connection for utilities, tree removal worker recruitment	Consents, Permits and Clearances (all infrastructure packages)	● Land lease for contractor facilities, water supply for drinking and construction and waste disposal - Thromde ● For electrical connections for work sites and worker camps- Bhutan Power Corporation ● For tree marking – Department of Forest and Park Services, through their local office ● Large tree removal – Natural Resources Development Corporation Limited ● For recruitment of foreign workers- Department of labor	Contractor	PMU
Site selection for site offices, material storage and contractor facilities	Site Accessibility and location of contractor facilities (all infrastructure packages)	● Maintain a minimum distance of 50m from any religious, health, or educational facility. ● Maintain a minimum distance of 30m from rivers and 15m from streams. ● Avoid natural forests and areas requiring tree felling or vegetation clearance.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
Construction Schedule, Cost Estimation and Bidding Process	Noncompliance with EMP (all infrastructure packages)	● Ensure compliance with the prevailing Bhutan Schedule of Rates (BSR) for OHS and worker accommodation ● Include the EMP into the contract documents and include a clause to make contractors liable for non-compliance to the ADB safeguards, national regulations and standards and the EMP. ● Incorporate the cost of waste transportation from the construction sites to the waste dump site in the Bill of Quantities (BOQ) to avoid supplementary claim and ensure proper waste disposal. ● Require contractors to review the EMP and prepare a site-specific Contractor EMP, incorporating and budgeting for all measures to avoid lapses and non-compliance during implementation. This will be reviewed and approved by the Thromde	PMU	PMU
Creation of Project Supervision team	Lack of technical capacity on environmental safeguards	● PMU and Contractor must incorporate adequate budget to ensure adequate staffing and capacity building measures from pre-construction to construction phases ● Conduct briefing/orientation/training for designated staff aware of ADB safeguard policies and RGOB regulations relevant for the project, EMP, GRM, compliance monitoring and reporting requirements	PMU	PMU
Commencement of pre- construction activities	Compliance to ADB loan covenants and safeguard policies	● Seek prior approval of the IEE report from ADB before disclosure ● Staffing commitments for Environmental and social safeguards and capacity building ● Ensure that sufficient funds are available to properly implement all agreed measures in the EMP; ● Disclosure of the approved IEE, updated IEEs and EMRs ● Incorporate EMP, GRM and EMOP and relevant provisions of the loan agreement into bidding documents only after approval from ADB	PMU and Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● During pre-bid meetings, brief contractors on their responsibilities in EMP implementation, and the need to comply with all ADB loan covenants, national legislation and clearances. ● Upon selection, conduct contractor training on the EMP requirements, documentation and reporting procedures, ● Prepare and submit semi-annual EMRs for ADB review and approval ● Report any accidents, fatalities to ADB within 48 hours as well as any unanticipated incidents along with corrective actions taken within one week?		
Project disclosure	Risk that residents, travelers and visitors are unaware of project activities, restrictions on access and GRM process	● Disseminate information about project activities and schedules (television, newspaper, social media and local representatives) ● Institute the Grievance Redress Mechanism prior to the construction phase and notify and disseminate information to the public on the GRM process ● Ensure that the contractors install project signboards (according to national design standards and specification) so that passersby, travelers and the community are aware of the project site, work timing, and access restrictions. Signboards should have project contact numbers ● Install signage in case of temporary closures ● Disclose the IEE and EMR on Thromde website	PMU and Contractor	PMU
Staff and worker recruitment	Non-compliance with National recruitment regulations and risk of employing underage children, forced labor, recruitment discrimination, lack of contracts, excessive overtimes, delayed, irregular or non-payments, Gender-based violence, Sexual	Strictly follow the Labor and Employment Act of Bhutan, 2007; Rules and Regulations on Foreign Workers Management, 2024 which covers all aspects pertaining to foreign worker recruitment and management and the notification on transferring foreign workers between employers and worksites (April, 2023), Regulation on Occupational Health and Safety for Construction Industry, 2022, Integrated Foreign Workers Recruitment and Management Guideline 2023 (revised 2024),	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
	Exploitation and Abuse/Sexual Harassment (SEA/SH) or lack of health and safety provisions. (all infrastructure packages involving contractors, employees and workers)	the Comprehensive Guide to Workers Compensation, Guideline on Investigation and Reporting of workplace accidents (2024) - Ensure that no person under the age of 18 is employed. For this a robust age verification process will be instituted. - No person will be forced to work against his/her will Process for worker permits and entry as per prevailing health restrictions and screening requirements. ● Each contractor will prepare a labor management plan that will include preparation of worker contracts with terms and conditions of employment, including hours of work, wages, overtime, compensation and benefits, holidays, leaves, and so on. The procedures will set out measures to ensure equitable treatment of all workers, uphold non-discrimination irrespective of gender, age, ethnicity, religion, disability, or other characteristics and address harassment, and/or exploitation and gender- based violence. The LMP will also include a provision for dealing with worker grievances. ● The Contractor will comply with the requirements of the Regulation on Occupational Health and Safety for the Construction Industry 2022 along with the relevant provisions in the Regulation on Occupational Health, Safety and Welfare, 2022 as applicable to construction sites. ● Prepare an Occupational Health and Safety Plan that incorporates the following; - Nominate a Health and Safety Focal Person (or equivalent) who will have the overall responsibility to		

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		ensure safe working conditions and environment for all workers. - Identify the hazards and conduct a risk assessment based on the work process and working conditions and take practicable steps to minimize any risk or hazard identified. - Ensure all foreign workers are screened at their point of entry for virulent and contagious diseases, including HIV/AIDS, TB, Malaria, Dengue and COVID 19. - Provide required and appropriate personal protective equipment (safety belts for working at heights for bridge construction, along slopes, safety boots, helmets, gloves, protective clothes, dust mask, goggles, and ear plugs), at no cost to the workers, maintain a PPE issue register, and enforce its use with sanctions for non-compliance - Provide adequate supply of safe drinking water at a workplace - Provide occupational health and safety training to all employees and workers involved in works during toolbox talks - Establish a schedule for work and rest periods during hot days - Institute protocols to deal with accidents (including provision of transportation of injured person to the nearest hospital. The protocol should also investigate cause of accidents at the workplace and include provisions for corrective measures - Institute protocols to deal with emergencies - Institute a protocol to deal with grievances at the worksite and communicate this to all workers. - Employ only trained and competent electrical workers for electrical installations - Employ only licensed drivers and machine operators - Maintain a well-stocked first aid kit at all times		

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		- Install safety signage and barricades at critical and risky/precarious areas. - Keep a log of all incidents, near-misses and accidents and include these in monthly monitoring reports including measures taken - Compensate workers for work injuries and fatalities as per national regulations - In case of emergencies such as COVID 19, institute medical protocols as per the prevailing requirements of the Ministry of Health and the relevant Taskforce. - For all disaster related cases, follow Thromde Disaster Emergency Protocols - All new workers must receive OHS orientation training covering basic site rules, personal protection, and preventing harm to others. - Conduct worker training on working on slopes, near the riverside and create and train a team for river rescue operations. For other sites, training must cover basic hazard awareness, safe work practices, code of conduct, standard work procedures and emergency procedures for fire, evacuation, and natural disasters. This includes cautioning workers on the risks of working near forested areas (such as snake bites) - If workers are required to work overtime, then the contractor must submit a night work plan based on assessment of all risks and hazards. The plan must include appropriate provisions to ensure a safe and healthy work environment with standard operating protocols, equipment, facilities and trainings.		
Site preparation and Construction of site office, worker camps and material storage sheds	Land requirements for contractor facilities (all contractors)	Mitigation Measures for Worker Camps: Site Selection & Land Use: ● Obtain prior permission from Thromde for locating worker camps.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● Select sites at least 30m from rivers and 15m from streams, minimizing vegetation clearance (no tree felling). ● Fulfill land lease requirements with Thromde for government land; sign agreements for private land use. Accommodation Standards: ● Provide good-quality, gender-friendly temporary housing that meets Bhutan Schedule of Rates (2024) standards. ● Ensure rooms are well-ventilated, with protection from elements (wind, heat, rain, etc.). ● Maintain minimum one room for every 4 employees with adequate space and headroom. ● Provide separate kitchen if workers choose to cook themselves. Sanitation & Hygiene: ● One pour-flush toilet per 6 persons, with separate facilities for males and females. ● Include bathrooms, washing areas, septic tanks, and soak-away pits located 30m away from water bodies. ● Ensure regular cleaning, hygiene, and organized waste management using separate bins for general, biodegradable, and hazardous waste. Water Supply: ● Provide ample and safe drinking water that meets national standards. ● Include adequate storage tanks. ● Test water quality if not sourced from municipal supply.		

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		Cooling & Health Provisions: ● Due to high summer temperatures in Phuentsholing, equip rooms with cooling facilities (e.g. fans) and mosquito nets to reduce malaria risk. Dining Facilities: ● Where meals are provided, establish a common dining room away from sleeping areas. ● Channel kitchen and dining wastewater to soak pits, away from streams. Utilities & Safety: ● Ensure access to electricity and install fire extinguishers. ● Camps must be self-contained, barricaded, and comply with occupational health and safety regulations (2022). ● Secure necessary approvals for water and electrical connections from Thromde and Bhutan Power Corporation. **Alternative Options:** Consider renting offices instead of constructing them to reduce the project footprint.		
Sourcing of construction water	Water will be required for construction works. (all infrastructure packages)	● As the site is along the Omchhu river, the water from the river can be tapped for ongoing construction works, with the prior permission of Thromde. ● Water tanks as required will be installed for water storage during the dry season	Contractor	PMU
Use of water	(Package W-01-w-04) and all worker camps	● Prevent direct discharge of concrete wastewater into the river by implementing on-site collection of all concrete wastewater using impermeable bunds, sedimentation ponds, or lined pits to facilitate sedimentation.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● Prior to disposal, treat collected wastewater by neutralizing acids to adjust the pH, filtering to remove fine particles and debris. ● Use of soak pits at worker camps		
Material sourcing	Haphazard and inefficient material purchase and sourcing (all packages)	● Construction materials will be sourced from existing approved sources with operating licenses to ensure that materials are from sustainable sources, ● The contractor must provide adequate facilities for handling and storage of construction materials such as storage sheds to reduce the amount of wastage caused by damage or exposure to the elements. ● To prevent shortage, storage or wastage, the contractor will prepare, and plan material requirement and delivery as required during each phase of the construction, maintain inventory, ● One option to minimize loss of materials due to theft is to appoint security guards, or install security cameras.	Contractor	PMU
Excavation work and sediment dredging	Generation of excavated soil (Packages W-01-W-04)	● Work to be done strictly during the dry season ● Store topsoil disturbed during earthworks separately to be reused for landscaping works. ● Reuse excavated soil for backfilling purposes or leveling but do not dispose downslope near streams and the river. ● Do not dispose muck indiscriminately. Consult with Thromdes to identify areas to dispose of the sediment and debris, especially in areas that may be used for reclamation. ● Wherever muck is dumped, ensure that the soil is disposed in layers and compacted well to prevent spillage ● Where required construct toe walls or retaining structures to prevent erosion and spillage ● Construct drainage channels to prevent water logging and to ensure slope stability.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
	Dust generation on windy days	● Enclose excavated areas to contain dust. Spray water over loose soil piles especially on windy days.	Contractor	PMU
Excavation	Disruption of utilities and services due to excavation (Packages W-01-W-04)	● Conduct a survey of the site before commencing excavation work to identify and mark any utilities that may be in the work site. ● Provide advance notice to BPC, and private persons so that they can indicate utility lines and discuss and plan options to minimize impacts. ● In the event of damage, the contractor will be held fully responsible for repair costs and compensation as determined by the Thromde or Grievance Committee.	Contractor	PMU
Mobilization of machines and trucks for material transportation	Air pollution (All packages)	● Ensure that ambient air quality levels do not exceed Environmental Standards 2020. ● Conduct regular vehicle maintenance to prevent smoke belching. ● Ensure all project vehicles are regularly serviced and maintained according to manufacturer's instructions and comply with emission standards and have valid emission certificates. ● All vehicles and machines must have a log of all maintenance work. ● Prohibit vehicle idling and enforce speed limits appropriate for road conditions	Contractor	PMU
	Dust generation during transportation (All packages)	● Material transporters must cover dust-generating materials such as sand and fine aggregates to prevent dust and spillage during transport. ● Carry out dust suppression through sprinkling of water during excavation work, especially on windy days. ● Enclose excavation sites with barricades ● To prevent sand from being blown away, cover loose sandpiles.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
	Congestion and blockages/obstructions (All packages)	● Contractor must coordinate with material transporters to schedule materials drop times and avoid peak traffic hours (e.g. 8.00-9.30AM and 4-6PM). ● Ensure loading and unloading of materials are carried out quickly and efficiently, without causing congestion ● Restrict parking of vehicles along the road unnecessarily ● Install signs to inform travelers of ongoing work to that they can opt to use alternative routes Transport vehicles must have back sirens to alert workers or the public when moving.	Contractor	PMU
	Noise from use of large machines and loud/noisy equipment and worker sites and from worker camps All packages)	● Ensure that noise levels do not exceed Environmental Standards 2020. Measures at the work site ● For renovation works at the Thromde site, instruct workers on the need to minimize disturbance during working hours. ● Schedule noisy work for before or after office-hours ● Ensure all vehicles and machinery are checked and maintained in good conditions to avoid noise ● Install noise buffers or station noise machinery away from residential, offices and institutional areas ● Carry out noise monitoring at adjacent properties at risk of noise level exceedance for the duration of such work and ensure that noise levels do not exceed national standards, 2020. ● Instruct workers not to blast music from their camps, especially during early hours and evening	Contractor	PMU
	Disruption of utilities and services (All packages)	● Caution machine operators and transporters to avoid impacting utilities and services during excavation, and material delivery.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● In the event of damage, the transporter or contractor will be held fully responsible for repair costs and compensation for any service delivery losses as determined by the Thromde or Grievance Committee.		
Construction activities	Noise and disturbance (All packages)	To minimize the impacts on Community health and safety the following measures are proposed; ● Ensure that noise levels do not exceed Environmental Standards 2020. Measures at the work site ● For renovation works at the Thromde site, instruct workers on the need to minimize disturbance during working hours. ● Schedule noisy work for before or after office-hours ● Ensure all vehicles and machinery are checked and maintained in good conditions to avoid noise ● Install noise buffers or station noise machinery away from residential, offices and institutional areas ● Carry out noise monitoring at adjacent properties at risk of noise level exceedance for the duration of such work and ensure that noise levels do not exceed national standards, 2020. Measures for worker accommodation Instruct workers not to blast music from their camps, especially during early hours and evening	Contractor	PMU
	Impact on fish diversity and habitat (Packages W-01-W-04)	● The project activities are timed during the dry season and periods of low flow to minimize impacts to fish and their habitat. ● Ensure that no waste (solid or liquid) is disposed into the river or streams,	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		Brief workers on Forest Rules and Regulations and prohibit the taking/hunting of any wildlife species or fishing.		
	Risk to Community health and safety due to influx of workers, ongoing construction work, waste generation, open access to public and unsafe work areas (All packages)	**Measures for the work site** ● Disseminate information to the public about the project and work scheduling, through the media channels as well as local representatives and schools ● Wherever possible, cordon the construction site to exclude public from the work area and institute temporary restrictions during work times ● Restrict material storage along footpaths or access areas ● Installing signboards to notify passers-by of ongoing work ● Install warning signs to indicate risky areas ● Avoid storing construction material along access road and footpath ● Institutionalize the Grievance Redress Mechanism (GRM) including a provision to deal with Gender based violence, sexual harassment and abuse. **Measures for workers** ● Prepare a Code of Conduct for workers and enforce it Brief workers on the Code of Conduct, prevention of sexually transmitted diseases sexual harassment and abuse, and gender-based violence and the GRM	Contractor	PMU
Hazardous materials usage, storage and disposal	Risk of inadequate storage, usage, spillage and disposal (All Packages)	● Provide material specific storage for hazardous materials and ensure chemical containers are labelled ● Do not allow any fuel storage at site. ● Designate areas to store hazardous materials in covered sheds with impermeable lining and bunded to 110% capacity. ● Provide spill response kit with sufficient absorbent materials (e.g., sorbents, dry sand, sandbags) on-site to immediately soak up any accidental spills and leaks.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● Workers who are required to handle corrosive, oxidizing, or reactive chemicals should be provided with specialized training on the risks and usage of these substances and provided with appropriate PPE (gloves, apron, splash suits, face shield or goggles etc.). ● Immediately evacuate employees/workers to the hospital in case of accidental exposure. Do not retain hazardous waste at site for more than 2 weeks, and ensure these are disposed of, as per Thromde's guidance.		
Waste generation	Improper waste management and disposal (All packages)	**Overall** ● Ensure compliance with the Waste Prevention and Management Act of Bhutan, 2009 **Waste management at site offices and worker camps** ● Provide appropriate color-coded and labelled bins to segregate waste into organic/biodegradable and general waste. General waste should further be segregated into plastics, bottles and paper and e-waste. ● Conduct employee and worker awareness to promote waste segregation, reduction, recycling and good housekeeping ● Prohibit burning of waste ● Maintain cleanliness of the respective premises or surroundings through weekly cleanup campaigns ● Follow the Thromde waste collection schedule timings and ensure that waste does not pile up. **Waste management at the construction site** ● Designate areas to store construction waste, chemical waste and hazardous waste, ensuring that the latter two are stored in containers in covered sheds with impermeable lining and bunded to 110% capacity.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● Prohibit burning of waste ● Conduct employee and worker awareness to waste reduction and illegal waste dumping. ● Maintain cleanliness of the work site through weekly cleanup campaigns ● Secure disposal permits to dispose construction waste at designated/approved disposal sites. ● Cover all construction waste during transportation, secure and label waste containers (hazardous waste), and transport these to a designated site without spillage along the transportation route. ● Maintain documentation and record of all types of waste generated and disposed. Thromde - Conduct awareness for contractors and their workers on waste management protocols and requirements prior to construction.		
	Aesthetic impacts (Packages W-01- W04, W06, W-07)	Ensure that contractors follow project design strictly and that any deviation from the design is approved by the project management.	Contractor	PMU
	Chance finds of Physical Cultural Resources (Packages W-01-W04, W06, W-07)	**Mitigation:** In case of discovery of a chance find, (archaeological, historical, cultural, religious objects, or graves) during the excavation or construction, the following steps must be undertaken by the contractor, PIU and PMU: ● Upon detection of any chance find, the contractor must immediately stop all activity within 30m of the find and immediately notify the supervisor onsite and the Thromde. No construction is to be carried out by the Contractor until notified by the Thromde ● The Thromde in turn will photo document the chance finds and inform Department of Department of Culture and Dzongkhag Development, Ministry of Home Affairs of the discovery immediately to avoid delay in the construction work.	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● The Department of Culture and Dzongkhag Development (DoCDD) may provide their assessment from the photo documentation or conduct in-person site assessment to assess the chance find in detail and relay appropriate instruction to Thromde. ● The Thromde must ensure that there are no delays in the verification process or in notifying the contractor of the procedures to be followed based on the assessment by the DoCDD Thromde must monitor to ensure that the instruction given by the DoCDD is carried out correctly.		
Construction activities	Damage to infrastructure due to natural hazards and disasters (All packages)	**Mitigation:** To mitigation against natural hazards and disasters, the following are proposed; ● Contractors must prepare an emergency preparedness plan that is aimed at ensuring the safety of all employees and workers in case of an emergency and to minimize work disruption as much as possible. ● Identify an Emergency Response Focal Person who will coordinate Emergency operations with the Thromde in case of natural hazards and disasters, ● Establish a clear protocol for communication between Thromde and Contractors and their focal persons ● Designate a meeting point at work sites and worker accommodation areas and establish protocols for evacuation, response and relief actions ● Brief workers on emergency response procedures to be followed and conduct mock drill for employees and workers ● Keep abreast on extreme weather forecasts and avoid working in such conditions ● In the case of accidents immediately evacuate injured persons to the hospital	Contractor	PMU

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		● Ensure that transportation is available for emergencies at all times ● Maintain fire extinguishers at site offices and worker camps and ensure these are regularly checked Post emergency numbers (police, ambulance, Thromde, fire, Contractor's emergency personnel) at visible places and update this if personnel have left or been replaced.		
Construction activities	Unanticipated impacts (All packages)	● Should there be any unanticipated impacts, the IEE and the EMP will need to be updated to account for any additional or new environmental impacts and relevant corrective actions. ● For impacts caused by the project, the Contractor/ material transporters will be fully liable for repair and restoration of any private or government property damaged during construction and material transportation. ● All accidents must be reported. In case of fatalities, this must be reported to ADB within the 48 hours, and corrective actions following the incident must be documented	Contractor	PMU
Completion of Construction work	Risk that sites are not cleaned up and waste remains at site, plantations are damaged or eaten by animals, and foreign workers do not depart from the site (All packages)	**Work sites** ● Upon completion of all work, remove all chemicals, construction materials, debris and dispose these at an approved site ● Dismantle all offices, storage sheds, worker camps ● Seek Thromde approval and empty all septic tanks, cover soak pits with soil and compact it. ● Ensure the entire site is cleaned up, and all barricades removed and restore the site to its pre-construction state. ● If private land was leased, obtain a handing over certificate from the land owner. ● Repair and handover any damaged property whether government or private before handing over the site.	Contractor	PMU

ect Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		Thromde. Evidence of repairs must be included in closure report. **Landslide restoration sites** ● Where new plantations have been carried out, ensure that the site is either fenced or that individual sapling are protected from being grazed by animals or damaged. ● Ensure that all sites are checked and handed over to the Dungkhag or Local Forest Office. **Worker repatriation** Ensure that all foreign workers are repatriated upon completion of work as required by the labor Regulation.		
Operation phase				
	infrastructure may not be resilient, sturdy and sustainable (all project infrastructure)	incorporate an operation and maintenance regime, that includes; ● Allocate annual budget for maintenance work ● Designated personnel to carry out regular check and maintenance work	Thromde	ADB
	Risk to the health and safety of O & M staff	● Ensure that operators of machines are certified and well trained ● Ensure that repair and maintenance workers are provided with adequate benefits, appropriate PPE, briefed on proper standard procedures, regularly guided and supervised.	Thromde	ADB
	Damage to infrastructure and impacts on community health and safety due to natural hazards and disasters	● Strengthen collaboration with National Centre for Hydrology and Meteorology to ensure that timely warning of flood events ● Strengthen dissemination of early and timely warning for people to evacuate in case of a flood event.	Thromde	ADB

Project Activities	Potential Environmental Impacts	Mitigation Measures	Implementation	Supervision
		• Conduct training for communities living along the banks of the river and adjacent to it on • Strengthen Thromde's disaster preparedness and response mechanisms • Monitor active landslide areas to detect changes in slope movements and potential risks • Restrict future infrastructure work in areas where landslides may be triggered • Promote community awareness, mobilization, volunteerism and cooperation for such emergencies		

D. Capacity Building

X. The Thromde has a dedicated Environmental Division with an Officer and assistants. However, the Staff are relatively new to the ADB SPS and may not have the capacity and tools needed to meet their obligations in the project, especially those related to their roles and responsibilities in the project, especially in compliance monitoring, providing guidance for corrective actions and handling unanticipated impacts.

XI. Additionally, traditional Grievance Redress Mechanisms and procedures are not instituted with clear roles and responsibilities for addressing grievances so there is little experience in Grievance Resolution.

XII. Under this project, the following capacity building requirements have been identified:

- Awareness on ADB Safeguards Policy Statement, environmental and social impacts, the need for consultation and information disclosure
- EMP mitigation and compliance monitoring measures; site visits, use of checklists/templates
- Updating the IEE in case of design change or unanticipated impacts
- Reporting procedures in case of accidents and fatalities
- Grievance Redress Mechanism and Procedures
- Chance finds procedures
- Preparation of environmental monitoring reports

Table 2. Recommendations for Capacity Building

Session	Frequency	Target participants	Trainer	Estimated Cost	Remarks
- ADB SPS, - IEE Preparation and updates - Environmental Measures and EMP Implementation - E&S Supervision, Monitoring and Reporting - Health and Safety – workers as well as community - Chance finds procedures	Once	Thromde -PMU staff	ADB, or PISC	1000 USD	Include under PISC consultant cost
- GRM Operationalization	Once	Thromde -PMU staff, Dungkhag and Local representatives	ADB, or PISC	500 USD	EMP budget
- EMP compliance and reporting - Preparation of CEMP, LMP, Code of Conduct, worker grievance mechanism - Construction site standard operating procedures (SOP) - Workers Grievance Mechanism - Traffic management plan - Waste management plan	Once	Contractor's staff and focal persons	ADB, or PISC	500 USD	EMP budget

Session	Frequency	Target participants	Trainer	Estimated Cost	Remarks
- Health and safety management plan - Site closure - Reporting of accidents, incidents, grievances - Emergency preparedness and response plan - Chance Finds Procedure - E&S Supervision, Monitoring and Reporting					
Emergency preparedness and response	Once during construction and during operation (budget permitting)	Thromde, Dungkhag, Community representative	ADB or PISC	1000 USD	Thromde annual budget
Total estimated training cost				3000 USD	

XIII. The capacity building will extend also to contractors, implementing partners such as District and Local Government and community representatives, especially as these play a critical role in SEP and GRM implementation.

E. Budget for EMP Implementation

XIV. The Budget for EMP implementation will be largely borne by the contractor and must be included under the contractor's cost. This will include expenditures for the following;

- Salaries for Environmental Health and Safety Personnel and their assistants
- Cost of establishment of site offices, worker accommodation, land lease as per National Regulations
- Cost of water supply, electricity, waste facilities
- Cost of transporting construction waste to the designated and approved landfill site
- Cost of preparation of all sub plans – contractors EMP, labor management plan, traffic management plan, emergency preparedness plan, Occupational health and safety plan,
- Installation of fire extinguishers, safety signage, signboards, barricades
- Site closure and restoration after completion of all works
- Orientation, induction and trainings for all employees and workers
- Provision of equipment, PPE, first aid box and other required equipment, transportation during emergencies and disasters
- Insurance of staff and workers
- Payment of compensation in case of illness, accidents or fatalities as per national regulation
- Contingency fund in case of grievances or unanticipated incidents resulting in corrective measures.

XV. There are also costs that will be incurred by the PMU. These costs include expenses for consultations, capacity building, compliance monitoring, revision of the disaster management plan and conducting aquatic surveys and air, water and noise monitoring.

Table 3. Cost estimation for EMP measures for PMU

Sl. No.	Particulars	Stages	Unit	Cost (USD) for entire project period	Costs Covered By
1	Public consultation meetings annually	Construction	Lump sum	3000.00	PMU
2	Grievance Redress implementation- conduct of GRC meetings, site visits to assess grievance and meetings with aggrieved person (s).	Construction & Operation	Lump sum	3000.00	PMU
3	Capacity building of staff and contractors	Construction	Lump sum	3000.00	PMU
4	Monitoring study - conduct aquatic surveys annually- to be outsourced	Construction	Lump sum	15,000.00	PMU
5	OHS compliance during Operation and Maintenance	Construction & Operation	Lump sum	2,000.00	PMU
6	Revision of the Disaster and Contingency preparedness plan and Implementation	Construction & Operation	Lump sum	10,000.00	PMU
6	Air, water and noise monitoring	Construction	Lump sum*	10,000.00	PMU
Miscellaneous, Provisional Sum and Contingency @ 5% of the Total					2,300
Grand Total					48,300

**Considered at 2 weeks of input twice a year for 5 years with 1 month for the first year.*

XVI. The Budget for EMP implementation will be largely borne by the contractor and must be included under the contractor's cost. This will include expenditures for the following:

F. Environmental Monitoring Budget

XVII. The Budget for Environmental monitoring will include collection of data on air quality, noise levels, receiving water quality and drinking water (if water is tapped from sources other than Thromde water supply).

XVIII. Laboratory results of environmental quality measurements can be either included under the Contractors cost, (in this case- the contractors must be informed during the pre-bid meeting), or under PISC (added to supervision cost), or Thromde (add to implementation cost). Budget requirement for Thromde to ensure EMP implementation include:

- Salaries for any additional staff hired to assist with Environmental and social activities
- Cost of carrying out environmental quality measurements and laboratory testing
- Cost of transportation for site assessments, supervision

- Organizing and conducting public consultation,
- Communication and information dissemination and updates on project activities
- Organizing grievance redressal meetings (if required)
- Waste management – transportation cost for waste disposal
- Revision and update of the Emergency Preparedness and Response Plan
- Provision of fund for implementation for the EPRP
- Contingency fund in case of unanticipated impacts.

XIX. An assessment of the contractors EMP budget is indicated in the table below. The key expenses for EMP implementation for contractors are provision of accommodation, OHS measures, waste management, training and hire of EHS staff. The total budget for all packages has been estimated at USD 1,430,500.

Table 4. Cost estimation for EMP measures for PMU

#	Particulars	Remarks	Total amount USD
1	Provision of full functional workers' camps for all packages, including drinking water, electricity and sanitation facilities, site drainage, fire extinguishers, and emergency protocols and seeking clearances and permits	3% of contract cost	1,200,000.00
2	Provision of OHS measures for all workers	300 USD per worker	98,000.00
3	Waste Management	Lumpsum	3,500.00
4	Provision of trainings for workers	Lumpsum	10,000.00
5	Human resource requirements – hire of full time EHS staff, and health and safety assistants	Lumpsum	84,000.00
6	Site closure and restoration and unanticipated impacts	Lumpsum	35,000.00
	Total		1,430,500.00

G. Environmental Performance

XX. The Environmental Monitoring Plan is linked to the Environmental Management Plan. Therefore, the environmental performance of the project will be measured against the following criteria:

- Air emissions and dust: number of fires, electrical appliances, and dust control measures during construction.
- Water supply: provision of adequate water for construction and domestic use by staff and workers.
- Waste disposal: receipt of permits, number of truckloads of excavated materials, and waste segregation, reuse, recycling, and disposal.
- Traffic congestion: number of accidents due to material transportation.
- Worker Health and Safety: record of accidents and emergencies with preventative actions.
- Community health and safety: number of grievances and complaints received during project construction and operation.
- Compliance with Environmental Clearance terms and conditions.

- Compliance with ADB's loan covenants, relevant laws, rules, regulations, guidelines, and standards.
- Provision of adequate worker accommodation facilities.
- Compliance with occupational health and safety provisions, worker trainings, accident documentation, and corrective actions.
- Creation, notification, and implementation of the Grievance Redress Mechanism.
- Community health and safety: measures taken to minimize risks and number of grievances received during construction and operation

XXI. MONITORING AND REPORTING

XXII. Due to limited social impacts, environmental and social monitoring reporting will be combined into an annual EMR. PMU will submit this combined report to ADB up to the operational stage, with safeguards inputs contributing to semi-annual reports. Post-operation, PMU will continue to submit the EMR annually.

XXIII. Following loan effectiveness, annual EMRs are due to ADB within 45 days after the end of each reporting period (i.e., before mid-February). These reports will detail project implementation progress, any changes to scope or design, adherence to environmenta l and social safeguard requirements outlined in the loan covenant, progress in implementing environmental mitigation measures, quantitative monitoring results as per the EMoP, and information on any grievances received.

XXIV. Where there are breaches, or where performance is not found to be satisfactory, or if there are unanticipated incidents, Thromde/PMU and/or its contractors will develop and implement a CAP, with agreed timelines and budget, in consultation with ADB. The CAP will aim to rectify any safeguard non-compliance or mitigate unanticipated incidents.

XXV. All EMR, CAPs and updated IEEs submitted by Thromde will be reviewed by ADB. Only once these are cleared, these documents can be disclosed at the project website, office and by ADB website upon receipt.

XXVI. Table 38 outlines the monitoring plan for the project as per the activities. The PMU/Thromde must monitor the implementation of the EMP as per the indicators and frequency and prepare and submit compliance reports, while the contractor is responsible for daily/weekly monitoring and submission of reports to PMU.

Table 5. Environmental Monitoring Plan

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
Pre-Construction					
1	Clearance and Approvals	Number and types of clearances and consents obtained	One time	Thromde and Contractor	PMU
2	Incorporation of EMP into bid documents	Inclusion of EMP in bid document	One time	PMU	PMU
3	EMP compliance and implementation	Budgeting for EMP, OHS by contractor		Contractor	PMU
4	Establishment of GRM	Formal office order designating committee members	One time	PMU	PMU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
5	Contractor briefing/awareness on EMP requirements	● Minutes of pre-bid meeting with contractors ● Contractor's attendance sheet	One time	PMU	PMU
6	Project disclosure and information	● Project IEE disclosed on Thromde Website ● EMP copy at contractors' site office. ● Project contact number on signboards	One time	PMU and Contractor	PMU
Construction phase					
9	Consents and Permits	● Tree removal ● Waste disposal	One time	Contractor	PMU
10	Recruitment of workers	● No. of workers (nationals/foreign-by gender) ● No. of skilled and unskilled workers ● No. of workers below age 18	During recruitment	Contractor	PMU
11	Worker's welfare (health and safety)	● No. of worker camps ● Availability of safe drinking water, electricity and sanitation facilities (with separate toilets for males and females) ● PPE distribution list/records ● Ocular inspection of the cleanliness of worker camps ● safety structure installed ● Overtime facilities provided ● Emergency Contact numbers displayed ● Assembly points identified ● Emergency protocols ● First aid kid ● Warning signs at risky/hazardous areas ● Records in accident register with incidents and actions taken. ● No of fire extinguishers installed at site ● Type and no. of trainings (training record)	Monthly	Contractor	PMU
12	Worker health and safety	● Designation of EHS focal person ● PPE distribution list/records ● Safety structure installed ● Emergency preparedness plan and protocols in place (-Emergency Contact numbers displayed, assembly points identified) ● First aid kit (status) ● Warning signs at risky/hazardous areas	One time and as required	Contractor	PMU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
		● Records in accident register with incidents and actions taken. ● No of fire extinguishers installed at site and condition of these ● Number of worker grievances and status ● Type and no. of trainings (training record, participant list and photos)			
13	Air pollution	● Use of electrical appliances ● Ocular observation of vehicle emissions ● Ocular observation of site conditions during excavation, materials storage ● Dust suppression measures being implemented ● Number of complaints on dust by community/residents	Monthly	Contractor	PMU
14	Water supply for drinking	● Source of drinking water ● Water quality test results if the drinking water is not sourced from Thromde	One time	Contractor	PMU
15		● Measures taken during periods of shortage (e.g. storage tanks/drums) ● Water conservation measures ● Ocular observations of leaking pipes	Monthly	Contractor	PMU
16	Water supply for construction	● Source of construction water ● Approval to abstract water for construction	One time	Contractor	PMU
17	Impact on rivers and streams	Ocular observation of the sites to check for disposal of waste (solid and liquid) into rivers and streams	Monthly	Contractor	PMU
18	Excavation work	Ocular observation of soil management, disposal over slopes, reuse or storage and disposal	Monthly	Contractor	PMU
19	Waste management of worker camps, construction sites	● Number and types of waste collection receptacles ● Types of solid waste segregated and reused ● Ocular inspection of camps and construction site ● Segregation and storage of hazardous waste ● Waste generation, storage and disposal records including number of truckloads of construction waste disposed of	Monthly	Contractor	PMU

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
20	Noise pollution and disturbance to the local community	● Number of complaints received from neighboring community ● Noise monitoring ● Grievance log	Monthly	Contractor	PMU
21	Site drainage	● Site drainage construction and maintenance ● Ocular observation of site drainage at work site and worker camps	Monthly	Contractor	PMU
22	Congestion and blockages/obstructions	● Number of complaints on congestion caused by construction traffic ● Ocular observation of road conditions (spillage of construction material along access road, blockage of drains and footpaths) ● Grievance log	Monthly	Contractor	PMU
23	Material storage	● Number of material storage sheds ● Ocular observation on material storage at site	One time and Monthly	Contractor	PMU
24	Community health and safety	● Consultation with community (minutes of meeting, participant list) or notifications ● Number of safety/warning signs ● Installation of barricades ● Obstruction of access routes/paths ● Number of accidents ● Installation of fire extinguishers ● Grievance log	Monthly	Contractor	PMU
25	Impact on Aquatic life	Number of illegal activities reported/detected	Monthly	Contractor	PMU
26	Removal of trees and vegetation clearance	● Number of trees removed ● Compliance with terms and conditions of the EC and FC	Monthly	Contractor	PMU
27	Impact on Physical Cultural Resources	Grievance log Implementation of chance find procedures	Monthly	Contractor	PMU
28	Unanticipated incidents	Ocular observation of site conditions Incident report and corrective actions	Monthly	Contractor	PMU
29	Camp closure	Ocular observation of site conditions and compliance to EMP	One time	Contractor	PMU
Operation phase					
30	Operation and maintenance	● Maintenance records/Number of repairs carried out ● Number of persons (including women) employed/engaged in O & M ● Worker OHS systems	Annually	PMU	Thromde

No.	Activity	Method of Measurement/Indicators	Frequency	Responsibility	
				Implementation	Monitoring
31	Natural hazard and disasters	● Early warning systems installation and network and coordination meetings ● Repair work or restoration of damaged infrastructure	Annually	PMU	Thromde
32	Accountability and Grievances	Number of grievances and actions taken	Annually	PMU	Thromde
33	Waste management	Maintenance record	Monthly	PMU	Thromde

XXVII. ADB will carry out the following monitoring actions to supervise implementation of the overall project:

(i) On a need basis, conduct site visits for projects with potential adverse environmental or social impact;
(ii) Conduct supervision missions with detailed review by ADB's environment/social safeguard specialists and/or officers and/or consultants for projects with adverse environmental and social impacts;
(iii) Review the EMRs submitted by PMU to ensure that adverse impacts and risks are mitigated as planned in the EMP;
(iv) Work with Thromde to rectify to the extent possible any failures to comply with its environmental safeguard commitments, as covenanted in the loan agreement and elaborated in all environmental safeguard documents; and formulate and implement a corrective action plan to re-establish compliance as appropriate; and
(v) Prepare a PCR that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

XXVIII. ADB's monitoring and supervision activities must be carried out on an on-going basis until the PCR is issued. ADB normally issues a PCR within 1-2 years after the project is physically completed and in operation.

In accordance with Sub-Clause 4.18 of the Conditions of Contract the Contractor shall prepare and submit the **Contractors Environment Management Plan (CEMP).** The Contents list of the CEMP shall reflect the environmental and social requirements and all the provisions in the Contract related to the protection of the environment. The CEMP shall address all environmental and social matters relevant to the Works, which shall include as a minimum, but not be limited to, the following subjects:

Construction Works Mitigation Sub-Plan

(i) sets out the construction methodology and proposed environmental mitigations (including site specific plans at each work site with proposed air quality, noise and water quality runoff mitigations)

(ii) Quarry/Borrow and Disposal area Management Sub-Plan (if required subject to proposed location)

(iii) Site layout showing work areas, proposed air quality, noise and water quality runoff mitigations

(iv) Operational Monitoring Compliance Checklist.

Camp Management and Site Security Sub-Plan

(i) Site layout showing office and security features (e.g. Guard post, perimeter fencing, Identity card)

(ii) Workforce employment breakdown (Professional, skilled, semi-skilled, unskilled)

(iii) Camp workforce community and security rules and training proposals

(iv) Employment Visa restrictions

(v) Proposed water supply sources and treatment

(vi) Proposed drainage system

(vii) Proposed liquid waste management system kitchen grease trap, proposed grey water and blackwater treatment

(viii) Proposed solid waste system including hazardous waste

(ix) Storage area for fuel, lubricants, hazardous material

(x) Proposed Operational Monitoring Compliance Checklist

Occupational Health and Safety Sub-Plan

(i) Community Relations Protocol (by arrangement with PISC)

(ii) STD/ HIV AIDS Implementation & Training Schedule

(iii) Worker Clothing and Equipment

(iv) Weekly Safety Tool Box Schedule

(v) Proposed Operational Monitoring Checklist

Traffic Management Sub-Plan

(i) Coordination with Thromde (municipality)

(ii) Proposed route(s) for truck traffic with weekly haul schedule

(iii) Arrangements to ensure public connectivity

(iv) Proposed Signage

(v) Equipment including Patrol Vehicles

(vi) Proposed operational Monitoring Checklist

The civil works contractor(s) will be responsible for preparing the CEMP during the mobilization phase of construction after contract award. The PISC environmental safeguards specialist will make recommendations on further conditions if required and PISC environment specialist will approve the CEMP before any construction work commences. The Contractor will undertake its own monitoring and prepare an environmental and social section of the monthly report to the PMU/PISC. The Contractor is responsible for implementing all sub plans including environmental, health and safety actions included in the CEMP and relevant clauses in the bidding documents.

The Contractor is required to mobilize the designated environmental safety officer (ESO) on notification of contract award and mobilization. The responsibilities will include:

(i) Coordinating with the PMU/PISC during preparation and approval of the CEMP

(ii) Preparation of the CEMP

(iii) Ensuring that the contractor engages a suitable organization to undertake STIs/HIV/AIDS briefings and awareness raising amongst the contractor's employees and neighboring communities follow-up upon request

(iv) Coordinating with PMU and PISC in respect of community consultation

(v) Participating in monitoring and coordinating with PISC to ensure that environmental management activities are reported as required

(vi) Ensuring that the contractor does not commence construction activities until requisite approvals have been received from PISC and any other Government permitting agencies such as the NEC.

(vii) Coordinating and communicating with the contractor's Liaison Officer (LO), as required, to facilitate consultation with the affected communities, various stakeholders, and ensuring smooth implementation of the subproject

The Contractor will be responsible for project environmental monitoring and Environmental Quality (ambient) monitoring during preconstruction, construction and post-construction. The PISC will be responsible for quality control and verifying the monitoring undertaken by the contractor through audits and spot-checks. The outcomes of the project related monitoring will be included in the overall safeguards monitoring progress reports to be submitted to NEC and ADB by PMU/PISC. These will also be consolidated and submitted to ADB for review on a designated time period as required and disclosed on the ADB website.

The Contractor shall be responsible for all environmental monitoring and mitigation measures in accordance with the Contract and the details of the Employer's Requirements, the cost of which shall be included in his rates and prices.

6. Supplementary Information Regarding Works to Be Procured

6.1. Setting Out of the Work

1. There are permanent Bench Marks fixed by National Land Commission Secretariat (NLCS) of Bhutan which shall be the primary reference points. All survey, including reduced levels will be in accordance with the Bhutan National Grid (Compound CRS, DrukRef 03 + EGM2008).

2. Temporary Bench Marks shall be set up by the Contractor at every 0.2km interval at convenient locations along the river to serve as reference levels. The Contractor will ensure they are not damaged or disturbed. The Contractor shall establish additional reference Bench Marks as may be needed for facil itating the setting out and taking levels for measurement of work, with the approval of the Engineer. The Bench Mark shall be marked on a concrete pillar 30cm (1) x 30 cm (b) x 75 cm (d) which shall be embedded 55 cm into firm ground and projecting 20 cm above the ground. The Bench Mark pillar shall be constructed in plain cement concrete of 1:4:8. The pillar shall be well protected from being disturbed. The RL of bench mark shall be conspicuously carved and painted on the pillar.

3. Before starting any work and during execution (if required), the Contractor shall erect reference Bench Marks, reference lines and profiles of convenient location as per the direction of the Engineer. The center line of the river and the reference line for all alignments for demarcation purpose shall be laid by marker pegs on the ground. The reference line shall comprise the base line properly marked by pegs on the ground with the numbered concrete/masonry pillars suitably spaced.

4. All materials and labor required for setting out works including construction of reference bench mark, reference line, check profiles and surveys, as may be required at the various stages of the constructio n shall be supplied by the Contractor at his own cost.

6.2. Weather Conditions

The project site is located at about 200m above sea level in the Himalayan foothills. The peak wind intensity is 100km/hr. The annual precipitation is in the range 4000–5000mm. The Contractor is advised that the detailed rainfall data, stream flow and rating records are available in Bhutan from National Centre for Hydrology and Meteorology (NHCM), Ministry of Economic Affairs.

Working Period: The Contractor is expected to schedule the major work during the period between September to May. The monsoon period is typically during June to August, however heavy rainfall may occur during any period of the year.

The Contractor shall not be entitled to any additional payment by reason of the occurrence or either direct or indirect effect of high winds, excessive rainfall, high or low temperatures, high or low humidity, ultraviolet radiation, high ground water levels, flood flows in surface water courses or any other meteorological phenomena.

6.3. Monsoon Damages

Damages due to rain either in cutting or in banks shall have to be made good by t he Contractor till the work is handed over to the Thromde. The responsibility for desilting and making good the damages due to rains rests with the Contractor. Contractor is also responsible for protecting his works, machinery, materials and manpower from floods during monsoon. No extra cost is payable for such operations and the Contractor shall therefore have to take all necessary precautions to protect the work done during the construction period.

During monsoon, if emergency river protection/ diversion works are deemed necessary by the Engineer, the Contractor shall carry out the same as per the design provided by the Engineer. The cost of such emergency work is included in bill of quantities.

6.4. Cross Drainage

The Contractor shall handle all flows from natural drainage channels intercepted by the work under these specifications and perform any additional excavation and grading for drainage as directed and provide and maintain any temporary construction required to bypass or otherwise cause the flows to be harmless to the work and property. When the temporary construction is no longer needed and prior to acceptance of the work the Contractor shall remove the temporary construction and restore the site to its original condit ion as approved by the Engineer. No separate payment will be made for the same.

6.5. River Materials

Backfill materials from the river bed/borrow areas should be processed to meet the quality standards of fill materials described in the specifications. During the segregation process there will be substantial quantity of materials generated which may not be used for backfill (like boulders). The Contractor can use these materials (with proper value addition) for construction, provided it meets the required specifications.

6.6. Disposal Areas

All suitable material removed in excavation or as much thereof as may be needed as determined by the Engineer shall be used in the construction of river embankments, selected bedding material or for backfill around structures. If there is excess of material in the excavation for any reach, it shall be used to form the temporary river diversion works in low areas to eliminate trapped drainage as directed by the Engineer. The disposal of excavated material shall be in accordance with clauses 8.1 and 8.2 of B.I. S. 4701 – 1982. All extra material shall be so disposed of as not to result in unsightly heaps and shall be levelled and properly dressed.

Any materials/spoil removed during excavation and considered not suitable for embankment, backfill or other required earthwork, shall be disposed in designated waste disposal areas owned by or controlled by the Phuentsholing Thromde, and as directed by the Engineer.

The Contractor may utilise the designated disposal areas for spoil material arising from works provided always that there remains sufficient area to accommodate the material produced from the work site. In case the Contractor is unable to utilise the designated disposal areas for any spoil material arising, or prefers to find disposal areas closer by, then the Contractor shall be wholly responsible for identifying all such areas, obtaining all permissions and licenses required under the law and prevailing regulations and to use them for the disposal of spoil and the written permission of the Engineer, making all necessary preparations for the areas including with respect to security, safety and protection of the environment ,and reinstating all such spoil areas after completion of their use to the satisfaction of the Engineer.

6.7 Information on land ownership and compensation

All land in which the work is to be executed is owned by the government, no private land acquisition or use is necessary. Works have been designed and shall be implemented to totally avoid any impacts on private lands and assets. For any unanticipated impact/damages to be caused to private owners due to construction works Contractor would be responsible and would make good the damages at its own cost as directed by the Engineer. Compensation to the private owners shall be as per ADB SPS 2009 or restore the damages, if any. Responsibility to handle and manage the Project grievances shall be of the Employer's Representative.

6.8 Specific Social Safeguards Requirements

(i) The contractor will be responsible for dissemination of information and prior information of the construction work to the public through pre-construction public consultation.
(ii) The contractor himself shall deploy his team members to carry out intermittent consultation with community around the construction site for any positive/negative impact.
(iii) The contractor will support the executing agency in meetings, consultations, and site-level grievance resolution.
(iv) The Contractor shall maintain access to residences, shops, and social, cultural, religious or any other structures irrespective of the nature and purpose of use during the construction period; by making necessary arrangements like provision of planks with handrails, displaying proper signages, using footbridge with handrails (where required) etc. to avoid any potential adverse impact
(v) The Contractor will ensure that works are undertaken only on available vacant and unused government land or within the existing right of way where no temporary or permanent impact is envisaged.
(vi) If additional land area is (temporarily) required for the construction work and/or materials storage purpose, and if taken on lease or on rent then, rent agreement or the lease deed will be required.
(vii) If during construction works, any additional area or property is damaged, it will be rebuilt and restored. In case of impossibility to rebuild or restore the property or any impact on it such as trees, crops and other improvements, corrective action plan should be prepared and the compensation should be provided to the owner/user according to the principles of ADB Safeguard Policy Statement (SPS).
(viii) The contractor to appoint or designate a person as a Social / Gender Safeguard Officer at the site for the entire construction period, who will be responsible for implementing and monitoring social safeguards issues and ensuring that they are addressed in a timely and appropriate manner.
(ix) The contractor will put up a "grievance box" at the site for anyone to put up complaints in connection to any negative impact due to the construction works. Contractor will maintain a grievance register at the site to record all types of grievances received from the complainant and also assist them in lodging any complaint clearly mentioning the name and contact details, date and time of complaint, nature of the complaint, mode of complaint (written, telephonic etc.) and redress them within 10 days of receipt of any such complaint. In a situation where the complaint can't be addressed by him, he will have to inform/report to the Employer's Representative involving them in resolving the same.
(x) Contractor will be responsible for timely escalation and reporting on status of grievances, documentation of pre-construction and post-construction status of sites and alignments, documentation of avoided impacts during construction, if any and documentation of unanticipated impacts, if any and alerting the Employer's Representative regarding such impacts, apart from managing and maintaining all the relevant safeguards documents.
(xi) The contractor with support of Employer's Representative will conduct monthly Grievance Redressal meetings for the addressal of unresolved complaints. The contractor to maintain all safeguards documents in relation to the activities being taken up. The documents include, grievance register, grievance formats, and so on.
(xii) The contractor will ensure no trespassing/entry for anyone, particularly children at the construction site without permission.

APPENDIX II

TECHNICAL SPECIFICATION

This Section contains the Technical Specifications of the Works (to be read in conjunction with the General Specifications in the Bidding Documents).

List of Abbreviations

ASTM	American Society for Testing and Materials
BIS	Bureau of Indian Standards
BS	British Standards
BSR	Bhutan Schedule of Rates
EN	European Standards
IRC	Indian Roads Congress
MOIT	Ministry of Infrastructure and Transport (Royal Government of Bhutan)
MORTH	Ministry of Road Transport & Highways (Government of India)

PREAMBLE

The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents as specified in this volume. All work shall be carried out in confirmation of the specifications. These specifications broadly cover all major aspects of the work involved. Minor details may not be specified here. However, if they are necessary for completion of the work, the Contractor shall execute such minor items without any additions to the costs. All work shall be executed in accordance with sound engineering practices. In case of any discrepancy or contradiction in any of the provisions of the specification, the order of the precedence as below shall be followed:

1. MOIT, Bhutan Schedule of Rates – 2025, and Specifications for Building and Road Works - 2025
2. Technical Specifications
3. MORTH Specifications published 1 month prior to bid invitation
4. IRC provisions
5. BIS provisions
6. Manufacturers specifications for special items
7. Sound Engineering Practice

The Contractor shall remain responsible for workmen's compensation if any, when such case occurs. The Contractor shall be responsible for any damage of life or property, during the execution of the work. In case of dispute or overlooked items, the decision of the Engineer shall be final. The Contractor shall have to give the site clean of all rubbish on completion of the work and handover the site with final finishing as directed. All rejected materials shall be removed from site within 24 hours by the Contractor at his risk and cost.

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

SECTION 100 - GENERAL REQUIREMENTS

101 GENERAL

The Technical Specifications and Bill of Quantities shall be read in conjunction with the other Contract Documents. All the documents and drawings are to be regarded as mutually explanatory. In the event of any discrepancy or assumed discrepancy being found between them, the Contractor shall immediately inform the Engineer of the matter in writing and the Engineer will issue his instructions in the matter in accordance with the Conditions of Contract.

The Sections, Clauses and/or Sub-clauses mentioned in these Specifications deem to apply to these Specifications only, if otherwise not specified. The Specifications or Technical Specifications shall denote the same meaning of the specifications.

102 PROGRAM OF WORKS

As soon as possible after the letter of acceptance and before signing of the Contract Agreement, the Contractor shall submit in triplicate the Program and particulars required under the General Conditions of Contract. The Contractor shall provide all information needed for fulfilment of the Program and required in accordance with the Conditions of Contract including the sequence in which the Contractor intends to work including implementation of quality assurance plan. In the Program and particulars the Contractor shall provide details of how the Contractor proposes to carry out the Works including:

(1) The Program for the construction and completion of the works shall be established using CPM/PERT techniques or equivalent. The Program shall be sufficiently detailed to give, in addition to construction activities, detailed network activities for the submission and approval of materials, procurement of critical materials, procurement/rental/leasing of equipment, progress milestones, fabrication of special products/equipment if any and their installation and testing, and for all activities of the Engineer that are likely to affect the progress of work. It shall be prepared so as to permit revisions, inclusion of additional detail and regular updates as the work progresses. The Program shall also include the Contractor's general requirements for any road closures pursuant to Clause 105 of the Technical Specifications to be agreed in principle with the Engineer. Such agreement shall not relieve the Contractor of his responsibility to obtain specific approval for each closure or series of closures. In all respects the Contractor shall pay particular attention to seasonal weather patterns including rainfall and snow conditions (if any), and the construction sequencing while preparing the Program and executing the Works in accordance with this. Any proposal for night working shall also be stated in the Program.

(2) A detailed Statement of Construction Management Procedures the Contractor proposes to adopt.

Once approved by the Engineer the Program and Statement of Construction Management Procedures shall be incorporated in the Contract Agreement and shall be strictly adhered to unless any alterations are found to be necessary during the construction of the Works and are confirmed in writing by the Engineer. If the Contractor requests a change in the sequence and such change is approved by the Engineer, the Contractor shall have no claim as per the Conditions of Contract for delay arising from such revisions to the Program.

The Contractor shall update all activities in accordance with the Conditions of Contract on the basis of the decision taken at the periodic site review meetings or as directed by the Engineer.

The Contractor shall furnish, at least 14 days in advance, his site work program of commencement of item of work, the method of working he intends to adopt for various items of work such as site clearance, construction for embankment, culverts, retaining walls, and such other items for which the Engineer demands the submission of the method of working. The Contractor shall provide information regarding the details of the method of working and equipment he proposes to employ and satisfy the Engineer about the adequacy and safety of the same. The sole responsibility for the safety and adequacy of the methods adopted by the Contractor will, however, rest on the Contractor, irrespective of any approval given by the Engineer.

103 INSURANCE

The Contractor shall provide and maintain the insurance cover in accordance with the General Conditions of Contract from an approved insurance company from the start date to the end of the Defects Liability Period. Contractor will be paid upon providing evidence of insurance as per contract terms.

104 SUBMITTALS

1 General Requirements

The Contractor shall maintain an approved system of recording and tracking submissions indicating dates, status (i.e. approved, not approved, approved subject to conditions), quantities, and other details as required.

Copies of all approved submissions will be retained securely and properly filed on site, available for reference by the Engineer at any time.

2 Contractor's Monthly Progress Report

The Contractor shall submit monthly progress reports to the Engineer in triplicate and showing actual work done superimposed upon copies of the program. He shall furnish an explanation of any deviation from the Program stating his proposals for improving progress should this be lacking in any respect and he shall furnish the Engineer with his amended critical path analysis in triplicate. The Contractor shall comply with the reporting requirements on implementation of the Environmental Management Plan in the monthly report following the guidelines provided by the Engineer.

The contractor shall submit monthly Laboratory/Field test reports including cumulative number of tests done in the prescribed format. If required, the Engineer shall ask the contractor to submit quarterly Fund Projection Statements.

3 Samples

(1) The Engineer may at his discretion request or take samples of any material or product intended for use in the Works. Where samples are requested in the Specifications they shall be submitted in the number requested or if not specified then as directed by the Engineer.

(2) Samples shall be of the type and size specified and fully representative of the materials proposed to be used.

(3) Samples shall be indelibly and clearly marked with the date of submission, material reference and any other data required to determine the source and kind of sample.

(4) One or more samples of each kind submitted will either be returned marked "ACCEPTED" and signed by a representative of the Engineer or the Contractor will be requested to provide new samples and be notified of deficiencies present in the submitted samples.

(5) One or more "accepted" samples will be retained by the Engineer for comparison with materials and workmanship supplied and will form the standard of acceptance.

(6) One or more "accepted" samples shall be retained at the Contractor's site office and be available for reference on request.

(7) The Engineer may reject any materials and goods which in his opinion are inferior to the samples thereof previously approved and the Contractor shall promptly remove such materials and goods from the Site.

4 Copies of Orders

The Contractor shall provide the Engineer with one copy of all orders for the supply of materials and goods required in connection with the Works as the Engineer may require.

5 Site Trials

Site trials/mock-up of works as specified shall be prepared by the Contractor for review and acceptance of the Engineer. They shall be in a location agreed with the Engineer, and if so specified may be incorporated into the work in a clearly identified position upon approval of the Engineer. The Contractor shall carry out such changes or carry out field trials as required to obtain the Engineer's approval. Approved field trials shall form the standard of acceptance of subsequent materials and workmanship.

6 Construction Drawings

a) The Contractor shall prepare and submit construction drawings for details of construction work.

b) The construction drawings shall show at a suitable scale all the particulars of the work including dimension, materials, finishes, lines, levels, tolerances and other details to show compliance with the specification, the suitability of item for its compliance.

c) The Engineer and his representatives will review the drawings only for their general compliance with the intent of the drawings and specifications. Responsibility for accuracy of dimensions, technical design, performance and suitability for intended purpose of the items shall remain with the Contractor.

d) Four (4) print copies and one soft copy of each construction drawing shall be submitted in sufficient time to allow for review, possible revisions and resubmission for approval prior to ordering materials, coordinating all affected and contingent work without delay to the schedule of construction.

e) Two copies of all construction drawings will be retained by the Engineer. The remaining copies will be returned to the Contractor signed by a representative of the Engineer and marked "REVIEWED" with either:

- a request for resubmission and notes as to deficiencies;
- a note indicating the drawing has been reviewed but is subject to conditions noted or listed, and does not require resubmission; or
- a note indicating the drawing has been reviewed and is considered to meet the intent of the design and does not require resubmission.

f) The drawings shall be submitted at least two weeks before the commencement of construction of work for which these drawings are intended.

g) Do not commence construction until drawings have been reviewed and are returned under the Conditions of Contract except where instructed by the Engineer.

h) Do not commence order for materials or products until drawings have been reviewed and are returned under Conditions of Contract except when instructed by the Engineer.

7 As Built Drawings

At least one month prior to the end of the Defects Liability Period, the Contractor shall submit As Built Drawings. It is advisable that the Contractor prepares the as-built drawings as the work is completed at the site to facilitate checking and verification. The following requirements will apply:

(a) The drawings shall be prepared in the latest version of AUTOCAD.

(b) The drawings shall include all available information on existing conditions as well as new construction.

(c) Drawings shall be at a scale suitable for easy reference and as required to clearly depict all required information as directed by the Engineer.

(d) The Contractor shall conduct such on-site checks as required to ensure the accuracy of the as-built drawings.

(e) One original and four copies of drawings shall be submitted in bound sets sub-divided by discipline. Copyright of all materials submitted will remain with the Employer without further compensation or charge.

Measurement and Payment

No separate measurement and payment shall be made for above items under Clause 104 of the Technical Specifications. All costs in connection with the work specified herein shall be considered included with other related items of the work in the Bill of Quantities.

105 ACCOMMODATION OF TRAFFIC

(1) Scope

This Clause covers the construction and maintenance of the necessary detours and diversions, barricades and signs, and everything necessary for the safe and easy passage of all public traffic during the construction period and also the removal of diversions as they become redundant including bringing up the area under use into its original condition. The Contractor shall take necessary safety procedures regarding traffic diversion or temporary road closures that are needed in execution of the works. The Contractor shall take precaution regarding safety at road works.

(2) Temporary Diversions

(a) Provisions of Diversions

Wherever traffic diversions are required, diversion roads as required shall be constructed.

(b) Survey Stations and Points

The survey stations and control points shall not be damaged or displaced. In exceptional cases where this is not possible, arrangements shall be made to have survey control points suitably referenced before they are displaced.

(c) Access to Properties

Access to properties which fall within or adjoining the area over which work is being carried out shall be provided in the manner as existed before the start of the work.

(d) Temporary Works

If diversions are provided they shall include the construction of temporary gates, grid gates, fences, drainage works, and other incidentals considered necessary.

(e) Public Services

Arrangements shall be made for the continuity of all public services such as power lines, telephone lines, water mains, sewerage, drainage, etc., if the existing services are likely to be affected.

(f) Temporary Drainage Works

All necessary temporary drainage works required for proper surface run-off, such as side drains, catch drains, temporary cross-drainage structures, etc. shall be constructed.

(5) Traffic Safety and Control

The Contractor shall provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required for the information and protection of traffic approaching to or passing through the site.

Measurement and Payment

No measurement and/or payment shall be made for works required under Clause 105 of the Technical Specifications. All costs in connection with the work specified herein shall be considered to be included with other related items of the work in the Bill of Quantities.

106 SURVEY AND SETTING OUT

(1) During the period of Commencement of works the Contractor shall re-establish the survey stations and bench marks and confirm the co-ordinates and levels of the stations. He shall immediately notify the Engineer of any discrepancies and shall agree with the Engineer any amended values to be used during the contract, including replacements for any stations missing from the original stations.

(2) The Contractor shall check, replace and supplement as necessary the station points and agree any revised or additional station details with the Engineer.

(3) All stations and reference points shall be clearly marked and protected to the satisfaction of the Engineer.

(4) Where a survey station point is likely to be disturbed during construction operations, the Contractor shall establish suitable reference stations at locations where they will not be disturbed during construction. No old station shall be covered, disturbed or destroyed until accurate reference stations have been established and details of such stations have been approved by the Engineer.

Measurement and Payment

No separate measurement and/or payment shall be made for the work required under Clause 106 of the Technical Specifications. All costs in connection with the work specified herein shall be considered included in the related items of the work specified in the Bill of Quantities.

107 MAINTENANCE OF ACCESS ROADS

The Contractor shall maintain the section of roads that the Contractor uses for construction or access to site. The access roads shall be identified and notified in advance to the Engineer for inspection prior to use.

Measurement and Payment

No separate measurement and payment shall be made for the works described in this Clause. All costs in connection with the work specified herein shall be considered included in the related items of work in the Bill of Quantities.

108 NOTICE BOARD

The Contractor shall erect and maintain notice boards (2m x 1.2m) giving details of the contract in the format and wording as directed by the Engineer. These boards shall be erected within 14 days after the Contractor has been given the Possession of Site.

The Contractor shall not erect any advertisement sign board on or along the work without the written approval of the Employer.

All sign boards shall be removed by the Contractor by the end of the Defects Liability Period.

109 ENVIRONMENTAL PROTECTION WORKS

The environment has been defined to mean the surrounding area including human and natural resources to be affected by execution and after completion of works.

The Contractor shall take all precautions for safeguarding the environment during the execution of the contract. He shall abide by all prevailing laws, rules and regulations governing environmental protection. The Contractor shall follow the requirements specified in the Environmental Management Plan for the environmental protection and management of the works carried under the contract. The Contractor shall be responsible to implementation of the Environmental Management Plan (EMP) and compliance with it. As party to this the Contractor shall follow the guidelines and submit the required information on monthly basis for monitoring of the EMP implementation by the Engineer. The Contractor at all times shall ensure that requirements of EMP are fulfilled.

The Contractor shall prohibit employees from unauthorized use of explosives, poaching wildlife, fishing and cutting trees. Where possible the workers must be provided with kerosene for cooking. Where it is not possible to get kerosene firewood must be provided by purchasing it through the local firewood contractor. Where there is no local firewood contractor, proper forestry permits must be obtained for collection of firewood. The Contractor shall be responsible for the action of his employees.

Environmental protection works, among others, shall also include the following:

(1) Provision and Maintenance of Camps, Offices, Stores, Equipment Yards and Workshops. Various works defined under this item are related to the provision and maintenance of camps for workmen and employees, Contractor's site offices, temporary accommodation to the supervision engineers, stores, equipment yards and workshops. These camps must be adequate, rain-proof, spacious, airy and hygienic with proper lighting and materials storage facilities. The area shall be kept neat and clean. Space allocated for storage of materials such as cement, gabion wire, reinforcing wire etc. shall in general be damp-free, rain-proof and away from petroleum products storage. Permission may be granted by the Engineer to erect temporary suitable camps within the right of way free of charge, if such establishments do not cause obstructions to traffic, nuisance to works execution and adverse effect to the environment. Camps must be located in stable areas where there are no possibilities of landslides or erosion. To prevent disturbance to nearby communities the labor camps must be located at least 500 m away from the nearest settlement.

Written information must be given to and approval be taken from the Engineer regarding proper establishment and maintenance of such camps. Failure in compliance with Engineer's instruction in respect of overall standard will lead to reduction or with holding of any payment to the Contractor.

The Contractor shall ensure that proper drinking water, waste disposal and toilet facilities are provided to the camps. This arrangement shall be enforced to avoid proliferation and generation of various water borne diseases. The Contractor shall inform the Engineer regarding sources, installation and operation of supply of potable water within a week after the supply is commenced.

Provision of toilets for labour and employees and supervision engineers shall be made to avoid public nuisance as well as pollution of water courses and air. Toilets shall not be located near streams or rivers. The Contractor shall construct suitable septic tanks and/or soak pits along with room of pit-type latrines. Sufficient water must be provided and maintained in the toilets. Proper methods of sanitation and hygiene should be employed during the whole project duration. The contractor shall provide waste disposal facilities such as dustbins and waste disposal pits.

A first aid kit along with proper medical supplies must be available in each of the camps for treating injuries or common health problems. Services shall also include on-the-way service and other arrangements required for taking them to the nearest hospital in case of emergency. If imported laborers are required for construction, proper medical tests of the laborers shall be carried out to prevent the spread of diseases such as STIs and HIV/AIDS amongst the communities near the construction sites. The scope of work shall include service of at least one part-time experienced health worker/health assistant with a minimum of once a week full time site visit as work assignment. The Contractor shall also supply and provide adequate medicines and facilities required for standard first aid. The Contractor shall inform the Engineer regarding the medical facility within a week after its establishment and operation.

All workers shall be provided with adequate safety wear such as, water boot, gloves, face masks, ear plugs, helmets, safety jackets and safety belts to prevent injuries and health hazards.

During shifting of the camp all trash and unwanted material must be burnt or disposed of properly. Pit latrines must be adequately covered. Areas without any vegetation must be re-vegetated carrying out appropriate bioengineering works.

The Engineer shall have the power to order basic facilities put in place through day work or local laborers and or procure such basic facilities to maintain adequate safety and hygiene for the Contractors workers/employees and deduct the same from the Contractor"s running bill in the event the Contractor does not comply the requirement as per environmental and as per labour laws of the Kingdom of Bhutan.

(2) Site Clearance and Removal of Top Soil

Loss of trees and vegetative cover is a permanent impact that cannot be avoided. However, the Contractor shall take all measures to minimize removal of vegetation and remove only what is necessary for the construction of the works. During clearing activities the Contractor shall make efforts to not to disturb or destroy the vegetation surrounding the river works alignment. Proper clearing and grubbing procedures shall be followed. The Contractor shall store top soil off the cleared area and reuse for carrying out bioengineering activities, as appropriate.

(3) Borrow/Quarry Sites: The Contractor shall use approved borrow/quarry sites in the construction works. The Contractor shall abide by the rules and regulations of the governing bodies while operating, using river side and rock quarries for the construction materials. All new rock quarry sites must be located in stable areas that are away from rivers, streams, settlements, drinking water intakes, cultivable lands and drainage systems.

The Contractor shall obtain the prior approval of the concerning authorities and permission of the Engineer before opening any borrow pits or quarries. Such borrow pits and quarries may be prohibited or restricted in dimensions and depth by the Engineer where they might:

(i) affect the stability or safety of the works or adjacent property;

(ii) interfere with natural or artificial drainage or irrigation;
(iii) be environmentally unsuitable.

The Contractor shall not purchase or receive any borrow materials from private individuals unless the source of such materials has been approved by the Engineer.

After completion of quarry operations, the Contractor shall restore the site properly. Where necessary the quarry site shall be restored immediately after completion of construction works. Restoration will include spreading of top soil and carrying out bioengineering works as per the instruction of the Engineer.

The Engineer shall have the power to disallow the method of construction and/or the use of any borrow/quarry area, if in his opinion, the stability and safety of the works or any adjacent structure is endangered, or there is undue interference with the natural or artificial drainage, or the method or use of the area will promote undue erosion.

All areas susceptible to erosion shall be protected as soon as possible either by temporary or permanent drainage works. All necessary measures shall be taken to prevent concentration of surface water and to avoid erosion and scouring of slopes and other areas. Any newly formed channels shall be backfilled.

The cutting of trees shall be avoided or if necessary shall be carried out only after getting approval of Forestry authority. Temporary ditches and/or settling basins shall be dug to prevent erosion. The undesirable ponding of water shall be prevented through temporary drains discharging to natural drainage channels.

Earthworks operations shall be strictly limited to the areas to be occupied by the permanent works and approved borrow areas and quarried unless otherwise permitted by the Engineer. Due provision shall be made for temporary drainage. Erosion and/or instability and/or sediment deposition arising from earthwork operations not in accordance with the specifications shall be made good immediately by the Contractor.

At least 14 days before the Contractor intends to commence opening up any approved borrow pit or quarry, the Contractor shall submit to the Engineer the intended method of working and restoration. These shall include but not be limited to:

(i) the location, design and method of construction of any access track;
(ii) the volume and nature of materials to be removed;
(iii) the sequence and method of excavation of materials;
(iv) measures for controlling runoff and sediment from the site during operations;
(v) proposals for site restoration including approximate finished levels, drainage, erosion and sediment control, slope stabilization and re-vegetation, including reinstatement of any access track.

Operation of borrow pits or borrow areas shall not be permitted until the method of working for that particular pit or area has been approved by the Engineer in writing. Restoration shall be to the satisfaction of the Engineer.

(4) Disposal of Spoil and Construction Waste

Materials in excess of the requirements for permanent works and unsuitable materials shall be disposed of in locations and in the manner as agreed with the Engineer. The locations of disposal sites shall be such as not to promote instability, destruction of properties and public service systems. Exposed areas of such disposal sites shall be suitably dressed and be planted with suitable vegetation. The top soil of the tipping sites must be stored and reused for restoring the tipping site and carrying out bioengineering works. Provisions shall be made to facilitate proper drainage around the site. Tipping sites shall be restored to the satisfaction of the Engineer.

(5) Crushing Plants

Crushing plants shall be located away from communities and water sources. Suitable dust control devices shall be fitted to the crusher to control emission of dust from the plant. The plants shall be operated only during the day time to minimize disturbance to nearby communities and wildlife. Water shall be sprinkled on the crushing plant and surrounding areas to minimize dust. At the same time appropriate drainage measures shall be constructed to drain out excess water from the site in order to keep the area dry.

(6) Hazardous Materials

The Contractor shall not store hazardous materials near water surfaces. The Contractor shall provide protective clothing or appliances when it is necessary to use some hazardous substances. High concentration of airborne dust resulting in deposition and damage to crops and water resources shall be avoided. The Contractor shall take every precaution to control excessive noise resulting in disruption to wildlife and human population. Only controlled explosives methods shall be applied and used in construction works as per the Technical Specifications.

(7) Operation of Vehicles, Machinery and Equipment

The Contractor shall regularly maintain all vehicles, machinery and equipment in order to minimize exhaust pollution. Oil and lubricants must be stored properly to prevent any spills and leakage and pollution of the surrounding soil as well as water bodies.

(8) Reinstatement of Environment

The Contractor shall arrange and execute works as well as related activities in such a way that environmental conditions are reinstated. The Contractor shall be required to carry out filling, removal and disposal works along with plantation of grass and trees as directed by the Engineer at his own costs at identified locations to reinstate environment.

Written instruction/approval shall be given by/sought from the Engineer regarding reinstatement of environment both during and after completion of works and up to the end of Defects Liability Period.

Measurement and Payment

No separate measurement and payment shall be made for the works described in this Clause. All costs in connection with the work specified herein shall be considered included in the related items of the work specified in the Bill of Quantities.

110 PHOTOGRAPHS

The Contractor shall undertake, maintain and provide photographic records of the existing condition and work progress. A complete photographic record of existing site conditions shall be undertaken by the Contractor before commencing any work on site. The record shall include existing pavement, drainage, structures and site areas affected by the work in sufficient detail to clearly portray all existing conditions of structures, finished surfaces. No work shall be undertaken prior to receiving approval at any work site. The Contractor shall supply digital photographs, of such portions of the works in progress and completed, as may be directed by the Engineer. The submission of photographs shall be as follows:

(a) progress photographs (in color) supplied within first week of each month)
(b) record photographs (in color) supplied within first week of each month)

The Contractor shall supply photographs taken at locations and times determined by the Engineer.

Both categories of photographs shall be properly referenced to the approval of the Engineer. Reference data shall be; the date of the photograph and the direction in which the camera was facing; ground coordinates based on geographic coordinates or the Bhutan National grid as nominated by the Engineer using a camera with the capability of recording GPS coordinates, the identifying description of the subject; and the reference number.
Photographs taken for the official record purposes, as ordered by the Engineer shall include hard-

copy color prints having on the reverse the signature of the Contractor and the Engineer's Representative for the purpose of attestation. If required, the Contractor may at his own expense have an additional print similarly attested for his retention.Cost of providing the above photographic record shall be included in the Contractor's overheads.

111 AUDIO-VISUAL DOCUMENTATION

The work consists of taking video film of important activities of the work as directed by the Engineer during the execution of the contract and editing them to a video film as directed by the Engineer. It shall contain narration of activities in English and Dzongkha by a competent narrator. The edition of the video film and the script shall be approved by the Engineer. Cost of providing the above video film shall be included in the Contractor's overheads.

Measurement and Payment

No separate measurement and payment shall be made for the works described in this Clause. All costs in connection with the work specified herein shall be considered included in the related items of the work specified in the Bill of Quantities.

112 SITE INFORMATION

The information about the site of work and site conditions in the Bidding Documents is given in good faith for guidance. The Contractor shall satisfy himself regarding all aspects of site conditions.

The location of the works and the general site particulars are as generally shown on the Site plan/index plan enclosed with the Bidding Documents.

Whereas the Right-of-Way to the work site shall be provided to the Contractor by the Employer, the Contractor shall have to make his own arrangement for the land required by him for site offices, labour camps, stores, etc.

It is assumed that the Contractor has inspected any quarries; borrow areas etc., before quoting his rates for the work to assess the availability of construction materials in required quantity and quality.

113 HEALTH AND SAFETY

The Contractor shall take due care and ensure that staff, first aid room are available at the camps, housing and on the jobsite at all times throughout the period of the contract and that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

The Contractor shall provide on-site such lifesaving apparatus as may be appropriate and an adequate and easily accessible first aid outfit or such outfits as may be required in any Government Ordinances, Acts as subsequently published and amended from time to time.

In addition an adequate number of persons permanently on the Site shall be instructed in their use, and the persons so designated shall be made known to all employees by the posting of their names and designations in a prominent position on site.

Measurement and Payment

No separate measurement and payment shall be made for the works described in this Clause. All costs in connection with the work specified herein shall be considered included in the related items of the work specified in the Bill of Quantities.

SECTION 200 – GABION WALL

201 STONE IN WIRE CRATES

Providing stone in wire crates in double twisted woven wire mesh of size 83 x 100 mm, mesh wire of 4 mm diameter, zinc coated - 215 gm/sqm with 0.5 mm PVC coating as per the specification mentioned in the drawing.

202 GENERAL

This work shall consist of laying boulders directly or in wire crates on the bed of rivers for protection against scour. The stones used in apron shall be sound, hard, durable and fairly regular in shape. Stones subject to marked deterioration by water or weather shall not be used. Round boulders available in river Omchhu shall be used. Stones in wire crates shall be used.

203 MECHANICALLY WOVEN CRATES

Mechanically woven wire crates shall be made of hot dipped galvanized mild steel wire of diameter not less than 2.2 mm having minimum tensile strength 350 MPa conforming to IS:280. The galvanization shall be heavy coating for soft condition conforming to IS: 4826. For corrosive environment, an additional PVC coating of 0.5 mm thickness shall be provided over the galvanization, or zinc alloy coating as per EN 10244-2 shall be provided in place of galvanization. The mesh of the crate shall be of type 10 x 12, 8 x 10, and 6 x 8 as per EN 10223. Mesh shall be given double twist at each intersection and shall be mechanically selvedge all along the edges of the boxes. Wire crates standard sizes shall be as per ASTM A975. The wire crates shall be divided into compartments by diaphragms placed at 1 m centre to centre.

Mesh and Box Characteristics

Mesh types and shapes shall be as given in Table 1. The mesh and box characteristics of gabions and mattresses shall be as per Tables 2 and 3 respectively.

Table 2: Mesh type and sizes

Mesh Type	Nominal Size, mm	Tolerances
10 x 12	100	+16% to -4%
8 x 12	80	
6 x 8	60	

Table 3: Mesh and Box characteristics for Gabions

Mesh Type	10 X 12			8 X 10		
'D',mm	100			80		
Wire Type	Only Zinc Coated		Zinc + PVC Coated	Only Zinc Coated		Zinc + PVC Coated
Mesh Wire Dia, mm	2.70	3.00	2.70/3.70*	2.70	3.00	2.70/3.70*
Edge/Selvedge wire Dia, mm	3.40	3.90	3.40/4.40*	3.40	3.90	3.4014.40*
Lacing wire dia, mm	2.20	2.20	2.20/3.20*	2.20	2.20	2.20/3.20*
PVC coating thickness, mm	N.A		Nominal - 0.50 Minimum - 0.38	N.A		Nominal - 0.50 Minimum - 0.38
Typical Sizes Length X Width X Height (m)/ Number of diaphragms	4 x 1 x 1 / 3 Nos. 3 x 1 x 1 / 2 Nos, 2 x 1 x 1 / 1 No, 1.5 x 1 x 1 / 0 No, 2 x 1 x 0.5 / 1 No , 3 x 1 x 0.5 I 2 Nos, 4 x 1 x 0.5 / 3 Nos. 2 x 1 x 0.3 / 1 No, 3 x 1 x 0.3 / 2 Nos, **4 x** 1 x 0.3 / 3 Nos					
Tolerances in Size of Gabion Boxes	Length & Width... +/- 5%: Height> 0.3m... +/- 5% and Height<= 0.3m... +/- 10%					

* Internal Diameter/External diameter of PVC Coated Wire

Only standard sizes of Gabion boxes are indicated in the table above. Special sizes can also be ordered as agreed between the purchaser and manufacturer.

Table 4: Mesh and box characteristics for Revet Mattresses

Mesh Type	6x8	
'D'.mm	60	
Wire Type	Only ZJnc Coated	Zinc + PVC Coated
Mesh WJre Ola, mm	2.20	2.20/3.20*
Edge/Selvedge wire Dia, mm	2.70	2.7013.70
Lacing wire dia, mm	**2.20**	2.2013.20*
PVC coating thickness, mm	**N.A**	Nominal-0.50 Minimum - 0.38
Typical Sizes Length x Width x Height {m)/Number of diaphragms	4x2 x 0.1713 Nos, 3 x2x 0.17 /2 Nos, 2x 2x0.17 / 1 No 4 x 2 x 0.23 J 3 Nos, 3 x 2 x 0.23 / 2 Nos, 2 x 2 x 0.23 / 1 No 4 x 2 x 0.30 / 3 Nos, 3 x 2 x 0.30 f 2 Nos, 2 x 2 x 0.30 / 1 No	
Tolerances in Size of Revet Mattresses	**Length & Width ... +/-5%: Height<::. 0.3m ... +/-10%**	

* Internal Diameter/External diameter of PVC coated wire

Dimensions and Tolerances

The diameter of galvanized steel wire shall conform to the values as per Table above for Gabions and Revet mattresses. The diameter of the wires shall also conform to the tolerance limits plus and minus the values as shown in Table below.

Table 5: Permitted tolerances on Galvanized Steel wire diameters

Nominal Diameter of Galvanized Wire, mm	**Permitted Tolerances** (+/-) **on Wire** Diameters, mm
2.00	0.05
2.20	0.06
2.40	0.06
2.70	0.07
3.00	0.08
3.40	0.09
3.90	0.10

Note:

1) The minimum and nominal thickness of PVC coating uniformly applied in a quality workmanlike manner shall be as shown in Tables 3 and 4.

2) Gabions shall be manufactured with a 10 x 12 or 8 x 10 mesh type (Fig. 1) having a nominal mesh opening size as per Table 3. Dimensions are measured at right angles to the centre axis of the opening and parallel to the twist along the same axis.

3) Revet mattresses shall be manufactured with a 6 x 8 mesh type (Fig. 1) having a nominal mesh opening size as per Table 3. Dimensions are measured at right angles to the centre axis of the opening and parallel to the twist along the same axis.

4) The width and length of the gabions and revet mattresses as manufactured shall not differ more than +/- 5% from the ordered size prior to filling. Typical gabion and revet mattress sizes are shown in Tables 3 and 4 respectively.

5) The height of the gabions and revet mattresses as manufactured shall not differ more than +/- 10% if the height is less than or equal to 0.3 m and shall not differ more than+/- 5% if the height is more than 0.3 m from the ordered size prior to filling.

6) Mesh Opening Tolerances - Tolerances on the hexagonal, double-twisted wire mesh opening shall not exceed +16% to - 4 % on the nominal dimension D values mentioned in Table 2.

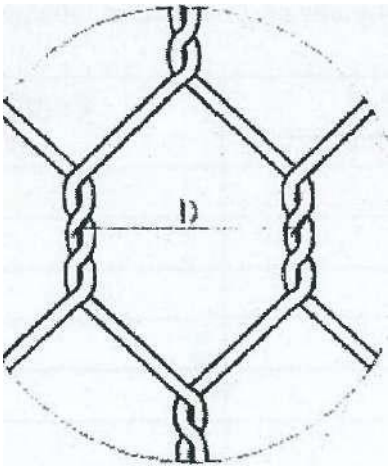


Figure 1: Mesh type and nominal size 'D'

Terminology mechanical properties, physical properties, number of tests and test methods related to mechanically woven wire crates shall be as per Appendix-2500/I of MORTH Specification for road and bridge works.

204 HAND WOVEN CRATES

Wire crates shall be made from hot dipped galvanized mild steel wire of diameter not less than 4 mm in annealed condition having tensile strength of 300 MPa-450 MPa conforming to IS:280. The galvanizing shall be heavy coating for soft condition conforming to IS: 4826. The mesh size of the crate shall not be more than 150 mm.

Wire crates for shallow or accessible situations shall be 3 m x 1.5 m x 1.25 m in size. Where these have to be deposited and there is a possibility of overturning, the crate shall be divided into 1.5 m compartments by cross netting. For deep or inaccessible situations, wire crates can be made smaller subject to the approval of the Engineer.

Wire crates built in-situ, shall not be larger than 7.5 m x 3 m x 0.6 m, nor smaller than 2 m x 1 m x 0.3 m. Sides of large crates shall be securely stayed at intervals of not more than 1.50 rn to prevent bulging.

The netting shall be made by fixing a row of spikes on a beam at a spacing equal to the mesh. The beam must be a little longer than the width of netting required. The wire is to be cut to lengths about three times the length of the net required. Each piece shall be bent at the middle around one of the spikes and the weaving commenced from the corner. A double twist shall be given at each intersection. The twisting shall be carefully done by means of a strong iron bar, five and half turns being given to the bar at each splice. The bottom and two ends of the crate or mattress shall be made at one time. The other two sides shall be made separately and shall be secured to the bottom and the ends by twisting adjacent wires together. The top shall be made separately and shall be fixed in the same manner as the sides after the crates or mattress have been filled.

205 LAYING OF WIRE CRATES

Wherever possible, crates shall be placed in position before filling with boulders. Undulations in the bed shall be levelled prior to placement of wire crate units. The crates shall be filled by carefully hand-packing the boulders as tightly as possible and not by merely throwing in the stones or boulders.Where the crates are to be laid on the sides and bed of the stream in underwater conditions, they shall be prefilled on dry area, lifted by cranes using suitable size frames with lifting slings at every 0.5 m to 1 m maximum spacing and placed at designated locations. Sacrificial steel rods of diameter 20 mm to 25 mm may also be used, in place of frame, by tying them to the edges and lifting directly with closely spaced slings. Once placed, divers shall lace the crates together at all contact surfaces. For sides of the banks a tilting platform, pontoon or barge can be used where mattresses are filled with stones on the level platform, resting at one end on the bank and has the other edge hinged to the pontoon/barge. One end of the filled wire crate is anchored to the dry edge of the slope and then

the pontoon/barge is moved away from the bank, thus lowering and sliding out the tilted platform under the crate, gradually placing the crate on the slopes while the tilted platform rotates around its hinges.

206 MEASUREMENTS AND RATES FOR PAYMENT

The works shall be measured as set forth below. If directed by the Engineer for measurement, the materials may have to be stacked at site before laying and nothing extra will be paid to the Contractor for this stacking.

The boulders and wire crates in apron shall be measured in cubic metres.

The rates quoted by the contractor shall include the cost of all inputs of materials, labour, machineries, tools and plants involved in the operations.

SECTION 300 – BIO-ENGINEERING

301 SCOPE

This Section covers all the components of bio-engineering works such as preparation of surface, spreading of top soil, turfing, sprigging, preparation of seeds and plant cuttings, nursery construction and operation, slope preparation for planting, site planting and sowing, jute netting, gabion wire bolsters and wire netting, site protection and maintenance.

302 PROVISION OF SEEDS

The Contractor shall provide or collect seeds of the required species and quantities in accordance with the requirements described hereafter, as and when required. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met in full. It shall be ensured that the seed is of a high quality.

The Engineer shall give indications as to the expected amounts of seeds required and the time of availability. But it shall be the Contractor's responsibility to ensure that adequate quantities of seeds are obtained in a timely manner.

The weights to be specified shall be for sun-dried seeds separated completely from fruiting bodies and other unwanted parts, and ready for storage and subsequent sowing. There is usually large discrepancy between this weight and that of the freshly collected, untreated fruits.

Should the Contractor be unable to supply the specified seeds, the advice of the Engineer should be sought. The Engineer may approve other substitute species, if found appropriate. Seed shall not be obtained commercially without the Engineer's written authority.

(1) Grass Seed Collection

(a) The species of grass seeds to be collected shall be determined by the Engineer. The Contractor shall be responsible for determining seed sources, though these may be specified by the Engineer's instructions. Seeds shall be collected in or very close to the office of use or the project area as much as possible.

(b) If the Engineer does not specify the species, then the current approved list of bio-engineering plants, as determined by the Department of Roads shall be referred to.

(c) Seeds shall be collected from as many individual plants as possible. Seeds shall be collected from the largest and most vigorous plants.

(d) The Contractor shall under no circumstances damage or remove the roots of grass plants while collecting seed. The Contractor shall be responsible for safety measures and for making all necessary arrangements with landowners, farmers and the Regional Forest Office, Range Office,

as applicable, before the collection of seeds.

(e) 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 70%.

(f) Immediately after collection, seeds shall be separated from flower heads by the method normally used by farmers for other grasses. Once separated, the seeds shall be sun-dried before storage.

(g) Seeds shall be stored in a cool, dry, ventilated building with adequate precautions taken against pests. Containers shall be raised above the floor. They shall not be kept in the same building in which materials like cement, or any chemicals, fuels or lubricants are stored. Grass shall be stored in bags made of cotton. Seeds shall be carefully inspected on a weekly basis to ensure that there is no deterioration or mould formation, or pest attack. Seeds shall only be stored after they have been properly dried in the sun beforehand.

Measurement and Payment: Works shall be measured on the basis of actual quantity collected, weighed in Kilogram and accepted by the Engineer. Such payment shall be the full and the final compensation to the Contractor for making arrangements of collection location, provision of safety measures, collection of seeds, separation of seeds, preparation of seeds, sun drying, packing and providing the seeds as per these Specifications.

(1) Tree and Shrub Seed Collection

(a) The species of tree and shrub seeds to be collected shall be determined by the Engineer. The Contractor shall be responsible for determining seed sources, though these may be specified by the Engineer's instructions. Seeds shall normally be collected in or very close to the working area.

(b) If the Engineer does not specify the species, then the current approved list of bio-engineering plants, as determined by the Department of Roads shall be referred to.

(c) Seeds shall be collected from as many healthy individual plants as possible. In any event, they shall be collected from at least ten individual plants. The plants from which the seeds are collected shall show vigorous growth and good form. Mis-shaven and stunted plants shall be discarded.

(d) The Contractor shall under no circumstances damage plants while collecting seed. The Contractor shall be responsible for making all necessary arrangements with and owners, farmers and the Regional Forest Office, Range Office, as applicable, before the collection of seeds.

(e) Appropriately trained personnel with appropriate equipment shall be employed while collecting the seeds. It shall be the Contractor's responsibility to ensure safe working conditions for his employees or Sub-contractors.

(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 80%.

(g) Immediately after collection, seeds shall be separated from fruit by the method normally used by farmers and foresters for this purpose; this shall depend on the individual species. Once separated, the seeds shall be sun-dried before storage.

(h) Seeds shall be stored in a cool, dry, ventilated building with adequate precautions taken against pests. Containers shall be raised above the floor. They shall not be kept in the same building in which materials like cement, or any chemicals, fuels or lubricants are stored. If kept in sealed containers, the seeds shall be carefully inspected on a weekly basis to ensure that there is no

deterioration or mould formation or pest attack. Seeds shall only be stored after they have been properly dried in the sun beforehand.

Measurement and Payment: Works shall be measured on the basis of actual quantity collected, accepted and weighed in Kilogram. Such payment shall be the full and the final compensation to the Contractor for making arrangements of collection, provision of safety measures, collection of seeds, separation of seeds, preparation of seeds, sun drying, packing and providing the seeds as per these Specifications.

303 PROVISION OF PLANT CUTTINGS

The species of plants to be collected for vegetative propagation shall be determined by the Engineer. The Contractor shall be responsible for determining plant material sources, though these may be specified by the Engineer. Plants shall normally be collected in or very close to the working area.

If the Engineer does not specify the species, then the current approved list of bio-engineering plants, as determined by the Department of Roads shall be referred to.

(1) Provision of Grass Cuttings

(a) Cuttings of various types shall be taken from grass species, which are known to propagate easily by vegetative means.

(b) Cuttings shall be made from as many healthy individual plants as possible. The plants from which the cuttings are taken shall show vigorous growth and good form. Grass clumps showing stunted growth shall not be considered as sources.

(c) Apart from the clumps, which are dugs up to make cutting, the contractor shall under no circumstances damage other plants. The Contractor shall be responsible for making all necessary arrangements with landowners, farmers and the Regional Forest Office, as applicable, before the making of hardwood cuttings.

(d) The type of cuttings to be made shall depend on the species specified in the contract. If the species is still not covered, then stem and root slip cuttings shall be used.

(e) Where roots are required for the cuttings, grass clumps shall be carefully dug up. They shall not be pulled hard so as to damage the material. They shall be separated carefully by hand, using a sharp knife where necessary. There shall be no tearing of the plant fabric.

(f) Stem cuttings shall be made using sharp secateurs/scissors. The top cut shall be made at right angles to the stem and the bottom cut shall be made at 45° to the stem.

(g) 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 digging out of the ground, splitting out, trimming and planting. If the Hessian jute is not easily available, the cuttings shall be covered with the thick blanket of off- cut part of vegetation such as Khempashing/Meringma (*Artemisia spp.*) and (*Eupatorium adenophorum*). For this prior approval of the Engineer shall be required. Under any circumstances, all cuttings shall be planted the same day that they are made.

(h) Measurement and Payment: Measurement of grass cuttings shall be made on the basis of actual numbers of slip or cutting prepared, counted on site and accepted. The quantities thus measured shall be paid at the unit rate shown in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for all arrangements for uprooting of grass clumps, collection of materials for cuttings and preparation and providing the cuttings as per these Specifications.

(2) Provision of Hardwood Cuttings

(a) Hardwood cuttings shall be taken from shrubs and trees species which are known to propagate easily by vegetative means.

Cuttings shall be made from as many healthy individual plants as possible. The plants from which the cuttings are taken shall show vigorous growth and good form. Mis-shaven and stunted plants shall not be considered as source.

(b) Apart from the branches from which cuttings are taken, the Contractor shall under no circumstances damage plants while taking cuttings. The Contractor shall be responsible for taking safety precautions and for making all necessary arrangements with landowners, farmers and the Regional Forest Office, Range Office, as applicable, before the making of hardwood cuttings.

(c) Hardwood cuttings shall be made from stems which are between 6 and 18 months old. Materials outside this range shall not be used. The Contractor shall be held liable if the success rate of cuttings is lower than 70%.

(d) Hardwood cutting shall be made using sharp secateurs or a sharp saw. The top cut shall be made at right angles to the stem and the bottom cut shall be made at 45° to the stem. Under no circumstances shall there be any damage to the bark of the cutting.

(e) Hardwood cuttings, which are to be planted in the nursery for later multiplication, shall be normally 150 to 200 mm in length and 20 to 30 mm in diameter. This size shall not be exceeded for the majority of species unless specified or approved by the Engineer.

(f) Hardwood cuttings which are to be used in brush layering, palisades and live stakes shall normally be 450 mm for brush layering on road embankments, 600 mm for brush layering on landslide debris, 600 mm for palisades and 20 to 40 mm in diameter. This length of cuttings shall not be exceeded for the majority of species unless specified or approved by the Engineer.

(g) The size of cuttings shall be of a minimum length of 1000 mm and 50 mm of diameter for fascines. All the small branches growing from the main branch shall be preserved. Those small branches contain the first sprouting buds which will help to keep alive the main branches as they are buried in the ground.

(h) A number of species can be propagated using large truncheon cuttings. Hardwood cuttings for these species shall be in the range of 2000 to 2500 mm in length and 50 to 80 mm in diameter unless otherwise specified.

(i) All truncheon cuttings shall be covered with long mulch during transportation and storage. Under any circumstances, all cuttings shall be planted within two days that they are made.

(j) Measurement and Payment: Measurement of hardwood cuttings shall be made on the basis of actual numbers of cutting prepared, counted on site and accepted. The quantities thus measured shall be paid at the unit rate shown in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for all arrangements for collection of materials and preparation of cuttings and providing the cuttings as per the Specifications.

(3) Provision of Bamboo Cuttings

(a) Bamboo cuttings shall be propagated by two different methods i.e. traditional method and single node culm cuttings method.

(b) Cuttings shall be made from as many healthy individual culms as possible. The culm from which the cuttings are taken shall show vigorous growth and good form having plenty of branches. Mis-shaven and stunted plants shall not be considered as source.

(c) The Contractor shall be responsible for taking safety precautions and for making all necessary arrangements with landowners, farmers and the Regional Forest Office, Range Office, as

applicable, before making of cuttings. The traditional method which will be required to take the whole culm and mother rhizome may eradicate the further development of clump. In this case, the contractor shall be responsible to make aware of such probability to the owner before taking the rhizomes from such clump. However, if the sourcing clumps are growing on steep slopes, the contractor shall not take more than 10% culm from the sourcing clump.

Single node culm cuttings or traditional rhizome cuttings shall be made from the culm, which are between 2-3 years old. Materials outside this range shall not be used without the prior approval of the Engineer. The Contractor shall be held liable if the success rate of single node culm cuttings is lower than 60% and in the case of rhizome cuttings not surviving 100%.

(d) Single node cuttings shall be made using sharp log saw. The top and bottom cut shall be made at right angles to the stem. Under no circumstances shall there be any damage to the bud and internodes section of culm.

(e) The rhizome cuttings shall be made using sharp log saw, axe and secateurs.

(f) 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, transporting and planting. Under any circumstances, all cuttings must be planted within two days of that they are made.

(g) Measurement and Payment: Measurement of bamboo cuttings shall be made on the basis of actual numbers of cuttings prepared, counted on site and accepted. The quantities thus measured shall be paid at the unit rate shown in the Bill of Quantities. Such payme nt shall be the full and the final compensation to the Contractor for all arrangements for purchasing of bamboo and preparation of cuttings and providing the cuttings as per the Specifications.

304 PREPARATION OF NURSERY

The Contractor shall provide nurseries to contribute stocks of grasses, shrubs and trees for planting operations as required by the Engineer. This shall be done according to the specifications described hereunder, as and when required by the Engineer. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met.

The Contractor shall note that the establishment and effective operation of plant nurseries is a skilled business requiring experienced and trained staff. These specifications alone do not provide all the information needed to set up and run nurseries. The Contractor shall seek the advice of specialist agencies and shall refer to the large number of reference books available on the subject.

The purpose of a nursery shall be to supply good quality, healthy plants of the correct type and species at the precise time they are required.

(1) Nursery Establishment

(a) The Contractor shall provide nursery facilities adequate to supply all of the stock required for planting operations. Alternatively, he may procure planting stock from elsewhere at the time of site planting, provided it is of a standard acceptable to the Engineer and as described hereunder.

(b) In selecting a site for a nursery, if not instructed by the Engineer, the Contractor shall fulfill the following requirements.

(i) Nurseries shall be as close as possible to all the sites to be planted. They shall be at the same altitude and in an identical climatic area tothe sites to be planted.

(ii) Wherever possible, nurseries shall be established on land owned by the Department of Roads if it is available and biophysically suitable. If it is not, other government land shall be used if it is available.

(iii) Nurseries shall have a reliable and adequate supply of water which remains constant throughout

the later part of the dry season.

(iv) Nurseries shall have all weather vehicular access.

(v) Nurseries shall have a perimeter of stock-proof fencing, effective against all domestic animals.

(vi) Nurseries shall have a weather and pest-proof office cum seed store and proper storage facilities for seed. Seed shall be kept cool, dry and in sealed containers, as specified in Section 1302.

All nurseries shall be provided with at least two above-ground compost bays, built of stone, brick or timber.

(vii) Where a nursery is established on a slope exceeding 2°, the ground shall be leveled by terracing before beds are constructed.

(viii) A qualified and experienced in-charge must be appointed.

(ix) There shall be adequate space in each nursery location for all operations to be performed in the cycle of work. In particular, all plants shall be spaced out periodically as they grow and there shall be adequate bed area to accommodate them.

(2) Preparation of Nursery Beds

(a) Nursery beds shall be made in a different way according to their purpose. The Contractor shall ensure that there are adequate beds available for all the operations to be undertaken in the nursery.

(b) There shall be paths around all beds to ensure the best possible access for operations such as weeding and watering.

(c) Table 14.1 summarizes the construction details of the five main bed types, which are described in full in paragraphs (d) to (h).

Table 14.1: Construction Details of Nursery Beds

Bed Type	Bed size	Details of construction
Beds for grass seeding, grass slips propagation	Bottom width 1200 mm and top width 1000 mm x 200 mm high	Bottom of the bed should be compacted making a camber to facilitate the drainage; 50 mm washed gravel placed above the ground; then 50 mm of 1:1 mix of soil and compost; and topped with 100 mm of 3:1 mix of sieved forest topsoil and washed sand.
Beds for bare root tree seedlings	Bottom width 1200 mm and top width 1000 mm, 200 mm high	Bottom of the bed should be compacted making a camber to facilitate the drainage; 50 mm washed gravel placed above the ground; then 50 mm of 1:1 mix of soil and compost; and topped with 150 mm of 3:1 mix of sieved forest topsoil and washed sand.
Seed beds for tree / shrub seedlings	1000 mm wide (external), 170 mm high with edging; Shade 900 mm of height on the lower side and 1200 mm higher side.	Bed should be provided with brick, flat stone or plank edging as determined by the Engineer; shade should be provided of waterproof materials or as determined by the Engineer; 50 mm of washed gravel placed above the compacted and cambered ground; then 50 mm 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 tree / shrub seedlings	1000 mm wide (external), 150 mm high with edging; Shade 900 mm of height on the lower side and 1200 mm higher side.	Bed should be provided with brick, flat stone or plank edging as determined by the Engineer; shade should be provided of highly porous materials or as determined by the Engineer; 50 mm of washed gravel placed above the compacted and cambered ground.
Beds for the propagation of Bamboo cul m cuttings and stool bed for tree and shrub cuttings	Bottom width 1200 mm and top width 1000 mm x 300 mm high	Ground below the bed is dug to a depth of 300 mm. Bed is made with 100 mm of unsieved soil (lower) and 200 mm of sieved soil (upper). A bund of 100 mm high is formed around the edge. 1500 mm high shade of bamboo frame structures and Hessian jute is made.

(d) Grass beds shall be constructed to hold grass seeds, grasses being propagated by vegetative means. 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 a cambered ground. They shall rise to a height of 200 mm above the surrounding ground. They shall be made up of 50 mm of washed gravel is placed above the ground; then 50 mm of 1:1 mix of soil and compost; and the bed is topped with 100 mm of 3:1 mix of fertile, loamy forest topsoil and washed sand. All sieving shall be done with a mesh size of 2 mm or smaller.

(e) Bare root beds shall be constructed to hold seedlings transplanted from the seed beds. 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 a cambered ground. They shall rise to a height of 200 mm above the surrounding ground. They shall be made up of 50 mm of washed gravel is placed above the ground; then 50 mm of 1:1 mix of 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 shall be done with a mesh size of 2 mm or smaller.

(f) Seed beds shall be made very carefully for germinating small seeds of shrubs and trees. These can be of any practical length but shall be flat and of one meter in width on compacted and a cambered ground. They shall rise to a height of 170 mm above the surrounding ground and provided with shadings as per the details given in the following paragraph (i). They shall be made up of 50 mm of washed gravel placed on the ground; then 50 mm of unsieved forest soil; 50 mm of 1:3 mixes of forest soil and washed sand; and the bed is topped with 20 mm of washed, and sterilized sand. All sieving shall be done with a mesh size of 2 mm.

(g) Standout beds shall be constructed to hold seedlings in polythene pots. These can be of any practical length but shall be flat and of one metre width. Bed floors shall be above surrounding ground level and they shall have a 50 mm layer of washed gravel on the compacted and cambered ground. They shall have a surround, preferably made from flat stones, plank or bricks. The bed shall then be covered with the highly porous shadings as per the details provided in the following paragraph (i).

(h) Beds for the propagation of bamboo culm cuttings and stool cuttings of trees and shrubs, shall be made specially. These can be of any practical length but shall be flat and of 1000 mm width at top and 1200 mm width at bottom. They shall rise to a height of 300 mm above the surrounding ground. They shall be made up of ground below the bed, dug to a depth of 300 mm; the bed itself is then made with 100 mm of unsieved soil on the original surface, and 200 mm of soil above this. All soil sieving shall be done with a mesh size of 2 mm or smaller. Finally, a bund of 100 mm high shall be formed around the edge.

(i) Shades shall be constructed over the beds and kept in position over delicate seedlings during hours of intense sunlight, according to need. Shades shall be 900 to 1200 mm above the ground, and angled so as to be effective for as much of the day as possible (i.e. with the lower side to the south). Bamboo strips laced together with nylon string are particularly suitable in most cases; but over tree and shrub seed beds, thatched shades with a polythene lining shall be used.

(j) Measurement and Payment: Work to be measured shall be the actual top area in sq.m of beds constructed on site and accepted. Only the finished area of the beds shall be considered after the completion of its shades. However, despite the fact that shades will be covering larger area than the beds, the final measurement shall be governed by the area of the top of the bed for payment. The payment shall be the full and the final compensation to the Contractor for providing all materials to be incorporated, all labor, tools, equipment and incidentals to complete the works of Nursery establishment and construction of Nursery beds as per these Specifications.

305 NURSERY OPERATION AND MANAGEMENT

(a) The contractor shall operate the nursery according to a high standard. The nursery shall be staffed well and tended at all times. It shall be maintained in clean, tidy and efficient manner at all times. Plants shall always be healthy and vigorous.

(b) Due to the nature of bio-engineering works, nurseries shall normally be operated and managed by small local contractors with a range of agricultural skills provided it is specified in the Contract.

(c) Plants shall be kept properly weeded at all times.

(d) Watering, as required for good plant growth, shall be carried out regularly in the cool of the evening between sunset and dusk. The Contractor shall ensure that the soil in all beds is kept moist but not saturated at all times. Beds shall be kept moist even when empty, so that the soil is kept in good condition.

(e) The timing of nursery operations shall be of the utmost importance. Activities such as seed sowing and the taking of cutting shall be carried out within the critical few weeks when they will yield the desired results. Most other operations, such as spacing out, root pruning and watering, shall also be carried out in a timely manner. The Contractor shall be responsible to keep works to the strict schedule required and under no circumstances to permit delays.

(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 paid at the unit rates entered in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for executing all the works as specified in these Specifications.

(1) Nursery Production of Grass

(a) Grass shall be propagated in nurseries either by seeding in carefully prepared beds or by vegetative propagation.

(b) Where grass seeding is required in the nursery, finely sieved fertile soil mixed with clean sand to a texture of sandy loam shall be placed in beds before the seeds are sown. Seeds shall be covered with a sheet of Hessian jute until they have germinated, then it shall be carefully removed. Watering of fresh seedlings shall be done by a fine spray and not by the rose of a watering can.

(c) Grasses to be propagated by vegetative methods shall be of the species instructed. The Contractor shall obtain adequate quantities of the plant material required, but under no circumstances it shall cause serious depletion of grass stocks in any steep or erosion-prone area.

(d) Vegetative propagation shall normally be by rhizome cuttings. With this method, the grass shall be treated in exactly the same way as a bamboo being propagated by the traditional farmer's technique. A clump shall be carefully dug up and brought to the nursery, being kept cool and damp at all times. Stems shall be cut above the first or second node above the ground: this usually gives a length of 100 to 200 mm. The clump shall be separated carefully, with the minimum of damage to the rhizomes and fine roots. Slips shall be separated out which keep a length of stem and about 50 mm of the rhizome. Each slip shall have some buds on the rhizome, but in some grasses, these can be difficult to see. The slips shall be planted with the soil surface at the same level as it was originally, in rows at 200 mm centres; slips shall be at 200 mm centres within the rows. A sheet of Hessian jute shall be placed over the tops of the cuttings. When the new shoots are about 50 mm long, it shall be removed.

(e) Every two to three months, all grasses shall be lifted from the beds, split carefully and replanted. It is normal that, once split out, three times the previous bed area is required. This is a standard practice to bulk up the supply of planting stock without having to degrade the natural vegetation cover in the region of the nursery.

(f) Measurement and Payment: The basis of measurement shall be the actual area of live grasses

covered surfaces in sq.m. Quantities measured as above shall be paid at the unit rates entered in the Bill of Quantities. Such payment shall be considered the full and the final compensation to the Contractor for executing all the works as specified in these Specifications.

(2) Nursery Production of Trees and Shrubs in Polypots

(a) Trees and shrubs shall be seeded either in seed beds or directly in polythene pots ("polypots"). Finely sieved fertile soil mixed with clean sand to a texture of sandy loam shall be placed in well shaded beds for seeding. Watering of fresh seedlings shall be by a fine spray, and not by the rose of a watering can.

(b) All pants shall be grown in pots of dimensions 100x180 mm (4 x 7 inches) or greater when laid flat. The pots shall be of black, 200-gauge polythene. They shall have adequate drainage holes at the bottom and be filled with fertile forest topsoil mixed with clean sand to a texture of sandy loam.

(c) Roots protruding from the bottom of pots shall be pruned with a razor blade on regular basis which shall not exceed weekly and may need to be more frequent. Protruding roots shall never be allowed to become more than 25 mm in length.

(d) When polypot seedlings begin to compete with each other for light, they shall be re-spaced as required. This would typically mean doubling the bed space occupied by the plants.

(e) To be acceptable for planting on site, trees and shrubs shall be healthy, vigorous and showing no signs of damage, wilt, irregular growth, fungal or pest attack, or nutrient disorders. They shall be at least 300 mm in height above soil surface level and of good form. The roots shall be in good condition and there should be no signs of disturbance to the soil in the polythene pot, even after transport to site.

(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 paid at the unit rates entered in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for executing all the works as specified in these Specifications.

(3) Nursery Production of Hardwood Plants by Vegetative Methods

(a) Trees and shrubs which can be propagated by vegetative methods may be specified by the Engineer. The Contractor shall produce these by the appropriate method, as required.

(b) All cuttings and stools shall be made as specified in Section 1403 and planted in fertile soil beds of the type specified in Section 1404.

(c) Cuttings shall be planted 300 mm apart in holes slightly larger than their diameter. They shall be placed at such a depth that only one bud remains above the soil surface (i.e. about 30 mm of the cutting).

(d) When plants compete with each other for light, they shall be cut back as necessary.

(e) To be acceptable for planting on site, trees and shrubs produced in this way must be healthy, vigorous and showing no signs of damage, wilt, irregular growth, fungal or pest attack, or nutrient disorders. They shall be at least 500 mm in height above soil surface level and of good form.

(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 paid at the unit rates entered in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for executing all the works as specified in these Specifications.

(4) Extraction of Plants from the Nursery

(a) The Contractor shall be responsible for extracting plants from nursery beds and preparing them ready for transport. They shall be extracted from the beds only on the morning that they are required for planting on site.

(b) Plants shall be hardened off, starting at least two weeks before they are to be taken out of the nursery. This process shall require a gradual reduction in the amount of watering and shading. The aim is to prepare them for transfer to a much more hostile location.

(c) The night before the plants are to be lifted, they shall be thoroughly watered. This is to make the soil softer and ease the business of extracting the roots.

(d) Plants growing in soil beds shall be carefully lifted from the soil. There shall be no pulling of stems or roots, but they shall be dug out and extracted with no strain on any part of the plant.

(e) Plants from soil beds shall be wrapped in wet Hessian jute. Hardwood plants shall have a ball of soil around the roots. Grass clumps can have most of the soil shaken or washed off.

(f) Polypot seedlings shall be lifted and stacked neatly in metal or wooden trays. They shall always be lifted by the pot and never by the stem or leaves.

(g) All plants shall to be kept moist, in a cool, shady place, until they are loaded for transport to site. In the vehicle, they shall not be stacked high. For transport on rough roads, they shall be packed in carefully so that they do not fall over or roll around. The vehicle shall be shaded.

(h) 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 paid at the unit rates entered in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for executing all the works as specified in these Specifications.

(5) Compost and Mulch Production

(a) The Contractor shall produce compost and mulch for nursery or site operations. It shall be produced in a timely manner, in the quantities required. Compost is normally required to sustain the long-term fertility of nursery beds. Mulch may also be used in the nursery, but nor mally produced to enhance site planting works, particularly the direct seeding of grass.

(b) Compost and mulch shall be made from annual and perennial weeds of poor rooting characteristics, such as *Eupatorium adenopherum*. The greenery shall be collected when there is most material available but before it forms seeds. This is most often in May-September.

(c) Collected material shall be chopped finely and stored in a mound, compost bay or pit. The maximum size for chopped compost is 50 mm; the maximum size for chopped mulch is 150 mm.

(d) Both compost and mulch shall be kept moist but not waterlogged and in an aerated condition. They shall be completely turned once a month on a regular schedule. Compost can have cow manure mixed in to assist the process of decomposition.

(e) Neither compost nor mulch shall be applied until they are fully rotted. By this time they shall be black and the parts of individual plants shall be indistinguishable. Early application shall not be allowed as this can lead to a nutrient loss in the soil if microbes extract nitrogen to decompose the added organic material.

(f) Measurement and Payment: The basis of measurement shall be the actual quantity of compost and mulch provided, accepted and certified by the Engineer in cum. or kg. Quantities measured as above shall be paid at the unit rates entered in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for executing all the works as specified in these Specifications.

306 TOPSOILING

(1) General

This Clause shall consist of preparing the ground surface for topsoil application, removing top soil from designated stockpiles or areas to be stripped on the site or from approved sources of the side and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the Drawings, as specified or as directed by the Engineer.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil and for the handling and placing of all required materials shall be in good condition, and approved by the Engineer before the various operations are started.

(2) Materials

(a) Topsoil

Topsoil shall not contain refuse or any material toxic to plant growth, and it shall be free from inorganic subsoil, stumps, roots, brush, stones (50 mm or more in any dimension), clay lumps or similar objects. Stripping material stockpiled in earthworks operations shall be free of brush and other vegetation except that ordinary sods and herbaceous growth such as grass and weeds shall not be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. To qualify as topsoil, the material shall contain soil particles of which not less than 20% but not more than 80% of the material passes the 75 micron sieve as determined by the wet sieving in accordance with IS 2720-Part 4.

(b) Source of Topsoil

Topsoil may be obtained directly from earthwork stripping operations, from stockpiles located at other sites from previous earthwork stripping operations.

Prior to the stripping of topsoil from designated areas, any vegetation, briers, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by dicing or other means, shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the Engineer. The topsoil shall be spread on areas already tilled and smooth-graded or stockpiled in areas approved by the Engineer. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding or sprigging.

The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed as required.

(3) Workmanship

(a) Preparing the Ground Surface

Immediately prior to dumping and spreading the topsoil on any area, the surface shall be tilled or loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 50mm to facilitate bonding of the topsoil to the subgrade soil to be covered. The surface of the area to be topsoiled shall be cleared of all stones larger than 50mm in any dimension and all litter or other material which may be detrimental to proper bonding and growth of plants.

Grades on the area to be topsoiled, as shown on the Drawings or as instructed by the Engineer, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and properly compacted condition

and shall be free-draining, to the extent practical.

(b) Placing Topsoil

The topsoil shall be evenly spread on the prepared areas to a uniform depth after compaction, as shown on the Drawings or as directed by the Engineer. Spreading shall not be done when the ground or topsoil is excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large clods and hard lumps shall be broken down and all stones or rock (50 mm or more in any dimension), roots, litter, or any foreign matter shall be raked up and disposed by the Contractor. After spreading is completed, the topsoil shall be satisfactorily compacted by rolling. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

(4) Measurement and Payment

Measurement for topsoil (to the depths shown on the Drawings) shall be made in square meter. Payment for top soiling shall be made at the respective contract unit rates and these shall be the full and the final compensation to the Contractor to complete the work in accordance with these Specifications.

307 FINAL SLOPE PREPARATION FOR BIO-ENGINEERING

(a) The Contractor shall prepare slopes for planting operations as required by the Engineer. This shall be done according to the specifications described hereunder, as and when required. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met.

(b) In the course of all slope preparation works, it shall be essential that no damage is done to existing vegetation unless the Engineer's instruction specifically requires certain plants to be removed.

(c) The timing of bio-engineering operations shall be of the utmost importance. Activities such as planting and seed sowing shall be carried out within the critical few weeks when they will yield the desired results. All other operations shall be carried out in timely manner to permit this to happen. The contractor shall be responsible to keep works to the strict schedule required and under no circumstances to permit delays.

(d) As slope trimming process can be dangerous and risky to personnel, the Contractor shall be responsible to ensure the safety of his/her and Client's personnel engaged for the same. It shall be essential to have the minimum of safety measures as listed below for a working gang of 10 people. The proportion of the safety harness shall be increased according to the requirements and labours employed on site.

The Contractor shall provide all safety measures as listed in Table 14.2 for his/her workers who will be on site and Employer"s personnel who will be supervising the work within the Contractor"s working premises.

Table 14.2: Materials Required for Safety Measures

S. No.	Description	Quantity
1.	Safety rope (mountaineering type or similar make having a minimum of 20 mm diameter and 30 metres in length)	For every workers
2.	Safety belt similar to tree climbers or scaffolding use	For every workers
3.	Goggles and dust proof masks	For every workers
4.	Safety hats	For every workers
5.	Knee pad	For every workers
6.	First Aid Kit with necessary medicines and bandages	1 box per working gang
7.	Stretcher	1 no. per working gang

(1) Cut Slope Preparation for Grass Planting

(a) The objective of final cut slope preparation shall be to produce a surface adequately prepared for grass planting. Grass lines shall be used to provide a strong surface cover. Grass lines shall be planted over a well prepared surface. The slope shall not be subject to any undue stress from erosion and mass movement in its initial stages.

(b) All the construction work shall be checked prior to slope trimming. The site shall be clear of people and equipment.

(c) The Contractor shall ensure that the slope under instruction is trimmed to a straight angle, according to the Engineer's instructions. Cut slopes to be planted with grass shall normally be 3 vertical to 2 horizontal, unless otherwise shown on the Drawing or instructed by the Engineer. In any event, a straight profile shall be obtained. Concavities shall be filled with well compacted material or dry stone dentition as instructed by the Engineer. Convexities shall be removed and it shall be ensured that the general profile does not have a shape giving over-steep segments.

(d) All loose material shall be removed from the slope and tipped elsewhere in an approved location.

(e) Measurement and Payment: Work shall be measured in square meters on the basis of actual area of trimmed surface. The payment shall be the full and the final compensation to the contractor for making arrangements for traffic control, trimming, and removal of loose materials,

all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein.

(2) Final Preparation of Fill Slopes for Bio-Engineering

(a) The objective of the final preparation of fill slopes shall be to produce a surface adequately prepared for shrub or tree planting or grass sowing, or a combination of these. Vegetation shall be used to provide a strong surface cover. Vegetation shall be planted over a well prepared surface. The slope shall not be subject to any undue stress from erosion and mass movement in its initial stages.

(b) The Contractor shall ensure that the slope under instruction is trimmed to a straight angle, according to the Drawing or instruction of the Engineer. In any event, a straight profile shall be obtained. All masses of loose debris, especially where it has previously been tipped at the head of the slope, shall be removed. Concavities shall be filled with well compacted material or dry stone dentition as shown on the Drawing or instructed by the Engineer. Convexities shall also be removed and it shall be ensured that the general profile does not have a shape giving over-steep segments.

(d) All loose material shall be removed from the slope and tipped elsewhere in an approved location.

(e) Measurement and Payment: The work shall be measured in square meters on the basis of actual area of trimmed surface as shown on the Drawing or instructed and approved by the Engineer. The quantities measured shall be paid at the unit rates shown in the Bill of Quantities. Such payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, trimming, and removal of loose materials, all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein.

308 SITE PLANTING AND SOWING

(a) The Contractor shall plant or sow grasses, shrubs and trees as shown on the Drawing or required by the Engineer. This shall be done according to the specifications described hereunder, as and when required. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met.

(b) Due to the nature of bio-engineering works, they may also be undertaken by small local contractors with a range of agricultural skills, if so provided in the Contract.

(c) It shall be the Contractor's responsibility to ensure that all planting stock, whether provided from a nursery under a separate contract or through a separate instruction, is of high quality and is vigorous enough to grow on the site to be planted.

(d) All seeds and other planting stock shall be of species indigenous to Bhutan unless otherwise specified. All species shall be covered in the current approved lists of species produced from time to time by the Field Division Offices of the Department of Roads. They shall be appropriate for the precise site conditions in which they are to be planted and the Contractor shall ensure that they apply to the specific altitude and other environmental characteristics of the site in question.

(e) Activities such as planting and seed sowing shall be carried out within the critical few weeks when they will yield the desired results. All other operations shall be carried out in a timely manner to permit this to happen. The Contractor shall be responsible to keep works to the strict schedule required and under no circumstances to permit delays.

(1) Sowing of Grasses on Site

(a) The Contractor shall be required to carry out the sowing of grass seeds according to the Engineer's specific instructions.

(b) If the site for sowing is to be prepared under a separate contract, then it shall be assumed that the site will already have been prepared for seed sowing. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of grasses.

(c) The Contractor shall be required to supervise all field operations very closely. The sowing of grass seeds is a delicate business and shall be approached in the same way as for agricultural crops. The Contractor shall employ experienced agricultural labourers for this work.

(d) If seeds have to be provided under a separate contract, then they shall be properly stored. However, it shall be the Contractor's responsibility to check that it has been carefully stored and remains fully viable.

(e) Immediately before sowing, the ground surface shall be lightly scarified using a rake to ease early root penetration. Seeds shall then be laid thinly over the surface. Under no circumstances shall they be broadcasted, because the lightness of perennial grass seeds and the steepness of the slopes to be treated give a poor cover using such a technique. The Contractor shall be responsible for ensuring that the correct quantities of seeds are used, while giving a good, even cover.

(f) A cover of 25 g of grass seed per square metre of surface shall be achieved unless otherwise specified.

(g) After sowing, a mulch of prepared and dried cut herbs shall be laid over the whole seeded area in a thin layer. If the mulch is too thick it will prevent light from getting to the seed and will inhibit germination. The Contractor shall identify local herbs suitable for this. However, freshly cut herbs shall not be used because of the danger of re-sprouting and weeding.

(h) If specified, the mulch should be secured with jute netting of mesh size 300x 500 mm and the netting fixed in place using suitable live pegs or hardwood cuttings (e.g. Jhakrikath, *Vitexnegundo*) at one metre c/c.

(i) Measurement and Payment: Work shall be measured in square meters on the basis of actual area of grass seeded and covered surface. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, providing seeds, collection and application of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein. If the seeds and mulch 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 and mulch no separate payment shall be made for these items.

(2) Direct Seed Sowing of Shrubs and Trees on Site

(a) The Contractor shall be required to carry out the sowing of shrub and tree seeds according to the Engineer's specific instructions.

(b) It is assumed that the site will already have been prepared for seed sowing, if this item has to be executed under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of shrubs and trees.

(c) The Contractor shall be required to supervise all field operations very closely. As the sowing of any seeds is a delicate business and, therefore, shall be approached in the same way as for agricultural crops. The Contractor shall employ experienced farmers for this work.

(d) Seed shall be collected and stored well before the time of sowing, if they have to be supplied under a separate contract. However, it shall be the Contractor's responsibility to check that it has been carefully stored and remains fully viable.

(e) Sowing shall start at the top of the slope and the labourers shall work downwards. Care shall be taken not to disturb areas already seeded.

(f) To sow the seeds, a small hole shall be made in the slope. The tool used to do this shall depend on the size of the seed. For some seeds, a piece of gabion wire will be adequate; for others, a piece of mild steel with a flattened end is required. The hole shall be in the best soil available but if there is little real soil, then a crevice between two stones is acceptable. Two seeds should be placed in each hole and a covering of soil or whatever fines are available shall be placed over them. This covering shall never exceed 10 mm and shall preferably be about 5 mm; it shall never be less than this. Seeds shall be placed at 200 to 250 mm centres, as ground conditions dictate.

(g) In some cases the seed can be broadcast starting at the top of the site and working down slope as evenly as possible so that the whole site is lightly covered. This shall be used 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 unless otherwise instructed by the Engineer. With Gawashing/Saonshing (*Alnusnepalensis*) seed it shall be at a rate of 1g of seed per square metre.

(h) Measurement and Payment: Work shall be measured in square meters on the basis of actual area of grass seeded and covered surface. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, providing seeds, collection and application of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as specified herein. If the seeds and mulch 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 and mulch no separate payment shall be made for these items.

(3) Site Planting of Grass Slips and Cuttings

(a) The Contractor shall be required to carry out the planting of grass seedlings or rooted cuttings, according to the Engineer's specific instructions. The configuration of planting shall be determined according to individual site conditions. It shall be either random, contoured or down slope, as instructed by the Engineer.

(b) It is assumed that the site shall already have been prepared for planting, if this is to be prepared under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of grasses, and complies with the specifications given in Section 1906.

(c) Using appropriate tools (such as tape measures and spirit levels), planting lines shall be marked out with string as required. Unless specified differently, the row spacing to be marked out shall be as shown in Table 14.3.

(d) The Contractor shall be required to supervise all field operations very closely. Since the planting of grass slips is a delicate business and therefore shall be approached in the same way as the transplanting of millet seedlings. The Contractor shall employ experienced farmers for this work.

Table 14.3: Row Spacing Details

Planting configuration	Slope steepness	Spacing
Random lines	All slopes	100 mm planting drill to drill
Contour lines	Slope less than 30°	100 mm planting drill to drill and 1000 mm between the lines
	Slope 30°-45°	100 mm planting drill to drill and 500 mm between the lines
	Slope more than 45°	100 mm planting drill to drill and 250 mm between the lines
Diagonal	Slope less than 45°	100 mm planting drill to drill and 500 mm between the lines
	Slope more than 45°	100 mm planting drill to drill and 250 mm between the lines
Downslope lines	All slopes	100 mm planting drill to drill and 250 mm between the rows

(e) The plants supplied to the Contractor from nursery (if so provided in the Contract) shall be prepared for planting by the Contractor. The Contractor shall transport them from the nursery 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 supplied shall be planted within two days from the time they are lifted from the nursery.

(f) Grass slips or cutting shall be carefully separated from the clumps to give the maximum viable planting material. Preparation of slips, cuttings or rhizomes shall be strictly followed as mentioned in Section 1403.

(g) Planting shall be started at the top of the slope and under no circumstances shall new plants be walked on or otherwise disturbed. Using a small bar (usually made of mild steel and with a flattened end), a hole shall be made that is just big enough for the roots. The slip or cutting is inserted; care shall be taken that the roots are not tangled or bent back to the surface. Soil shall then be replaced around the roots and firmed with the fingers. The spacing of plants within rows shall be 100 mm unless otherwise specified. Two grass slips shall be planted in each drill.

(h) If the soil is dry and there is no rain within 16 to 24 hours of planting, the site shall be watered carefully with a fine spray. The Contractor shall be required to water for the first two weeks after planting in the event of inadequate rainfall.

(i) If it is provided in the Contract that the plants are to be collected from locations other than nurseries then utmost care shall be taken to minimize disruption to neighboring land, in the event that species are collected from areas surrounding the road. It shall be the Contractor's responsibility to collect the stock required from a wide area and not to give rise to any soil erosion through the excessive removal of plants in one locality.

(j) Measurement and Payment: The measurement shall be the actual area of grass planted and covered surface in square meters for the random planting and any other patterns of planting up to 300 mm between the lines. The contour line planting in 500-1000 mm in any slopes shall be measured in linear meter. The payment shall be the full and final compensation to the Contractor for making arrangements for traffic control, providing grass slips or rhizome, collection of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as per these Specifications. If the grass slips and mulch 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 slips and mulch, no separate payment shall be made for these items.

(4) Site Planting of Shrubs and Trees raised in Polythene Pots

(a) The planting of trees and shrubs is intended to replace or restore something of the natural vegetation on the slope to be treated. The Contractor shall be required to carry out the planting of seedlings to the Engineer's specific instructions.

(b) It is assumed that the site will already have been prepared for planting if it has to be prepared under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of delicate young plants.

(c) The spacing of plants shall be determined according to individual site conditions. However, it shall normally be at 1.5 meters interval unless otherwise specified or instructed by the Engineer.

(d) The Contractor shall be required to supervise all field operations very closely. As the planting of trees and shrubs is a delicate business and should be approached in the same way as the planting of horticultural seedlings. The Contractor shall employ experienced agricultural or forestry labourers for this work.

(e) If the plants are to be supplied to the Contractor from a nursery under a separate contract, the plants should be ready for planting. They shall be at least 300 mm in height above the soil surface and hardened off in the normal way. The Contractor shall collect the plants from the nursery and transport them to site with all due care. The plants will normally be supplied in polythene pots, which shall not be removed until the moment of planting. Plants shall be lifted by the pots, never by the stem or leaves. At all times they are to be kept as cool as possible. The Contractor shall be responsible for ensuring that the soil around the roots does not dry out. Under any circumstances, all plants supplied must be planted within three days of removal from the nursery.

(f) If it is provided in the Contract that the Contractor is responsible for the supply of plants, he shall maintain the same workmanship and standard as specified herein.

(g) Planting shall be started at the top of the slope and under no circumstances shall new plants be walked on or otherwise disturbed.

(h) A planting pit wide and deep enough for the main root to be buried in without bending it and wide enough for all the roots and surrounding soil ball shall be dug at the time of planting. Some compost if available shall be mixed with the soil from the slit prior to backfilling around the roots. The polythene pot must be removed from the seedling by cutting it away with a razor blade. The plant should then be carefully placed into the hole, the compost and soil packed in, and all surrounding soil firmed up, taking care not to cause any damage to the plant or its roots. The surface over and around the pit shall then be mulched using any appropriate, locally available material, such as manure, compost, dead leaves or cut herbage. The use of freshly cut *Eupatorium adenophorum* shall be avoided, since it can re-sprout from the buds after being cut.

(i) The Engineer may specify bigger seedlings for specific areas, such as those to be used intensively for amenity purposes. These will normally have been growing in a nursery for at least a year and should have well developed roots as well as aerial parts. They will be provided either as bareroot stock with a substantial root ball, or in pots of a minimum of 100 x 180 mm laid flat dimensions. When these larger seedlings are planted, the pits shall be of 300 mm diameter and 300 mm depth. In addition, well-rotted compost shall be mixed with the soil backfill in a ratio of at least one part compost to ten parts soil.

(j) Measurement and Payment: The measurement shall be made in number of seedlings 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. This payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, providing seedlings, collection and application of mulch, all labour, tools, equipment, safety harness and incidentals to complete the work as per these Specifications. If the seedlings and mulch 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 of seedlings and mulch, no separate payment shall be made for these items.

(5) Site Planting of Hardwood Cutting

(a) Certain trees and shrubs can be planted on site by means of hard wood cuttings. Where these are specified, the Contractor shall be required to carry out the planting of cuttings as per the Engineer's instructions.

(b) It is assumed that the site will be prepared for planting, if it is to be prepared under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of delicate young plants.

(c) The spacing of hardwood cutting shall be determined according to individual site conditions. However, it will normally be at 500 mm centres unless otherwise specified.

(d) The Contractor shall be required to supervise all field operations very closely. The planting of tree and shrub cuttings is a delicate business and shall be approached in the same way as the planting of horticultural cuttings (e.g. those of tea). The Contractor shall employ experienced agricultural or forestry labourers for this work.

(e) The cuttings supplied to the Contractor will normally be from a nursery as arranged seperately. If these cuttings are to be provided by the Contractor himself, he shall make such arrangements so as to make the cuttings ready for planting. The size of the cuttings shall be prepared as specified in Section 1403 unless otherwise instructed by the Engineer. The Contractor shall collect the cuttings from the nursery (if provided in the Contract) and transport them from the nursery wrapped in Hessian jute. 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 cutting from the parent plant, trimming and planting. Under any circumstances, all plants supplied shall be planted the same day that they are lifted from the nursery.

(f) Planting shall be started at the top of the slope and under no circumstances shall new plants be walked on or otherwise disturbed. Using a small bar (usually made of mild steel and with a pointed end), a hole shall be made that is just big enough for the cutting. The cutting shall be inserted and the soil shall be replaced around it and firmed with the fingers. The cutting shall be inserted to depth such that two-thirds to three-quarters of it is buried.

(g) If the soil is dry and there is no rain within 16 to 24 hours of planting, the site shall be watered carefully with a fine spray. The Contractor shall be required to water for the first two weeks after planting in the event of inadequate rainfall.

(h) If it is provided in the Contract that the cuttings to be used are to be from elsewhere other than nurseries then the Contractor shall obtain them in the manner described in Sub-Section 1403.

(i) The Engineer may specify bigger cuttings for specific areas, using large truncheon cuttings. Cuttings of these species should be planted at 1000 mm centres burring up to 500 mm. A large crowbar shall be used to make the planting hole, but otherwise the technique shall be as described above for smaller cuttings. Under no circumstances shall these cuttings be hammered into the ground.

(j) Measurement and Payment: The measurement shall be made on the basis of per number of cuttings planted, counted and accepted on site by the Engineer. The quantities measured shall be paid at the unit rates shown in the Bill of Quantities. This payment shall be the full and final compensation to the Contractor for making arrangements for traffic control, providing and delivering seedlings, all labour, tools, equipment, safety harness and incidentals to complete the work as per these Specifications. If the seedlings 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 seedlings, no separate payment shall be made for this item.

(6) Brush Layering, Palisades and Fascines

(a) Under certain conditions, the Contractor shall be required to construct vegetation structures using hardwood cuttings. Where these are specified, the Contractor shall be required to carry out the necessary preparation and planting works as required in the Engineer's instructions.

(b) It is assumed that the site will be already prepared for planting, if it has to be prepared under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the successful establishment of delicate young plants.

(c) The cuttings supplied to the Contractor may be from a nursery as arranged under a separate contract, and will be ready for planting. If the cuttings have to be arranged by the Contractor, he shall ensure that they are ready for planting. The cuttings shall be prepared as specified in Clause 1403 or as instructed by the Engineer. The Contractor shall collect the cuttings from the nursery and transport them from the nursery wrapped in Hessian jute. At all times, cuttings shall be kept moist and as cool as possible, and shall be wrapped in wet Hessian or in the thick blanket of mulch material (i.e. *Eupatorium adenophorum*) between all operations such as cutting from the parent plant, trimming and planting. Under any circumstances, all plants supplied shall be planted the same day that they are lifted from the nursery.

(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 Section 1403 except that the size of cuttings will be of a minimum length of 450-600 mm for brush layering, 600 mm for palisades and 1000 mm for fascines, and minimum diameters of 20-30 mm for brush layering and palisades and 40-50 mm for fascines.

(e) Cuttings of the following species, if specified for the truncheon cuttings planting, shall be a minimum of 2500-3000 mm in length.

(f) The Contractor shall be required to supervise all field operations very closely. The planting of tree and shrub cuttings is a delicate business and shall be approached in the same way as the planting of horticultural cuttings (e.g. those of tea). The Contractor shall employ experienced agricultural or forestry labourers for this work.

(g) Planting shall always be started at the top of the slope and under no circumstances shall new plants be walked on or otherwise disturbed.

(h) Brush layering on road embankment slopes shall be planted as given below, unless specified differently.

(i) Starting at the top of the area to be treated, and using appropriate measuring equipment, exact lines should be marked out. From 1.5 meters below the road edge, a precise contour line should be marked out on every 1 meter down the slope.

(ii) After the line marking is completed, starting at the bottom of slope, a back sloped terrace (1:10) of approximately 300 mm in width x 100 mm inner depth and 300-400 mm outer depth should be excavated along the lines. The terrace must not be allowed to open more than 5 metres length at a time before planting work is completed.

(iii) Topsoil or agricultural soil of maximum depth of 100 mm from the ROW should be collected and laid on the terrace. The minimum thickness shall be 50 mm unless otherwise instructed by the Engineer.

(iv) Cuttings should then be placed into the terrace at 100 mm centres, the correct way up and angled so that they are at right angles to the maximum slope angle. All cuttings should be inserted to a depth such that two-thirds of their length is buried.

(v) The terrace should then be partially backfilled with another 50 mm thick layer of topsoil and another line of cuttings placed (pushing into the soil) along the terrace at 100 mm centres, and with the individual cuttings offset to coincide with the gaps between the cuttings in the first line. This results in cuttings at 50 mm final gap on each brush layer (i.e. 21 cuttings per linear metre).

(vi) When a practical working length is completed, formation of second terrace is then started. As the excavation is undergoing, the partially backfilled brush layering terrace below should be fully backfilled using the material that comes out of the second terrace and gently compacted. Any loose or excess material is cleared down the slope making the complete daylight upon the completion of whole slope.

(i) Brush layering on the landslide debris shall be planted as given below, unless specified differently.

(i) Starting at the bottom of the area to be treated, and using appropriate measuring equipment, exact lines shall be marked following a precise contour line at 1 metre interval.

(ii) After the line marking is completed, starting at the bottom of slope, a back sloped terrace (1:10) of approximately 450 mm in width x 100 mm inner depth and 300-400 mm outer depth shall be excavated along the lines. The terrace shall not be allowed to open more than 5 metres length at time before planting work is completed.

(iii) Cuttings shall then be placed into the terrace at 100 mm centres, the correct way up and angled so that they are at right angles to the maximum slope angle. All cuttings shall be inserted to a depth such that two-thirds of their length is buried.

(iv) The terrace shall then be partially backfilled with 50 mm layer of soil and another line of cuttings placed (pushing into the soil) along the terrace at 100 mm centres, and with the individual cuttings offset to coincide with the gaps between the cuttings in the first line. This results in cuttings at 50 mm final gap on each brush layer (i.e. 21 cuttings per linear metre).

(v) When a practical working length is completed, formation of second terrace shall then be started. As the excavation is undergoing, the partially backfilled brush layering terrace below shall be fully backfilled using that material that come out of the second terrace and gently compacted. Any loose or excess material shall be cleared down the slope making the complete daylight upon the completion of whole slope.

(vi) Brush layering is often done in diagonal or chevron pattern. If it is instructed so, the procedure given above shall be followed except setting out lines, which shall be changed accordingly.

(j) Palisades shall be constructed as given below, unless specified differently.

(i) Starting at the top of the area to be treated, and using appropriate measuring equipment, exact lines shall be marked out. From 1 metre below the top of the slope, a precise contour line shall be marked out every 1 metre down the slope.

(ii) Starting at one end and using a small bar (usually made of mild steel and with a pointed end), a hole shall be made that is just big enough for the first cutting. The cutting shall be inserted and the soil shall be replaced around it and firmed with the fingers. The cutting shall be the correct way up and angled so that it is vertical. The cutting shall be inserted to a depth such that two-thirds of it is buried.

(iii) This process shall be repeated along the entire line, with a series of cuttings placed at 50 mm centres.

(iv) If a double line is specified, then a second line of cuttings shall be placed in the same way, 100 mm behind the first and with the individual cuttings offset to coincide with the gaps between the cuttings in the first line.

(v) The soil around the single or double line shall then be completely backfilled into any remaining gaps and gently compacted. Any loose or excess material shall be cleared down the slope before the next line is planted.

(k) Fascines shall be bundles of hardwood cuttings laid horizontally in trenches, and parallel to the line of the trench. The bundles shall be thereby completely buried. Fascines shall be constructed as given below, unless specified differently.

(i) Starting at the top of the area to be treated, and using appropriate measuring equipment, exact lines shall be marked out. From 1 metre below the top of the slope, a precise contour line shall be marked out every 1 metre down the slope.

(ii) Starting at the bottom as the marking is completed; trenches approximately 200 mm x 200 mm in depth shall be excavated along the lines.

(iii) 600 mm long cuttings of same material that is going to make fascine shall be planted on the lower side of trench in vertical position as a peg at 1000 mm interval.

(iv) Cuttings shall then be laid along each trench, so that they lie horizontally along the trench. There shall be a minimum of six cuttings together. They shall be overlapped so that no two ends coincide. All the small branches growing from the main branch shall be protruding on slope. Under no circumstances, the branches and buds shall be damaged. The cuttings shall then be tied using jute or coir (coconut fiber) string at 500 mm intervals to form a bundle. As the fascine is created, it thereby forms a continuous bundle right across the slope.

(v) The trench shall then be backfilled and gently compacted. The top of the fascine shall be 50 to 100 mm below the surface. Any loose or excess material shall be cleared down the slope before the next line is planted.

(vi) The Engineer may specify that orientations other than along the contour of the slope are used. In this event, the Contractor shall alter the laying out of lines accordingly and meet the precise angle required.

(vii) If the soil is dry and there is no rain within 16 to 24 hours of planting, the site shall be watered carefully with a fine spray. The Contractor shall be required to water for the f irst two weeks after planting in the event of inadequate rainfall.

(l) Measurement and Payment: Brush layering, Palisades and Fascines shall be measured separately as per the accepted final product in linear metre. The payment shall be the full and final compensation to the Contractor for making arrangements for traffic control, collecting and transporting of cuttings to the site, all labour, tools, equipment, safety harnesses and incidentals to complete the work as per these Specifications. If the cuttings 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 cuttings, no separate payment shall be made for this item.

(7) Live Check Dam Construction

(a) Under certain conditions, the Contractor shall be required to construct vegetation structures using hardwood cuttings. Where these are specified, the Contractor shall carry out the necessary preparation and planting works as directed by the Engineer.

(b) The site preparation shall be completed for planting in advance; but the Contractor shall ensure that the condition of the site is good enough for the successful establishment of delicate plants.

(c) The cuttings shall be at least 4000 mm long and 50 mm in diameter made from woody material that is 6 to 30 months old. The Contractor shall collect the cuttings from local area and transport them from there wrapped in Hessian jute. At all times, the cuttings shall be kept moist and cool as much as possible, and thus should be wrapped in wet Hessian. Under any circumstances, all plants supplied shall be planted the same day.

(d) If the instruction to the Contractor includes the provision of cuttings, then the Engineer will specify the species and expected sources, and the Contractor shall obtain the cuttings required.

(e) Cuttings of dabdabe*(Garugapinnata)*, kavro (*Ficuslacor*), phaledo (*Erythrinaspp*) and *Gliricidiasepium*shall be a minimum of 2000 mm in length. Apart from these other species shall be used as directed by the Engineer.

(g) Live check dams shall be constructed as given below, unless otherwise specified:

(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. Do not damage the bark. They shall protrude about 300 mm above the ground.
(iii) Place long hardwood cuttings on the uphill side of the vertical stakes.
(iv) Key these horizontal members into the wall of the gully
(v) Backfill around the check dam and compact the soil

(h) Measurement and Payment: The live check dam shall be measured in linear meter. The Live check dams shall be paid at the respective contract unit price which shall be the full and the final compensation to the Contractor as per Section 116 to complete the work in accordance with these Specifications.

(8) Site Planting of Bamboo

(a) The planting of bamboo is intended to replace or restore the natural vegetation on the slope to be treated. The Contractor shall carry out the planting of seedlings as directed by the Engineer.

(b) The site preparation shall be completed for planting in advance and the Contractor shall ensure

(c) that the condition of the site is good enough for the successful establishment of delicate plants.

(d) The spacing of plants shall be determined based on site conditions. Unless otherwise specified the spacing shall be two meters across the slope and five meters up and down the slope.

(e) Select a suitable culm of the parent clump and dig out the rhizome carefully. Cut off the culm about two meters above the ground level. Cut the rhizome where it branches from the main plant, taking care not to damage the buds and small roots.

(f) Wrap the root ball in damp hessian and transport the cuttings to site for planting on the same day.

(g) Dig a hole (at least five times the size of the cutting's rhizome) 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.

(h) The Contractor shall supervise all field operations very closely. The planting of bamboo is a delicate task, thus the Contractor shall employ only experienced agricultural or forestry laborers.

(i) Measurement and Payment: The measurement shall be made in number of plants planted. The bamboo planting shall be paid at the respective contract unit price which shall be the full and the final compensation to the Contractor as per Section 116 to complete the work in accordance with these Specifications.

(9) Use of Fertilizer

(a) Under certain circumstances, the use of chemical fertilizers may be specified in place of farmyard manure or mulching.

(b) Levels of fertilizer application shall vary according to soil type and nutritional content. However, if nutritional data are not available, the following figures shall be used as a rough guide:

Nitrogen (N) : 10 g/m^2;
Phosphorus (P) : 5 g/m^2;
Potassium (K) : 4 g/m^2.

309 SPRIGGING

(1) Scope

This Section shall consist of planting sprig of living grass plants at the locations shown on the Drawings or as directed by the Engineer in accordance with these specifications.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer, before starting the various operations that the planting and application of required materials will be made at the specified rates.

Unless otherwise directed sprigging shall be done on all embankment slopes greater than 3.5 horizontal to 1 vertical, and on drainage berms.

(2) Materials

(a) Sprigs

Sprigs shall be healthy living stems (stolons or rhizomes), of the grass species approved by the Engineer, harvested without adhering soil and obtained from sources where the sod is heavy and thickly matted. Sprigs containing weeds or other material which might be detrimental to the proposed planting will be rejected.

(b) Water

All water used shall be sufficiently free from oil, acid, alkali, salt, or other harmful materials that would inhibit the growth of grass. Brackish water shall not be used at any time. Water shall be subject to the approval of the Engineer prior to use.

(3) Soils for Repairs

Soil for fill and topsoiling of areas to be repaired or made up shall be at least of equal quality to that which exists in areas adjacent to the area to be worked in. The soil shall be free from large stones, roots, stump or other materials that will interfere with subsequent sprigging, compacting, establishing turf or grass cutting operations, and shall be approved by the Engineer before being placed.

(4) Construction

(a) Advance Preparation and Cleanup

After grading of areas has been completed the areas to be sprigged shall be raked or otherwise cleared of stones larger than 50 mm in any one dimension, sticks, stumps, and other debris which might interfere with sprigging, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after grading of areas and before the planting of sprigs the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

(b) Obtaining Sprigs

The sprigs obtained from sources off the site shall be from suitable areas as close as practical to the planting site. Regardless of the source, sprigging material to be harvested shall be mowed to a height of 75 mm, and the clippings raked and removed before harvesting begins. Harvesting may be performed by any method acceptable to the Engineer, including crisscross cultivation, shallow ploughing or other acceptable methods to thoroughly loosen the sprigs from the soil and to bring them to the surface. After loosening the sprigs from the soil, they shall be gathered in small piles or windrows, watered, and kept moist until planted.

Not more than 24 hours shall elapse between harvesting and planting sprigs, except that, when weather or other uncontrollable conditions interrupt the work, a time extension may be granted, provided the sprigs are still moist and viable. Springs that have heated in stockpiles, dried out, or otherwise been damaged during harvesting or delivery shall be rejected and shall be disposed of as directed by the Engineer.

(c) Planting Sprigs

Sprigging shall be completed such that the turf is well established at the coming of the monsoon season to minimize risk of damage due to rain erosion. Sprigging shall not be done during windy weather, or when the ground is dry, excessively wet, or otherwise untillable. If the soil is not moist when the sprigs are being set, water shall be applied until the soil is moist and in a workable condition. Sprigs shall be broadcast by hand or by suitable equipment in a uniform layer over the prepared surface with sprigs spaced not more than 150 mm apart. The sprigs shall then be forced into the soil to a depth of 50 to 100 mm with a straight spade or similar tool, or with a disc harrow or other equipment set to cover the sprigs to the required depths.

After planting has been completed, the surface shall be cleared of stones larger than 50 mm in any dimension, large clods, roots, and other litter brought to the surface during sprigging.

(d) Compacting

The sprigged area shall be compacted within 24 hours from the time sprigging has been completed. If weather and soil conditions permit, compaction shall be carried out by rollers operated at right angles to

the slope. Compaction shall not be done when the soil is in such condition that it is picked up by the equipment.

(e) Care of the sprigs until Final Acceptance

The Contractor shall be responsible for the proper care of the sprigged areas during the period when the plants are becoming established and he shall protect the sprigged areas against traffic by warning signs or barricades approved by the Engineer. Surfaces eroded or otherwise damaged following sprigging shall be repaired by grading and resprigging as directed. The Contractor shall mow, water as required to promote sprig development, and shall otherwise maintain sprigged areas in a satisfactory condition until final inspection and acceptance of the work.

Measurement and Payment

Measurement for sprigging shall be made in square meter. Payment for sprigging shall be made at the respective contract unit rates and these shall be the full and the final compensation to the Contractor as per Section 116 to complete the work in accordance with these Specifications.

310 TURFING

(1) Scope

This Section consist of furnishing, hauling, and placing approved live turfs on prepared areas in accordance with this specification at the locations shown on the Drawings or as directed by the Engineer.

Areas to be soiled, stripped or spot sodded shall be as shown on the Drawings or as directed by the Engineer.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

(2) Materials

(a) Turfs

Turfs furnished by the Contractor shall have a good cover of living or growing grass. This includes grass that may be seasonally dormant during the cold or dry seasons but capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf with fewer than 5% weeds or other undesirable foreign plants. Obvious large stones, roots, or other materials which might be detrimental to the development of the sod or to future maintenance shall be removed from sod at the point of harvesting. At least 70% of the plants in the cut sod shall be composed of species approved by the Engineer. Grass shall be mowed to a height of 75 mm before turf is lifted. Turfs, including the soil containing the roots and the plant growth stated above, shall be cut uniformly to a thickness not less than 50 mm.

(b) Water

Water shall be sufficiently free from oil, acid, alkali, salt, or other materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

(3) Soil for Repairs

The soil for fill and topsoiling of areas to be repaired or made up shall be at least of quality equal to that which exists in areas adjacent to the area to be worked in. The soil shall be free from stones larger than 50

mm in any dimension, toots, stumps, or other materials that will interfere with subsequent placement, leveling, compacting, and establishment of the sod, and shall be approved by the Engineer before being placed.

(4) Workmanship

(a) Preparing the Ground Surface

After grading of areas has been completed the areas to be sodded shall be raked or otherwise cleared of stones larger than 50 mm in any dimension, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before placing of turf, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

(b) Obtaining and Delivering Turfs

After inspection and approval of the source of turfs by the Engineer, the turfs shall be cut with approved turf cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 50 mm. Turf sections or strips shall be cut in uniform widths, not less than 250 mm, and in lengths of not less than 450 mm, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, and turf must be rolled without damage with the grass folded inside. Turfs shall be mowed if required to meet this specification.The turf shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor"s control make storing necessary. In such cases, turfs shall be stacked, kept moist, and protected from exposure to the air and sun. Turfs shall be cut and moved only when the soil moisture conditions are such that favorable results can be achieved. Where the turf and soil to be cut is too dry, permission to cut turfs may be granted subject to sufficient watering to moisten the turfs and soil to the full depth the turfs is to be cut.

(c) Laying

Turfing shall be performed only during the seasons when satisfactory results can be achieved. Turfs may be transplanted during periods of drought with the approval of the Engineer, provided the turfing bed is watered to moisten the soil to a depth of at least 100 mm immediately prior to laying the turfs. The turfs shall be moist and shall be placed on a moist earth bed. Pitch forks shall not be used to handle turfs. Turfs shall be carefully lifted, loaded and unloaded to prevent tearing or loss of dirt. Turfs shall be carefully laid by hand, edge to edge and with joints staggered a nominal 100 mm, in rows at right angles to the slopes, commencing at the base of the area to be turfed and working upward. The sod shall immediately be pressed firmly into contact with the turf bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of turfed areas. Where it is likely that the turfs may be displaced during turfing operations, workers when replacing it shall work from ladders or treaded planks to prevent further displacement. Screened soil of good quantity shall be used to fill all cracks between sods. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surface or road shoulders across sodded areas, the surface of the sod after compaction shall be set approximately 40 mm below the pavement edge. Where the flow will be over the turfed areas and onto the paved surfaces around manholes and inlets, the surface of the turf after compaction shall be placed flush with pavement edges and inlets.

Newly turfed areas on slopes of cuttings and embankments shall be pegged down in a manner approved by the Engineer.

(d) Watering

Adequate water and watering equipment must be on hand before turfing begins, and turf shall be kept moist until it has become established and its continued growth is assured. In all cases, watering shall be done in a manner which will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

(e) Care and Maintenance of Turfing until Final Acceptance

The Contractor shall be responsible for the proper care of the turfed areas during the period when the turf is becoming established and he shall protect the turfed areas from traffic by warning signs or barricades approved by the Engineer. Surfaces eroded or otherwise damaged following turfing shall be repaired by regrading and returfing as directed by the Engineer. The Contractor shall water as required to promote turf development, and shall otherwise maintain sodded areas in a satisfactory condition until final inspection and acceptance of the work.

The Contractor shall mow the turfed areas with approved mowing equipment, depending upon climatic and growth conditions and the needs for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the sodded species, they shall be mowed and the clippings raked and removed from the area.

When the surface has become eroded or otherwise damaged during the period covered by this Contract the affected area shall be repaired to re-establish the grade and the condition of the soil as directed by the Engineer, and shall then be returfed as specified above.

Measurement and Payment

Measurement for turfing shall be made in square meter. Payment for turfing shall be made at the respective contract unit rates and these shall be the full and the final compensation to the Contractor as per Section 116 to complete the work in accordance with these Specifications.

311 SEEDING

(1) General

This Section shall consist of furnishing, sowing and maintaining turf growth in landscaped areas, as an alternate to turfing, in accordance with this specification at the locations shown on the Drawings or as directed by the Engineer.

Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be in good condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made at the specified rates.

Unless otherwise directed seeding shall be done only on central reserve areas designated landscape areas and upon approval of the Engineer.

(2) Materials

(a) Seed

Seed shall be the best quality seed available in Bhutan and suitable for use in the project area.

(b) Fertilizer

Fertilizer shall be added to topsoil after placement in accordance with these specifications. The Contractor shall submit a list of the composition of the proposed fertilizer mixture together with a 2 kg sample to the Engineer for approval. The fertilizer shall contain amounts of nitrogen, phosphorus and potash appropriate to the soil and growing conditions, as recommended by the Department of Agriculture, Bhutan.

(c) Water

Water shall be sufficiently free from oil, acid, alkali, salt, or other materials that would inhibit the growth of grass. It shall be subject to the approval of the Engineer prior to use.

(3) Soil for Repairs

Soil for making topsoil repairs shall be of equal quality to that which exists in areas adjacent to the area to be worked in. The soil shall be free from stones larger than 50 mm in any dimension, roots, stumps, or other materials that will interfere with subsequent placement, leveling, compacting, and establishment of the turf, and shall be approved by the Engineer before being placed.

(4) Construction

(a) Preparing the Ground Surface for Seeding

After grading of areas has been completed the areas to be seeded shall be raked or otherwise cleared of stones larger than 50 mm in any dimension, stick, stumps, and other debris which might interfere with seeding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes occurs after grading of areas and before seeding, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.

(b) Approval of Seed

Seed shall contain only varieties of grasses considered acceptable for the areas to be seeded. The Contractor shall submit a list of the proposed seed mixture together with a 1 kg sample of the seed mix proposed to the Engineer for approval. Seed shall be 95% weed-free.

(c) Seeding

Seed shall be applied by mechanical rotary spreader so to evenly distribute the seed over the surface at the specified rate of application of 1 kg per 125 square meters. Manual seeding shall be permitted only if the Contractor is able to demonstrate and prove uniform spreading to the approval of the Engineer. Seeding shall be performed only during the seasons when satisfactory results can be achieved. Seed may be sown during periods of drought with the approval of the Engineer, provided the seed is constantly kept moist until two weeks after germination, and then is watered sufficiently frequently to ensure growth of the seed.

Immediately prior to seeding, fertilizer shall be applied to the topsoil at the specified application rate of a minimum 8 kg per 100 square meters. The top 100 mm of soil shall then be mixed by light tilling. Following this the surface shall be bladed and rolled lightly to consolidate and level the loose soil. After rolling, the surface shall be hand-raked so as to slightly loosen the surface of the rolled ground. Seed shall then be applied at the specified rate of application.

Immediately after seeding, the surface shall again be lightly raked in order to barely cover the seed in the top of the soil. The surface shall be lightly rolled.

(d) Watering

The method proposed for use by the Contractor to keep the seed bed moist during the germination period and beyond shall be approved in advance by the Engineer. Adequate water and watering equipment must be in place at all times after seeding. Seed shall be kept moist until it has become established and its continued growth is assured. In all cases, watering shall be done in a manner which will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

(e) Care and Maintenance of Seeded Area until Final Acceptance

The Contractor shall be responsible for the proper care of the seeded areas during the period when the turf is becoming established and he shall protect the seeded areas from traffic by warning signs or barricades approved by the Engineer. Surfaces eroded or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall water as required to promote turf development, and shall otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

The Contractor shall mow the seeded areas with approved mowing equipment, after new grass reaches a height of 100 mm to 150 mm. The grass shall be cut to a height of 75 mm, and shall be further cut to that height so that it at no time exceeds 150 mm in height prior to final acceptance. In the event that large weeds or other undesirable vegetation becomes established in the new turf, they shall be removed by hand or chemical means. Any dead plant material shall be raked and removed from the area.

When the surface has become eroded or otherwise damaged during the period covered by this Contract the affected area shall be repaired to re-establish the grade and the condition of the soil as directed by the Engineer, and shall then be reseeded as specified above.

Measurement and Payment

Measurement for seeding shall be made in square meter. Payment for seeding shall be made at the respective contract unit rates and these shall be the full and the final compensation to the Contractor as per Section 116 to complete the work in accordance with these Specifications.

312 JUTE NETTING WORKS

(a) The Contractor shall provide and install jute netting as shown on the Drawing or as required by the Engineer. This shall be done according to the specifications described hereunder, as and when required. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met.

(b) The Engineer may instruct that jute netting applications be used in conjunction with other techniques, particularly the sowing or planting of grasses. In this event, the netting shall be applied before the plants are introduced. When planting, the labourers shall take care only to hold or stand on the pegs and not to disturb the netting except when carefully placing grass seed underneath on the soil surface.

(1) Supply of Jute Nets

(a) The Contractor shall manufacture or obtain supply of jute nets to the satisfaction of the Engineer.

(b) The detailed specifications for standard jute net shall be as follows. "Standard" jute netting is used for placing on bare slopes and is normally planted with grasses. *(Note: warp ends are the length-ways threads and weft strands are the cross-ways threads)*

(i)	Material:	High quality, 100% natural jute fiber from the latest harvest, properly treated and dried.
(ii)	Yarn:	Handspun 5 to 8 mm.
(iii)	Strip size:	minimum 1.0 x 10.0 metres;
		maximum 1.1 x 11.5 metres.
(iv)	Warp ends:	27 ends per 1000 mm.
(v)	Weft strands:	20 to 24 strands per 1000 mm.
(vi)	Mesh size:	40 mm square mesh holes.
(vii)	Weight:	1.1 to 1.2 kg per square metre.

(c) The detailed specifications for wide mesh jute net shall be as follows. "Wide mesh " jute net is used for holding on to slopes which have been sown with grass seed. *(Note: warp ends are the length-ways threads and weft strands are the cross-ways threads)*

(i)	Material:	High quality, 100% natural jute fibre from the latest harvest, properly treated and dried.
(ii)	Yarn:	Handspun 3 to 5 mm.
(iii)	Strip size:	minimum 1.0 x 5.0 metres;
		maximum 1.1 x 11.5 metres.
(iv)	Warp ends:	7 ends per 1000 mm.
(v)	Weft strands:	3 strands per 1000 mm.
(vi)	Mesh size:	150 x 450 mm rectangular mesh.
(vii)	Weight:	0.2 kg per square metre.

(d) Measurement and Payment: No separate measurement and payment shall be made for the supply of jute nets. All costs incurred for the supply of jute nets shall be included in the item rate for the placement of jute nets.

(2) Placement of Small Mesh Size Jute Nets/Standard Jute Nets

(a) The Engineer shall normally instruct the placement of standard jute nets on slopes in excess of 45°. It is therefore very essential to place the netting in an effective manner to the satisfaction of the Engineer.

(b) It is assumed that the site will already have been prepared for the application of jute netting, if it is to be prepared under a separate contract. Nevertheless, it shall be the responsibility of the Contractor to ensure that the condition of the site is good enough for the optimum effect to be attained. In any event, a smooth profile must be obtained. All loose debris shall be removed. Concavities shall be filled with well compacted material or dry-stone dentition as shown on the Drawing or as instructed by the Engineer. Convexities shall also be removed and it is essential that the general profile does not have a shape giving over-steep segments.

(c) Starting at one end of top of the site to be treated, a roll of netting shall be pegged 300 mm above the slope to be covered.

(d) The netting shall be rolled slowly down the slope. Hardwood cuttings, ideally of Jhakrikath (*Vitexnegundo*) or pegs (usually made from split bamboo culms) shall be hammered through the netting at 1000 mm centres at 100 mm inside of each edge. They shall protrude about 80 mm on the slope. Labourers shall stand on these cuttings or pegs and not hang on to the netting. As the full length of the jute netting is unrolled down the slope, a second round of the pegs shall be added in between. This will make total allowable spacing of not more than 500 mm interval. Another strip shall then be started to unroll from the top. This shall overlap by 100 mm and under no circumstances the pegging is done through both layer of jute net instead it shall be pegged separately. Each strip of jute netting shall be pegged down on the slope individually.

(e) The tension of the netting shall now be reduced so that it hugs the slope surface precisely. This is done by pulling up about 200 mm at the bottom of the netting and hooking it on to the pegs a little higher up. This process shall be repeated up and across the slope until the netting rests snugly against the surface and is nowhere tight or pulled away from the surface in minor concavities. Additional pegs shall be used to hold netting closely against the face of conca ve slope segments if necessary.

(f) This process shall be repeated until the entire slope surface is covered. There shall be no lacing of any jute netting whatsoever.

(g) Finally, the bottom of the netting shall be trimmed to give a tidy finish.

(h) Measurement and Payment: As the actual quantity of jute net and area covered on slope differ from each other due to the overlapping, payment shall be made on the basis of final area covered on slope and measured in square metre (not the quantity of jute net). The payment shall be the full and the final compensation to the Contractor for making arrangements for safety to traffics, purchasing of jute, arrangement for looms and shades, fabrication of jute netting and transportation to the site, all labour, tools, equipment, safety harnesses and incidentals to complete the work as per these Specifications.

(3) Placement of Wide Mesh Size Jute Netting

(a) In the case of wide mesh jute netting, it shall only be specified for use on slopes which have already been treated with grass and mulch. These shall usually be less than 45°. However, the process of placing the netting shall be similar to that for standard netting.

(b) Unlike the standard mesh jute net, wide mesh jute net is available on shorter length of 5.5 metres and smaller roll in nature. It shall be opened by two people by two end laid flat (same as bed sheet is laid) on seeded and mulched slope.

(c) The netting shall be pegged with hardwood cuttings, ideally of Jhakrikath (*Vitexnegundo*) or pegs (usually made from split bamboo culms) at every 500 mm intervals. The Contractor shall ensure that his/her labourers do not damage the area of seeding and mulching while placing the jute net.

(d) This process shall be repeated until the entire slope surface is covered. The strips shall then laced together with lengths of the same jute yarn, to form a continuous net. The lacing shall form joins every 500 mm or less.

(e) The tension of the netting shall now be reduced so that it hugs the slope precisely and hold the mulch firmly against the surface throughout the area covered. Additional pegs shall be used to hold netting closely against the face of concave slope segments.

(f) Finally, the bottom of the netting shall be trimmed to give a tidy finish.

(g) Measurement and Payment: The payment shall be made on the basis of final area covered on slope and measured in square metre (not the quantity of jute net). The payment shall be the full and the final compensation to the Contractor for making arrangements for safety to traffics, purchasing and transporting of jute net to the site, all labour, tools, equipment, safety harnesses and incidentals to complete the work as per these Specifications.

313 GABION WIRE BOLSTERS, SUB-SOIL DRAINS AND WIRE NETTING

The contractor shall provide and install wire bolsters as shown on the Drawing or instructed by the Engineer. This shall be done according to the specifications described hereunder, as required. The Contractor shall supply all necessary expertise, resources and facilities to ensure that these requirements are met.

(1) Fabrication of Bolster Panels

(a) Bolster panels shall be either 5 x 1 metres or 5 x 2 metres in size, according to the type of bolster to be used. If the bolster panels are used for the wire netting, the size of the panel shall be 5.0 m X 5.0 m. They shall be woven with hexagonal mesh in the same way as normal gabion panels. For the panel frame, 10 swg galvanized wire shall be used; for the mesh, 12 SWG shall be adequate. Gabion wire shall comply with the requirements of Section 900.

(b) Weaving shall start from one of the long sides. A total of 83 coils of wire shall be spaced evenly along the 5 metre length. This gives a mesh width of about 60 mm. Each weave shall have three twists, as for normal hexagonal mesh. This shall give a length of about 80 mm to each mesh link.

In any event, the mesh length shall not exceed 90 mm. The mesh shall be turned on to the larger frame wire at least one and a half turns and made fully secure.

(2) Placement of Contour Bolsters

(a) A contour bolster treatment shall give a series of stone-filled wire tubes of 300 mm diameter, laid in trenches cut across the slope. The tops of all the tubes shall flush with the surface of the slope in which they are placed. The purpose shall be to check scour of the slope surface by preventing the development of rills and gullies.

(b) The site to be treated shall be given final preparation immediately before bolster installation. All small protrusions and depressions shall be obliterated by cutting, or by infilling and compaction.

(c) Starting at the base of the area to be treated, and using appropriate measuring equipment, exact lines shall be marked out. From 2 metres above the base of the slope, a precise contour line shall be marked out every 2 metres up the slope.

(d) Starting at the bottom, trenches with circular base shall be dug along the lines, adequate to take the final 300 mm diameter tubes.

(e) Bolster panels shall then be laid along the trenches and shaped to fit neatly into the base of the trenches, as well as into any curves formed as a result of the slope contours; each panel shall be securely joined to the next panel, to form a continuous bolster tube.

(f) The panels shall be packed with stones, closed over and the edges wired together. All stones must be bigger than the mesh size. The same care shall be taken as when filling a conventional gabion basket, and stones must be carefully placed to give good structural integrity.

(g) The ends of the bolsters shall be closed over and wired together. The trenches around all the bolsters shall then be filled and compacted with material left from the excavations.

(h) Once all of the lines are in place, all surplus debris shall be cleaned off the slope. Mild steel bars of at least 16 mm diameter shall then be driven into the slope through the lower sides of the contour bolsters. These shall be at least every 2 metres along the lines. Bars shall be 1-2 metres in length on slopes composed of soft materials, but at the Engineer's discretion, on slopes comprising hard rocky materials, bars of 1 metre length shall also be adequate. All bars shall be driven home until the tops protrude no more than 25 mm above the slope surface.

(i) Measurement and Payment: Bolster shall be measured as per the accepted final product in linear metre. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, fabrication of bolster panel including cost of wire, collection and transportation of boulder/stone to the site, packing of stones/boulders, wiring, supply and driving of steel bars, excavation and filling, all labour, tools, equipment, safety harnesses and incidentals required to complete the work as specified in these Specifications.

(3) Placement of Herringbone Bolsters

(a) A herringbone bolster network is in essence a system of wire tubes of between 300 mm to 600 mm in diameter depending on the amount of water flowing through the site, laid in trenches cut into the slope. The main bolster shall run straight down the slope (the spine) with other running into it at an angle of 45° to the fall of the slope (the herringbones or branches) depending on slope angle and terrain morphology. The purpose shall be to check scour of the slope surface by preventing the development of rills and gullies, and to drain the surface material in a similar way to a French drain. The diagonal components shall be at 2 to 5 metreccentres if measured straight down the slope.

(b) The site to be treated shall be given final preparation immediately before bolster installation. All small protrusions and depressions shall be obliterated by cutting, or by infilling and compaction.

(c) Starting at the base of the area to be treated, and using appropriate measuring equipment, exact lines shall be marked out; every 7.0 metres across the slope, a line shall run straight up to the top of the slope (these form the main bolster spines). From the base of the line, and every 3 metres above this, other lines of 5 metres length shall be marked at 45° to the main line (these will form the herringbones).

(d) Starting at the bottom, trenches with circular base shall be dug along the lines, adequate to take the final 300 mm diameter tubes, or 600 mm diameter tubes if large (5 x 2 metre) panels are specified.

(e) Bolster panels shall then be laid along the trenches and shaped to fit neatly into the base of the trenches, as well as into any curves formed as a result of the slope contours; the panels of the herringbones shall be securely joined to the panels of the main bolster.

(f) The panels shall be gradually closed together and secured, working up from the bottom of the slope, while stones are passed in from above to fill them. The stones shall be randomly packed so as to allow free drainage, and all stones shall be bigger than 100 mm. The same care shall be taken when filling a conventional gabion basket, and stones shall be carefully placed to give good structural integrity.

(g) The upper ends of the herringbones shall be closed over and wired together; they should touch the ends of the next herringbones but shall not be secured (hooked) to each other. The trenches around all the bolsters shall then be filled and compacted with material left from the excavations.

(h) Once all of the lines are in place, all surplus debris shall be cleaned off the slope. Mild steel bars of at least 16 mm diameter shall then be driven into the slope through the sides of the main spine bolsters and the lower sides of the herringbone bolsters. These shall be at least every 2 metres along the lines. Bars shall be 1-2 metres in length on slopes composed of soft materials, but at the Engineer's discretion, on slopes comprising hard rocky materials, bars of 1 metre length may be adequate. All bars shall be driven home until the tops protrude no more than 25 mm above the slope surface.

(i) Measurement and Payment: Bolster that are accepted by the Engineer shall be measured in linear metre. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, fabrication of bolster panel including cost of wires, collection and transportation of boulder/stone to the site, excavations and fillings, boulder/stone packing, all wiring, supply and driving of steel bars, all labour, tools, equipment, safety harnesses and incidentals to complete the work as specified in these Specifications.

(4) Wire Netting

(a) Wire netting shall be a complete cover on the steep rocky slope where heavily shattered rock face is eroding away by surface water. A wire mesh panel, normally larger than bolster, of 5 m x 5m shall be placed over the slope and later plant will be grown to replace the wire netting.

(b) The site to be treated shall be given final preparation immediately before wire netting. All loose bulging shall be trimmed off.

(c) Starting at the top of the slope to be treated, wire netting shall be placed securing well on to the slope. The wire net shall then be stapled down with a "U" shaped hook.

(d) The hook shall be made of 16 mm diameter M/S rod and a minimum of 1000 mm in length. The hook shall be driven hammering down with the mason"s hammer at 500 mm interval. This will be effective if driven into the cracked joint. A shorter length may also be used if the rocky face does not permit the bar, but the Engineer"s approval shall be obtained prior to taking a decision.

(e) The wire netting shall be well secured. If there are any minor concavity and convexity, the wire shall be secured by hammering down by mason"s hammer. Additional staples could be used as necessary. If some of the staples become weak and loose, they shall be jammed with 1:4 cement sand mortar in slurry form.

(f) Measurement and Payment: Wire netting shall be measured in square metre. The payment shall be the full and the final compensation to the Contractor for making arrangements for traffic control, purchasing of wire net, fabrication and transportation of wire netting to the site, supply and driving of hooks, all labour, tools, equipment, materials, safety harnesses and incidentals to complete the work as specified in these Specifications.

(5) Construction of Sub-soil Drains (Sub-surface Drains)

Sub-soil drains shall be installed and paid in accordance with the requirements specified in Section 1100.

(6) Construction of Rip-rap Drain

Rip-rap drains shall be installed and paid in accordance with the requirements specified in Section 1100.

314 SITE PROTECTION

(a) The Contractor shall protect a planted site for the period specified in the Contract. Protection shall include the prevention of damage to the site works and plants by people and domestic or wild animals. It shall also include the tending of plants and improving their growth, as specified below.

(b) The period of maintenance/site protection shall be twelve months unless otherwise specified in the Contract.

(1) Provision and Role of Site Warden

(a) The Contractor shall be required to provide an adequate number of site wardens to look after the site to fulfill the specified requirements. The function of Warden shall be broader than that of watchman. It shall also involve a number of routine maintenance operations.

(b) Warden shall be matured and reliable who need little supervision for the fulfillment of his duties. They shall be active and physically fit. Old people who are losing their strength shall not be employed. They shall be experienced agricultural workers familiar with caring for plants. They shall remain on site through all hours of daylight and through all adverse weather conditions. They shall not leave the site unattended for any reason whatsoever.

(c) The role of the Warden shall be primarily to tend the plants. He/she shall take the initiative in weeding, mulching, replanting failed plants, pruning and protecting plants against all pests. This will require an active role of individuals with considerable energy and initiative. The Warden shall work constantly to maintain and improve the site and its bio-engineering plants.

(d) The Warden shall also be required to protect plants on the site from damage by local people, domestic and wild animals. In doing this he/she shall use a friendly approach to the people as far as possible so that no conflicts arise between the locals and the Contractor.

(e) Measurement and Payment: Site Warden employed under the Contract shall not be paid for separately. All costs associated with the employment of warden as well as execution of works specified shall be considered to be included in the item rate of "Site Aftercare and Maintenance".

(2) Fabrication of Bamboo Tree Guards

(a) The Contractor shall provide bamboo tree guards as shown on the Drawing or specified in the Contract. This shall be done according to the specification described hereunder, as and when required. The Contractor shall supply all necessary supervision, resources and facilities to ensure that these requirements are met.

(b) The bamboo strips used to make bamboo tree guards shall be made from bamboos(*Bamboos mutants* subs *copulate*) whilst the uprights are to be made from (*Bamboos mutants* subs *mutants* or *Bamboos balboa*) from bamboo. Bamboo tree guards shall be a minimum of 450 mm in diameter by 1300 mm in height so that they are able to provide sufficient protection from grazing for the first 18 months after planting the seedling.

(c) The guard shall be made by cutting 5 bamboo posts which are a minimum of 50 mm wide by 10 mm thick and at least 1600 mm long. The posts shall be cut so that they have a strong spear-like point at the bottom that can be driven into the ground when placing out on site. The bamboo poles used to make the uprights shall be a minimum of 3 years old.

(d) Bamboo strips, a minimum of 5 mm thick and 50 mm wide shall be cut from poles that are at least 2 years old. The bamboo used shall be split so that the outer wall remains intact. Only lengths with the outer wall intact shall be used. The split bamboo shall be the length of the whole bamboo pole that it is cut from, or as long as possible. The split bamboo shall be woven in and out of the bamboo uprights and pulled tight, so that it is firm and strong. The end of each of the strips shall be woven back into the basket and tied with binding wire to keep it in place. End pieces shall not be left sticking out and unbound, because they quickly get broken and the basket starts to unravel from this point. The split bamboo shall be woven round the poles so that when they are tightly pressed down there are no gaps in the guard.

(e) Measurement and payment: No separate payment shall be for the fabrication of the bamboo tree guards. All associated costs shall be considered to be included in the item rate for "Site Aftercare and Maintenance".

(3) Placement of Bamboo Tree Guards

(a) Tree guards shall be installed on site at the time of planting, no later than the second week of July, and shall be placed carefully around the planted seedlings.

(b) The tree guards shall be placed over the seedling immediately after planting. The upright posts shall be firmly driven at least 300 mm into the ground so that the guard is able to resist bashing and rubbing from cows, buffalo, goats and people. The woven slats shall be pushed down firmly from the bottom upwards so that they touch one another and are free from large gaps.

(c) Tree guards alone are not adequate protection for small plants. The Contractor shall provide a site Warden in addition, for the time specified, to maintain the tree guards and ensure that local people respect them, and generally fulfill all the requirements of Section 1400.

(d) Measurement and Payment: No separate payment shall be made for the placeme nt of the bamboo tree guards. All the associated costs shall be deemed to be included in the relevant item rate for "Site Aftercare and Maintenance".

(4) Fencing

Fencing shall be executed as per the instruction of the Engineer but payment shall be included in the item rate of "Site Aftercare and Maintenance".

315 SITE AFTERCARE AND MAINTENANCE

(1) The Contractor shall maintain planted bio-engineering sites as required by the Engineer. This shall be done according to the specifications described hereunder, as and when required. The Contractor shall supply all necessary expertise and resources to ensure that these requirements are met.

(2) The Contractor shall carry out weeding as required throughout the site. All annual weeds and other unwanted plants shall be cut just above the ground and the aerial parts will be used to make compost or mulch. Weeds shall not be pulled out by the roots since this disturbs the ground surface.

(3) Weeding shall be carried out throughout the growing season. It shall be undertaken with particular diligence at the end of the monsoon, so that there is the minimum amount of competition during the subsequent dry season.

(4) The Contractor shall carry out mulching as required throughout the site. All plants required under the bio-engineering specifications will be mulched using material prepared as specified in Section 1905, or the aerial parts of weeds cut on the site or brought from elsewhere for the purpose. The desired plants shall be kept mulched at all times but special care shall be taken in the spring, when the soil moisture deficit is at its highest.

(5) The Contractor shall replace failed, damaged, diseased and very weak plants, using fresh, healthy plants of the same species, at the correct time of year for planting. This replanting operation shall normally be carried out during the monsoon in the year following the first planting works. Vegetation structures shall be enriched by the planting of additional cuttings or seedlings, as instructed by the Engineer. Failed seeding areas shall be reseeded at the appropriate time of year.

(6) In replanting and enrichment works, the Engineer may specify the use of different species. This shall be done where failures or poor performance of plants may be attributed to poor stock or an incorrect initial choice of species.

(7) All bio-engineering sites shall be maintained so that there are at least the following two storey of vegetation. In certain locations, however, there may be a number of additional vegetation storeys.

(a) A dense ground cover of healthy grass plants, in the configuration specified at the time of planting.

(b) An open canopy of shrubs or trees with a deeper rooting network.

(8) In general it shall be necessary to keep the upper canopy thinned in order to maintain the lower ground cover. Most grasses require high light intensities and become degraded if subjected to excessive shade from the overstorey. It shall therefore be the Contractor's responsibility to thin the canopy as necessary to permit adequate levels of light to penetrate for the optimum growth of the grass understorey.

(9) All thinning and pruning operations shall be undertaken in accordance with the guidelines issued by the Environment Specialist. Since these are skilled silvicultural operation, the Contractor shall take appropriate professional advice and employ suitably skilled personnel.

(10) All products from thinning and pruning operations shall be disposed off in accordance with the regulation in place. The Contractor shall follow the instructions of the Engineer in this regard.

(11) Other maintenance operations shall be undertaken by the Contractor according to the instructions of the Engineer.

(12) Measurement and Payment: The works shall be measured in a lump sum basis. The item rate shown in the Bill of Quantities shall be the full and the final compensation to the Contractor for carrying out all works specified herein including provision of site protection specified in Section 1414.

Should at any time the Engineer issue any instruction for the proper Site Protection/Aftercare and Maintenance and the Contractor does not respond within 24 hours, the Engineer shall engage other individuals/parties to carry out the works. Any costs involved by such actions shall be borne by the Contractor.

TECHNICAL SPECIFICATIONS OF WORKS

SECTION 400 – FORMS FOR QUALITY ASSURANCE SYSTEM

401 SCOPE

Standard forms for quality assurance have been provided for implementation of quality assurance system as per the international code of best practice. Only the selected forms have been added and any additional forms, if required, shall be adopted during the implementation.

402 REQUEST FOR INSPECTION SHEET (RFI)

The Contractor shall submit Request For Inspection (RFI) prior to start of any work activity. Similarly the Contractor shall submit the same again after the completion of the same activity. The Contractor shall ensure adequate time after submission of RFI so that the Engineer or his representative shall make themselves available at the site for the inspection. The Contractor shall not be relieved of his obligations if the quality of works have been found to be sub-standard even after implementation of the RFI.

403 NON-CONFORMANCE REPORT (NCR)

The Engineer shall issue Non- Conformance Report (NCR) in the event the material or works are not implemented as stipulated in the technical specification. The Contractor shall propose any corrective action and shall implement the same within the time frame agreed between the Engineer and the Contractor.

404 QUALITY ASSURANCE PLAN (QAP)

The Contractor shall prepare comprehensive Quality Assurance Plan as well as condensed form of QAP as per the sample format and get it approved within a month from the date of award of the contract. The QAP shall be prepared in conjunction with the work schedule. Any updating of the work schedule will require QAP to be updated accordingly to complete the test program within the work schedule.

405 TEST REQUEST FORM

Test request form is to be used for delivering sample material to the laboratory or other laboratories outside the project. This form shall be used by the Contractor to deliver sample material jointly collected by the Engineer or his representative(s) and the Contractor when there are no test facilities in the project laboratory.

There are two types of forms (i) specifically designed for testing the crushing strength concrete cubes and (ii) the other form for testing the materials other than concrete.

406 MONTHLY FIELD/LABORATORY REPORT FORM

Monthly laboratory/field test report shall be submitted by the Contractor using sample form. The monthly test report shall cover number of test covered during the period of reporting as well as the cumulative number of test covered since the start of the project.

500 BOULDER PITCHING

501 BOULDER PITCHING OR TOE WALL PROTECTION

This work shall consist of laying boulders directly on the bed of rivers for protection against scour.

The stones used in the filling shall be sound, hard, durable and fairly regular in shape. Stones subject to marked deterioration by water or weather shall not be used.

River-worn boulders, failed concrete sections, or other suitably dense and durable stone materials may be used, provided they meet the strength, weight, and durability requirements. Quarried stone may also be used where available, but **no preference is given to quarry stone over river boulders or approved concrete blocks**.

The size of the stone shall be as large as possible and no stone shall weigh less than **50 kg**. The specific gravity of the stones shall be as high as possible and not less than **2.4**.

To ensure regular and orderly disposition of the intended quantity of stone in the apron, the stones shall, to the extent possible, be graded before being carefully packed in layers so that voids between the stones are minimized.

The surface on which the boulders are to be laid shall be levelled and prepared for the length and width shown on the drawings.

502 MEASUREMENTS FOR PAYMENTS

The packed boulder filling/pitching for toe protection shall be measured in cubic metres. If directed by the Engineer, the materials shall be stacked at site before laying, and such stacking shall be considered incidental to the work.

503 RATE

The contract unit rate for the construction of toe protection for the abutments shall cover the cost of all materials including transportation, laying, compacting, all labour, tools, equipment, sampling and testing, supervision, and all incidentals necessary for completing the work in accordance with these Specifications, the drawings, or as directed by the Engineer.

TECHNICAL SPECIFICATIONS OF WORKS

REQUEST FOR INSPECTION (RFI) SHEET

Appendix: _____

Name of Project: _____ Contract package: _____

To, _____

_____

Dear sir,

You are kindly requested to attend the inspection as follows.

Inspection No.	IRS-01							
Site:	FC	Subgrad (circled)	GSB	Base Course	Permanent works	Drainage	Bridge	Others (Pl specify)
Inspection Date & Time:								
Location:								
Item Description:								

Your kind attention will be highly appreciated
Yours sincerely,

_____
(Name)
Designation & Company

Inspection Result Sheet

WORK ITEM	INSPECTION DATE:

DESCRIPTION:
Ex: compaction is satisfactory except the subgrade which does not comply with cross slope

INSPECTION RESULT
see attached inspection sheet (IS)-1

Satisfactory	Unsatisfactory	Others

signature

CLIENT(PMU): _____	CONSULTANT: _____	CONTRACTOR: _____

Quality Assurance Plan (QAP)

Project name: Contract award date:

Contract Package No: Contract completion date:

Chain: Contract Duration:

Slno	Type of work	As per specification		BoQ Qty	Unit	No of tests reqd as per site cond	Schedule		Remarks
		No. Test(s)	Frequency(ies)				From	To	
1	**Embankment construction**								
	1. MDD/OMC	10	1500 m3 of soil; each soil type shall be tested	18600	m3	12	Nov 15,2010	Mar-11	as per requirment
	2. Field density test	50	500 m3 of soil; each soil type shall	25400	m2	60			
	3. Deleterious content test	-	As & when required by the engr	-		as per site requirment			
	4.Moisture content	48	Per 250 m3 of soil	12000	m3	50			
2	**Granular sub-base**						Dec-10	15-Mar-10	as per requirment
	1. Gradation	27	200 m3	5500	m3	27			
	2. Atterberg limits	12	200 m3	2500	m3	6			
	3. Density of compacted layer	30	500 m2 30	15000	m2	20			
	4. CBR	11	1 test comprising of 5 random checks in 1800sqm	20000		14			
3	**Road base**								
	.....								
4	**Bituminious works**								
	A. Aggreagtes								
	1. Aggregates grading	85	Every 50 m3 or part of it and in every change of source	4500	m3	90	Oct 15,2010	15-Apr-10	as per requirment
	2. FI (<30%)	2-3	250 m3	4500	m3	18			
	3. LAA (<40%) or	2-3	500 m3	4500	m3	9			
	4. Agg. Impact value(AIV)	2-3	500 m3	4500	m3	9			
	5. Rate of application of Agg.	2	Per run			required			
	B. Bituminous Binder								
	1. Quality of binder	-	Test certificate to comply with spec(50000 litres per test)	90000	litres	2	Feb-10	Apr-10	as per reqd.
	2. Binder temperature	-	At close interval			as required			
	3. Rate of application	2	Per run			as required			

Submitted by: **Approved by:**

Contractor's Engineer signature: ..... Date: Engineer/Engr's representative signature:..... Date:

Sample History form (For concrete /cement mortar cubes)

Organisation/Agency: Division/Project:

Date:

To

_____

_____

_____

Subject: Material Testing

Kindly carry out the compressive strength test on the concrete cubes with following details. Necessary test charges (if any) would be borne by.....

Name of works: Location:

Name of contractors Firm:

Details of Concrete Cubes

1. Date of casting: _____
2. Mix ratio(By Weight/by Voulme): _____ (Pl specify if different material is tested
3. Required Compressive strenght for: M10/M15/M20/M25/M30 ex cement-mortar)
4. Specific Works/Structural member: _____
5. Cube identification marks: _____

6. Desired date of cube test

_____	7 days	Date:	_____
_____	14 days	Date:	_____
_____	28 days	Date:	_____
_____	Others	Date:	_____

Note: A minimum of 3 cubes (preferably more) comprising one set shall be submitted for each works/ structural member. Cubes so prepared shall cover the entire concreting operation at any particular period .

....

Name & Sig. of Contractor's Engr. Name & Sig. of Engr/Engrs' representative

Date: Date:

Delivered to: Date: (copy to be retained)

Sample History Form (For General works other than concrete cubes)

Organisatio/Agency: Division/Project:

To Date:

_____

_____

_____

Subject: Material Testing

Kindly carry out the specified tests on the sample material with following details. Necessary test charges (if any) would be borne by.....

Name of works: Location:

Source of sample material: Sampled by:

Name of contractors Firm: Date of sampling:

Details of sample material

Sample name/refence No.	Description of material	Desired tests
1. *Gravelly clay/ch. 10+240*		
2		
3		
4		

Note: In case of doubts Contractor shall enquire on the test sample quantity and tests type from the the laboratory

....

Name & Sig. of Contractor's Engr. Name & Sig. of Engr/ Engrs' representative

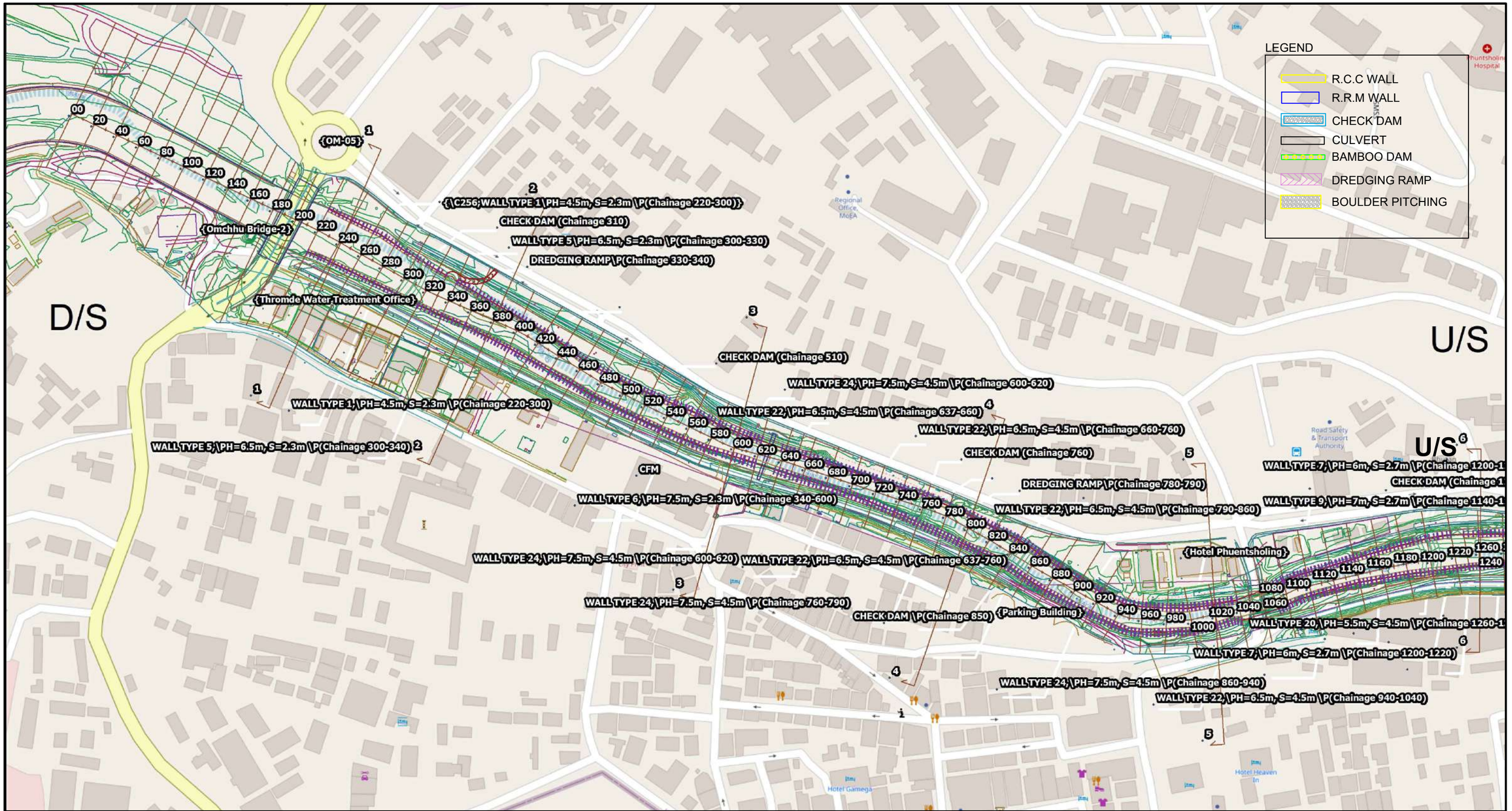
Date:..... Date:.....

Delivered to:..... Date:..... (copy to be retained)

APPENDIX II

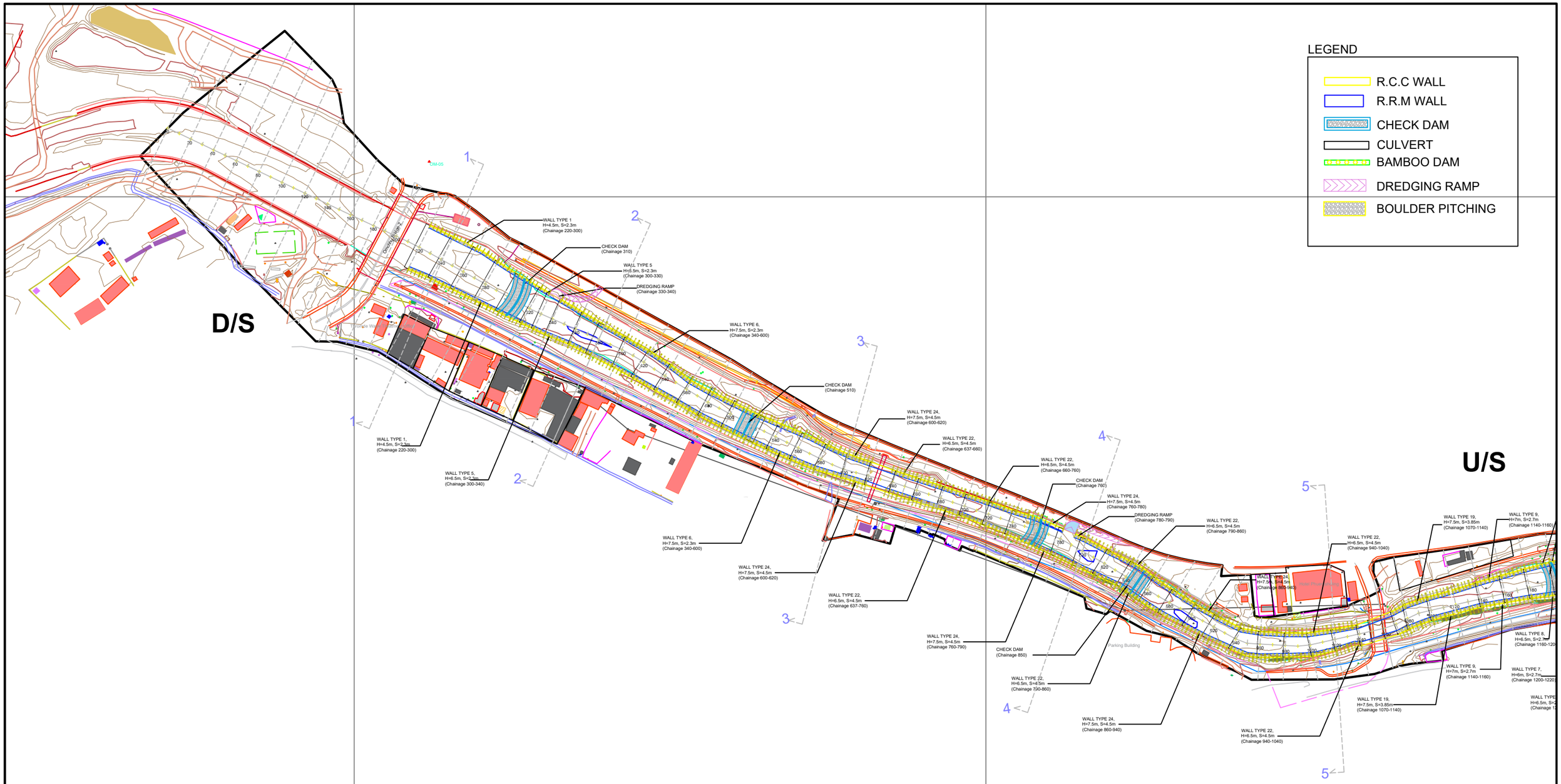
Drawings

PHUENTSHOLING THROMDE
CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT
CONTRACT NO: PT2025/CRORBP/WP1
WORKS PACKAGE 1
CHAINAGE 0-1040
(OMCHHU BRIDGE 2-RSTA BRIDGE)

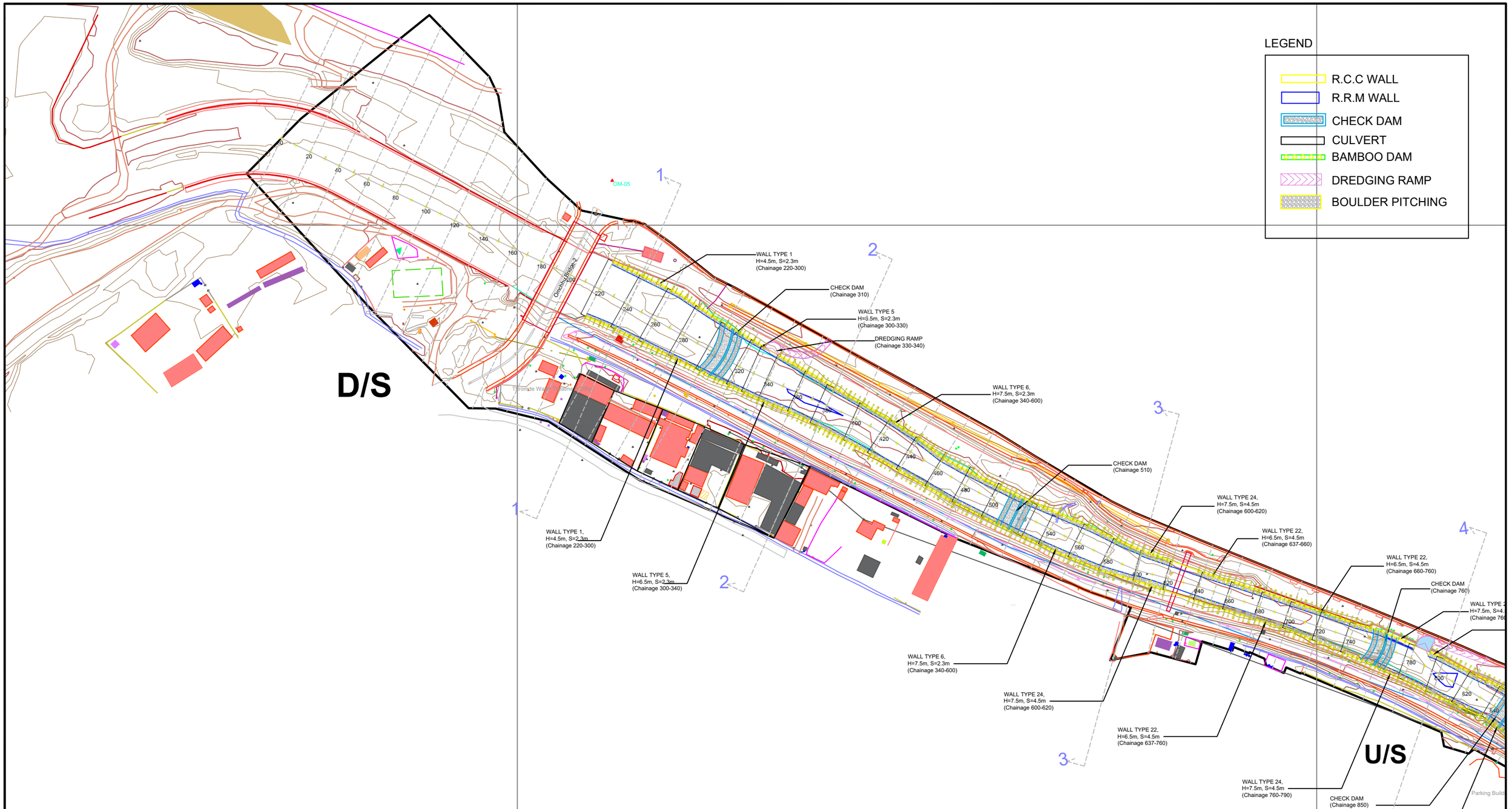


PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/01	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: LOCATION PLAN Package 1 Chainage 0-1040 Scale : NTS Drawing No: Contract No/WP1/01 Sheet No: 1 of 26

N

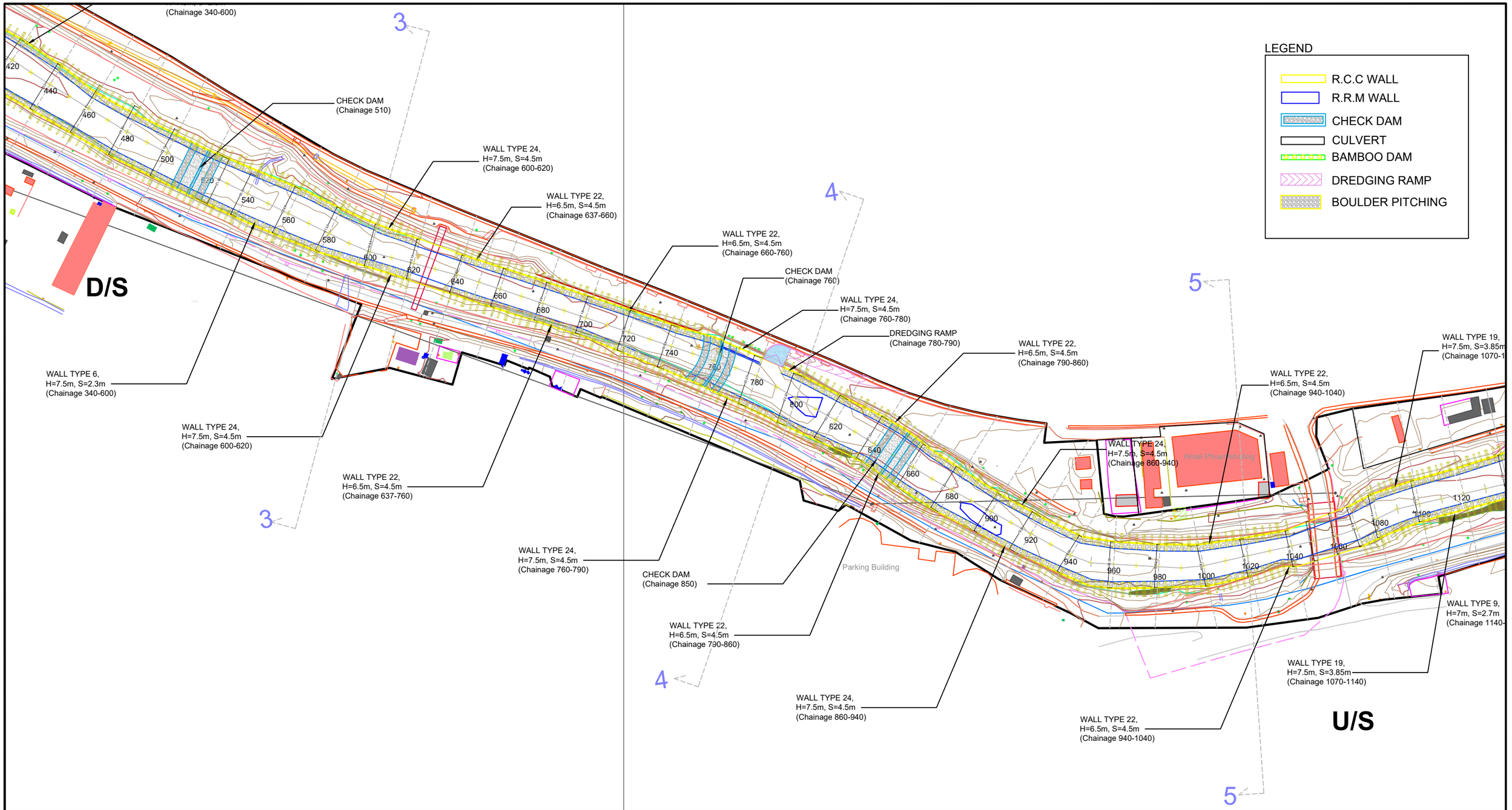


PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/02	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: OUTLINE PLAN - WORKS PACKAGE 1 Package 1 Chainage 0-1040 Scale : NTS	N Drawing No: Contract No/WP1/02 Sheet No: 2 of 26

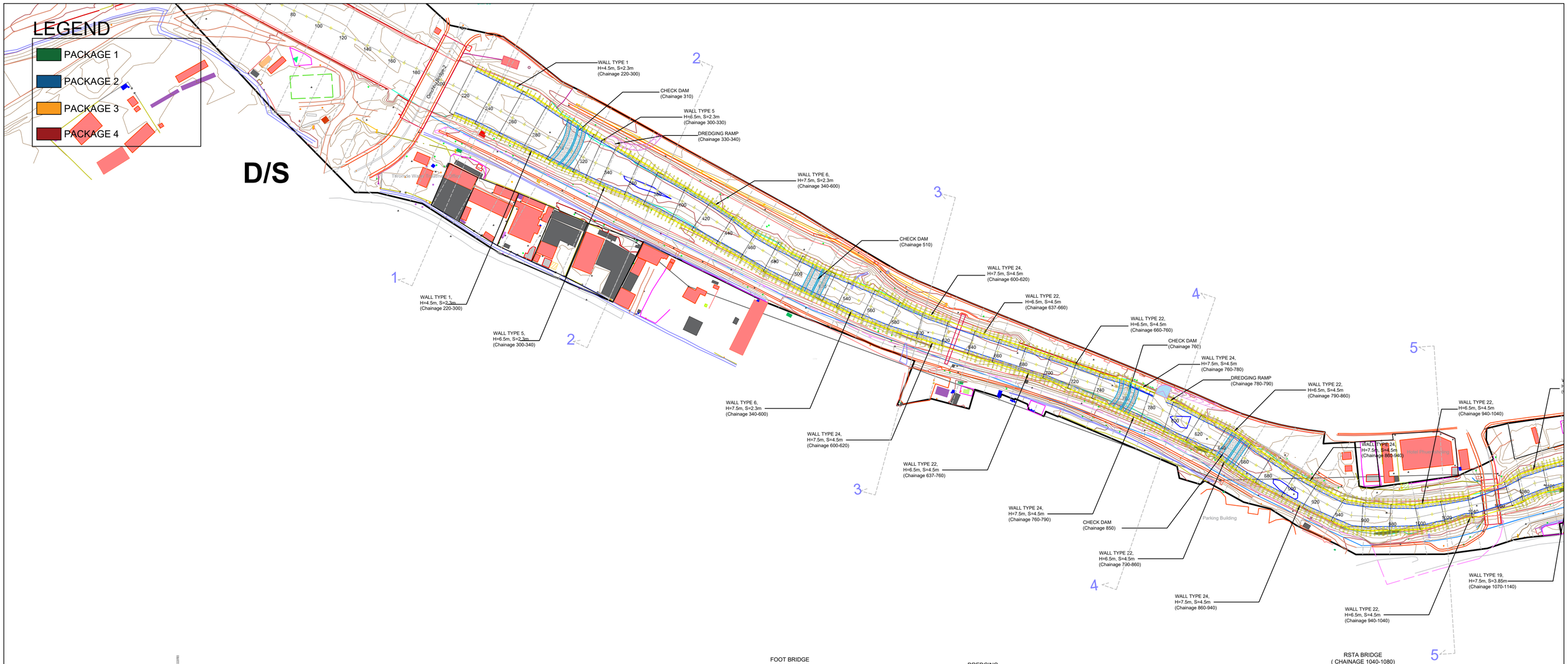


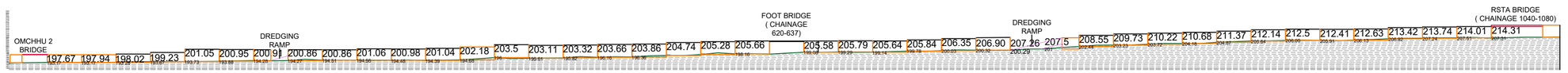
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/03	DESIGN CONSULTANT: APECS Consultancy C:\Users\User\Pictures\NEW LOGO.png	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WORK PACKAGE 1 CHAINAGE 0-800M Chainage 0-800 Scale : NTS Drawing No: Contract No/WP1/03 Sheet No: 3 of 26

N

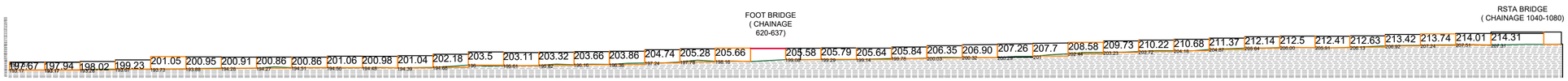


PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/04	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WORK PACKAGE 1 CHAINAGE 800-1040M Chainage 800-1040 Scale : NTS N Drawing No: Contract No/WP1/04 Sheet No: 4 of 26



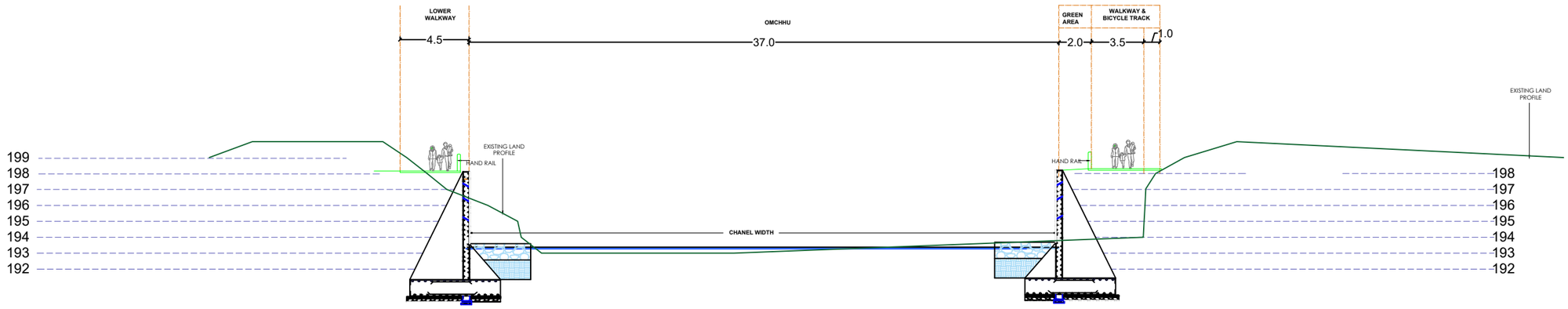


RIGHT BANK L-SECTION PROFILE WITH WALLS



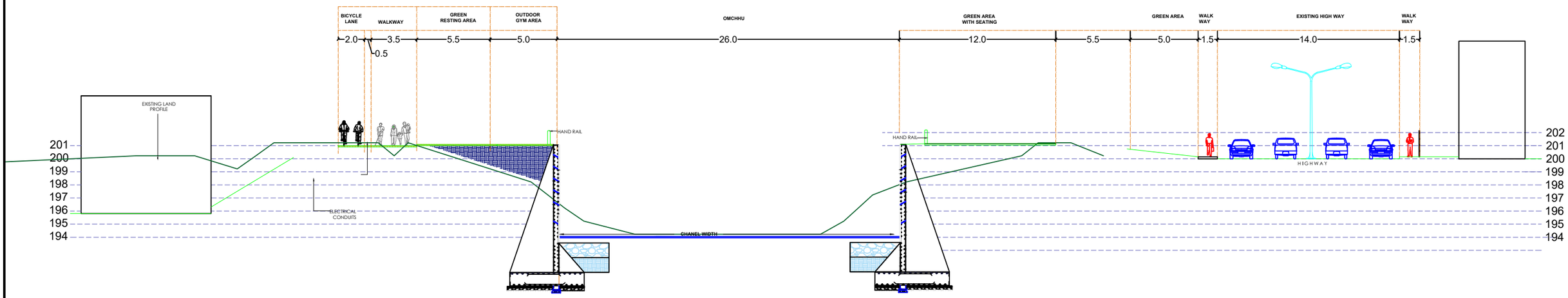
LEFT BANK L-SECTION PROFILE WITH WALLS

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/05	DESIGN CONSULTANT: APECS Consultancy C:\Users\User\Pictures\NEW LOGO.png	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WORKS PACKAGE 1 - LONGITUDINAL PROFILE WITH WALL LEVELS L-SECTION PROFILE WITH WALLS Scale : NTS	N Drawing No: Contract No/WP1/05 Sheet No: 5 of 26



SECTION 1-1 AT CHAINAGE 240

Wall Height: 4.5m
Scour depth with foundation: 3.3m
Bed Level :193.3 m

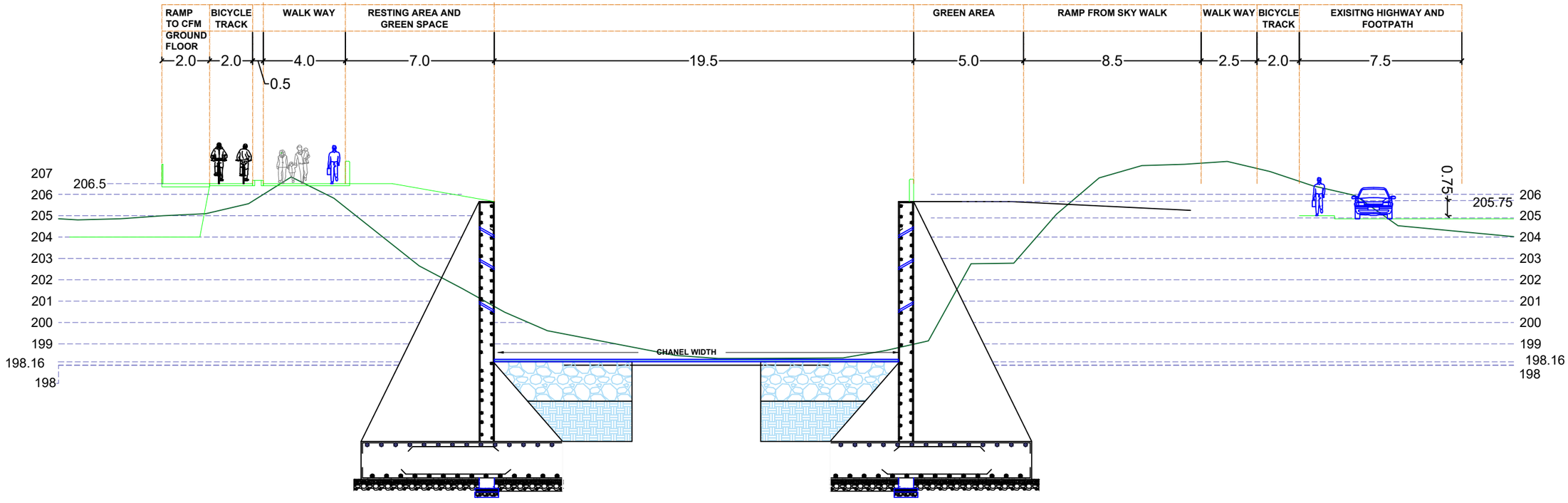


SECTION 2-2 AT CHAINAGE 380

Wall Height: 7.5m
Scour depth with foundation: 3.3m
Bed Level :194.6 m

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/06	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WORK PACKAGE 1 - CROSS-SECTION 1 SITE SECTIONS Scale : NTS Drawing No: Contract No/WP1/06 Sheet No: 6 of 26

N



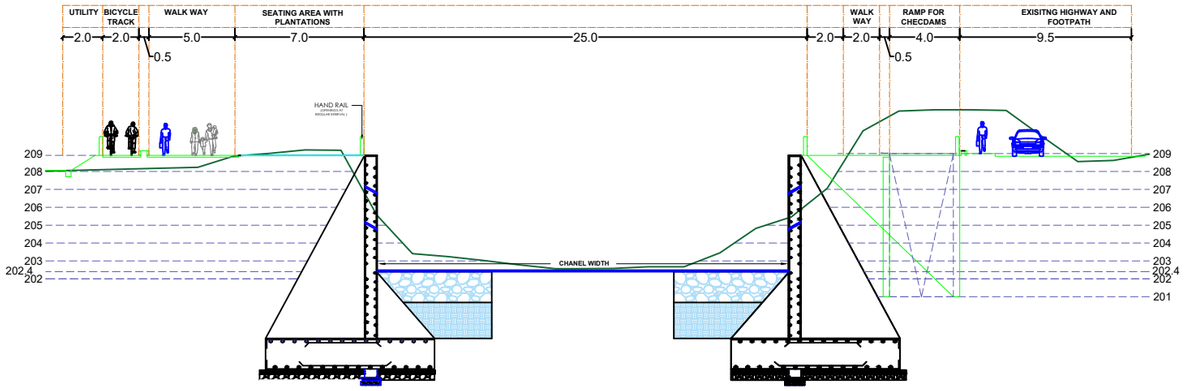
SECTION 3-3 AT CHAINAGE 600

Wall Height: 7.5m

Scour depth with foundation: 5.5 m

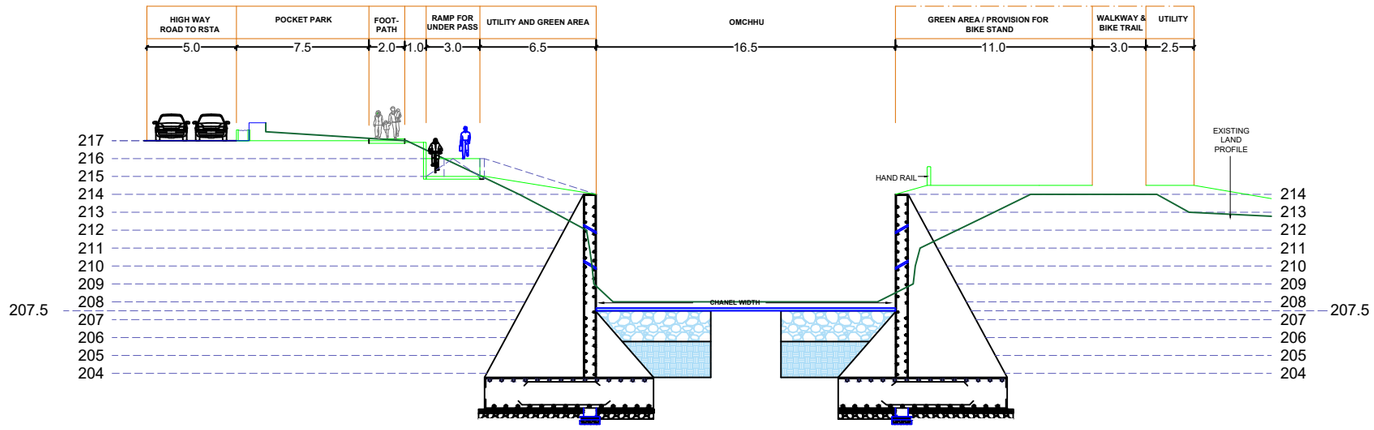
Bed Level 198.16 m

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/07	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WORK PACKAGE 1 - CROSS-SECTION 2 SITE SECTIONS Scale : NTS Drawing No: Contract No/WP1/07 Sheet No: 7 of 26



SECTION 4-4 AT CHAINAGE 800

Wall Height: 6.5m
Scour depth with foundation: 5.5 m
Bed Level 202.4 m



SECTION5-5 AT CHAINAGE 1020

Wall Height: 6.5m
Scour depth with foundation: 5.5 m
Bed Level 202.4 m

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/08	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde

Drawing Title:
WORK PACKAGE 1 - CROSS-SECTION 3

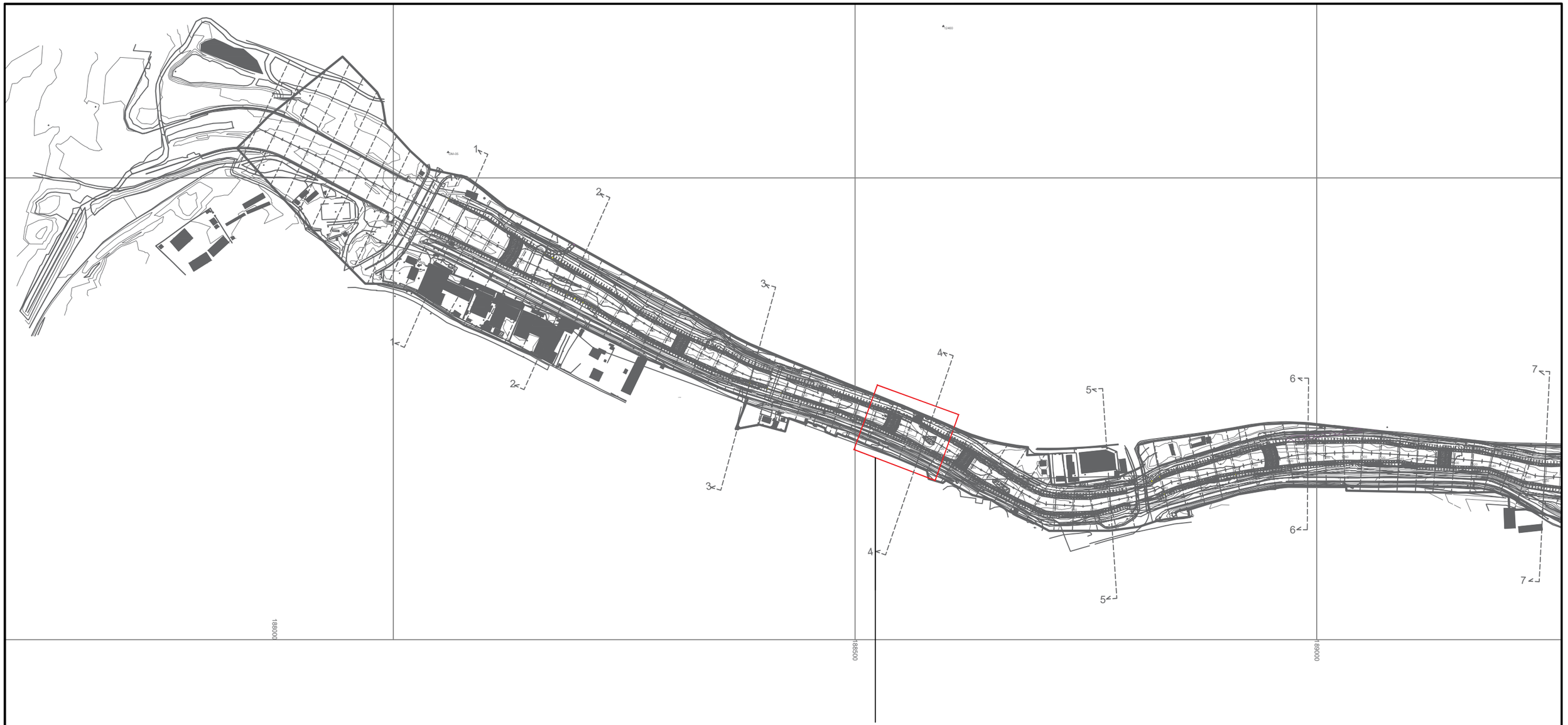
N

SITE SECTIONS

Drawing No: Contract No/WP1/08

Scale : NTS

Sheet No: 8 of 26



CHAINAGE (730-820)

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/09	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: LOCATION OF CROSS-SECTIONS CRITICAL AREAS DURING CONSTRUCTION Scale : NTS	N Drawing No: Contract No/WP1/09 Sheet No: 9 of 26

GENERAL NOTES FOR RCC CONSTRUCTION

A. GENERAL

1. THE NOTES IN THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS PERTAINING TO THE STRUCTURES.
2. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETER (mm) EXCEPT THE MASTER PLAN IN METRES AND ALL LEVELS ARE IN M. DIMENSIONS ARE NOT TO BE SCALED AND ONLY WRITTEN DIMENSIONS ARE TO BE FOLLOWED.
3. THE CONTRACTOR SHALL VERIFY ALL CHAINAGES, REDUCED LEVELS, COORDINATES AND DIMENSIONS BEFORE START OF THE WORK. IN CASE OF ANY DISCREPANCY, THE MATTER SHALL BE BROUGHT TO THE NOTICE OF THE ENGINEER.
4. BRIDGES/CULVERTS ARE DESIGNED AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATION 2007

- VEHICULAR LIVE LOAD : IRC 6 : 2000 STANDARD LOAD

SN	CARRIAGE WIDTH (m)	LOAD CAPACITY	NO. OF LANE
1	5.50	DOUBLE LANE CLASS A	2

- SUPER STRUCTURE - SINGLE SPAN SIMPLE SUPPORTED RCC GIRDER

B. CONCRETE;

UNLESS OTHERWISE SPECIFICALLY MENTIONED IN THE DRAWING OR DIRECTED BY THE ENGINEER, CONCRETE GRADE SHALL BE AS PER RELATED SECTION OF CONTRACT DOCUMENT PARTLY REPRODUCED BELOW:

APPLICATION LOCATION	SPECIFIED COMPRESSIVE STRENGTH IN CUBE (28 DAYS) IN MPa
REINFORCED CONCRETE (RCC) DECK	M30
ABUTMENT, RAIL POST, KERB BEAMS	M25
PCC FOR LEVELING/BLINDING CONCRETE AND CONCRETE BLOCKS	M10
CONTOURFORT AND CANTILEVER WALLS	M25
CHECK DAMS	M20
RAMPS	M20
CASCADING WORKS	M20

*** UNLESS OTHERWISE MENTIONED IN THE SPECIFICATION, THE TRIAL MIX DESIGN STRENGTH SHALL BE 33.0 MPa.

C. REINFORCEMENT

1. ALL REINFORCING STEEL SHALL BE OF HIGH YIELD STRENGTH DEFORMED BARS (MIN fy = 500 MPa) CONFORMING TO IS 1786
2. BENDING OF REINFORCEMENT BARS SHALL BE AS PER ARTICLE 5.10.2 OF AASHTO / 2007.
3. LAPS IN REINFORCEMENT BARS IN TENSION ZONE SHALL BE AVOIDED AS FAR AS POSSIBLE. LAPS MAY BE PROVIDED, IF UNAVOIDABLE. HOWEVER, IN SUCH CASES:

(A) NOT MORE THAN 50 % OF REINFORCEMENT BARS SHALL BE LAPPED AT ANY ONE SECTION.

(B) FOR CLOSELY SPACED BARS LAPPING MAY BE AVOIDED BY PROVIDING SUITABLE TYPE OF MECHANICAL ANCHORAGE (WITH PRIOR APPROVAL).

(C) SPLICES SHALL BE STAGGERED AT LEAST 600 mm.

(D) ALL SPLICES SHALL BE CLASS B SPLICES.

(E) MINIMUM LAP LENGTH OF REINFORCEMENT SHALL CONFORM TO ARTICLE 5.11.2 AND 5.11.5 OF AASHTO / 2007 SPECIFIED LENGTH OF THE LAP SPLICE SHALL BE

BAR DIA,mm	LAP SPLICE,mm
10	300
12	412
16	732
18	926
20	1144
22	1384
25	1787
28	2241
32	2927

4. CLEAR CONCRETE COVER TO REINFORCING STEEL SHALL BE MAINTAINED AS FOLLOWS UNLESS OTHERWISE SHOWN IN THE DRAWINGS OR DIRECTED BY THE ENGINEER.

A. REINFORCED CONCRETE STRUCTURES

- CONCRETE DECK SLAB
  - -TOP REINFORCEMENT - 50 mm
  - -BOTTOM REINFORCEMENT - 25 mm
- BEAM, ALL FACES - 40 mm
- ABUTMENT - 75 mm
  - a. STEM 70 mm
  - b. TOE 70 mm
  - c. HEEL 70 mm
- CONTERFORTS 70 mm

5. SPECIALLY MADE COVER BLOCKS OF SAME STRENGTH AS THAT OF CONCRETE SHALL ONLY BE USED.
6. WELDING OF REINFORCEMENT BARS SHALL NOT BE PERMITTED, UNLESS APPROVED BY THE ENGINEER.
7. SUPPORTING CHAIRS OF REQUIRED DIAMETER FOR MAIN REINFORCEMENT SHALL BE PROVIDED AT SUITABLE INTERVALS AS PER DIRECTION OF THE ENGINER.
8. FULL COVER SHALL BE MAINTAINED AT GROOVES AND OTHERWISE ARCHITECTURAL FINISHES TO THE CONCRETE SURFACES.

D. WATER

WATER TO BE USED IN CONCRETING AND CURING SHALL BE POTABLE WATER TO BE TESTED AS PER AASHTO T26-79.

E. MATERIAL SPECIFICATION

MATERIAL SPECIFICATIONS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION AS SPELT OUT IN THE CONTRACT DOCUMENT.

F. WORKMANSHIP / DETAILING

1. ALL SHARP EDGES OF CONCRETE SHALL BE CHAMFERED (10mm x 10mm). OR AS PER DIRECTED BY THE ENGINEER
2. FORM WORK DETAILS SHALL BE SUBMITTED BY THE CONTRACTOR FOR THE APPROVAL AND SHALL BE TESTED IN ACCORDANCE WITH THE SPECIFICATION.
3. CONSTRUCTION JOINT : THE LOCATIONS AND PROVISION OF CONSTRUCTION JOINTS SHALL BE APPROVED BY THE ENGINEER-IN-CHARGE. THE CONCRETING OPERATION SHALL BE CARRIED CONTINUOUSLY UP TO THE CONSTRUCTION JOINT.

G. SUPERVISION

1. THE CONSTRUCTION WORK MUST BE SUPERVISED BY A COMPETENT SUPERVISION ENGINEER.

H. ABBREVIATIONS

RL	- REDUCED LEVEL		
EF	- EACH FACE		
RCC	- REINFORCED CONCRETE		
BF	- BOTH FACES		
CH	- CHAINAGE		
NF	- NEAR FACE		
SF	- SUPER ELEVATION		
EGL	- EXISTING GROUND LEVEL	BP	- BEARING PAD
FRL	- FINISHED ROAD LEVEL		
T	- TOP		
LV	- LENGTH VARIES		
HFL	- HIGH FLOOD LEVEL		
B	-BOTTOM		
LBL	-LOWEST BED LEVEL		
THK	- THICK		
M	- METER		
mm	- MILLIMETER		
mPa	- MEGA PASCAL		
PCC	- PLAIN CEMENT CONCRETE		
kPa	- KILO PASCAL		
KB	- KERB BEAM / EDGE BEAM		
EQ	- EQUAL		
FDN	- FOUNDATION		
REINF.	- REINFORCEMENT		

I. MASONRY WORKS:

1. MORTAR FOR MASONRY WORKS SHALL BE 1:4 (CM) OR RICHER.
2. MASONRY WALLS SHALL BE PROVIDED WITH HORIZONTAL & VERTICAL REINFORCEMENTS OF 10Ø@700MM.
3. RC BANDS AT LINTELS OF OPENINGS AND AT HUMEPIPE JUNCTIONS OF PROJECTED WALLS SHALL BE CONNECTED PROPERLY WITH THE RC FRAME ELEMENTS.

J. FORM WORK:

1. QUALITY OF FORM WORKS SHALL BE IN ACCORDANCE WITH IS 456:200.
2. FORM WORKS SHALL BE PROPERLY HELD IN POSITIONS AND MUST NOT ALLOW ANY KIND OF MOVEMENTS DURING PLACEMENT.
3. STRIPPING OF FORM WORKS SHALL ALSO COMPLY WITH CLAUSE 11.3 OF IS 456:2002.
4. THE CONCRETE RECEIVING FACE OF THE FORM WORK SHALL BE VERY SMOOTH AND FIRMED.

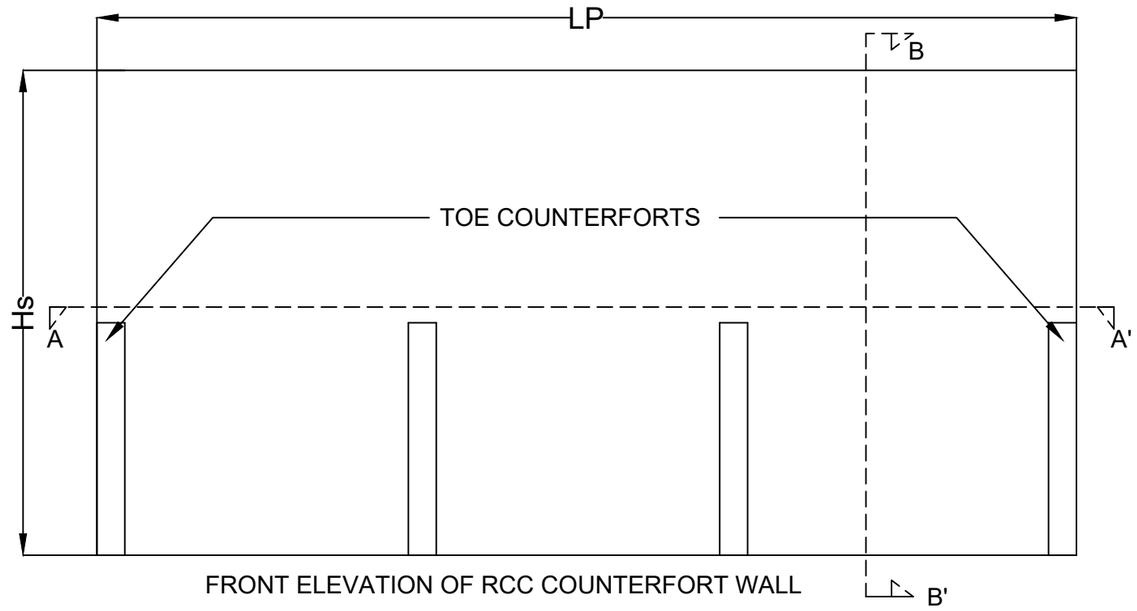
K. WELDING AND BOLTING:

1. WELDING TO BE CARRIED OUT IN ACCORDANCE WITH IS 816:1969,IS 819:1957, IS 1024:1979, IS 1261:1959, IS 1323:1982 AND IS: 9595: 1980 AS APPROPRIATE.
2. THE STRENGTH OF ELECTRODE USED FOR WELDING SHALL BE EQUAL TO OR GREATER THAN THE STRENGTH OF MEMBER THAT IS BEING WELDED.
3. ALL WELD SHALL BE COMPLETE PENETRATION BUTT WELD.
4. ALL BOLTS SHALL BE HIGH STRENGTH FRICTION GRIP GALVANIZED M16 AND M20 IN ACCORDANCE WITH IS 3757:1967 AND IS 800: 1984.
5. ALL MEMBERS OF STEEL TRUSS SHALL BE DRY AND THOROUGHLY CLEANED FROM ALL LOOSE SCALE AND RUST PRIOR TO PAINTING.
6. THE MEMBERS SHALL BE PROVIDED WITH COAT OF ZINC COATING.

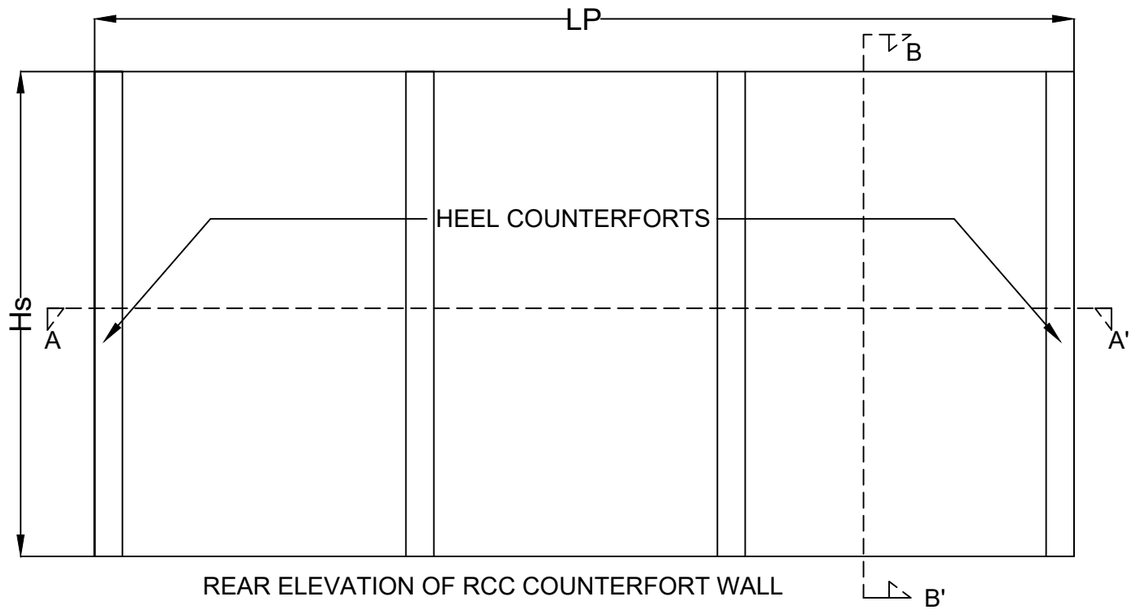
L. EXCAVATION WORKS

1. EXCAVATION OWRKS SHALL COMPLY WITH IS 3764 : 1992
2. SPECIAL CARE SHALL BE GIVEN TO AREAS NEAR THE BRIDGES, ROADS, BUILDINGS AND OTHER CRITICAL AREAS PROVIDED IN THE MAP

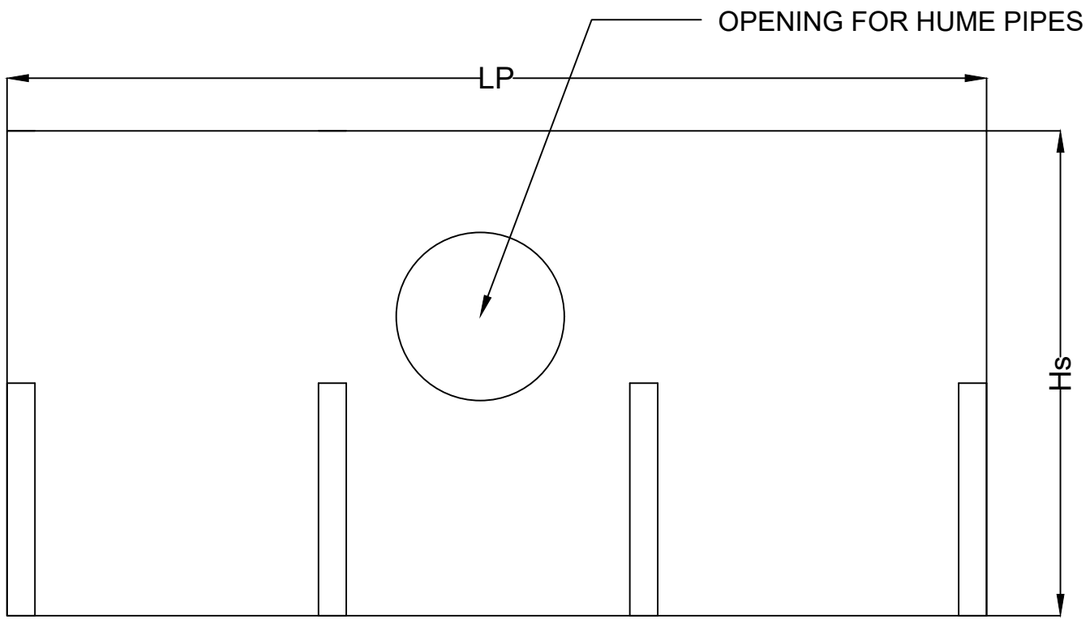
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/10	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN GENERAL NOTES FOR RCC CONSTRUCTION Scale : NTS Drawing No: Contract No/WP1/10 Sheet No: 10 of 26 N



FRONT ELEVATION OF RCC COUNTERFORT WALL



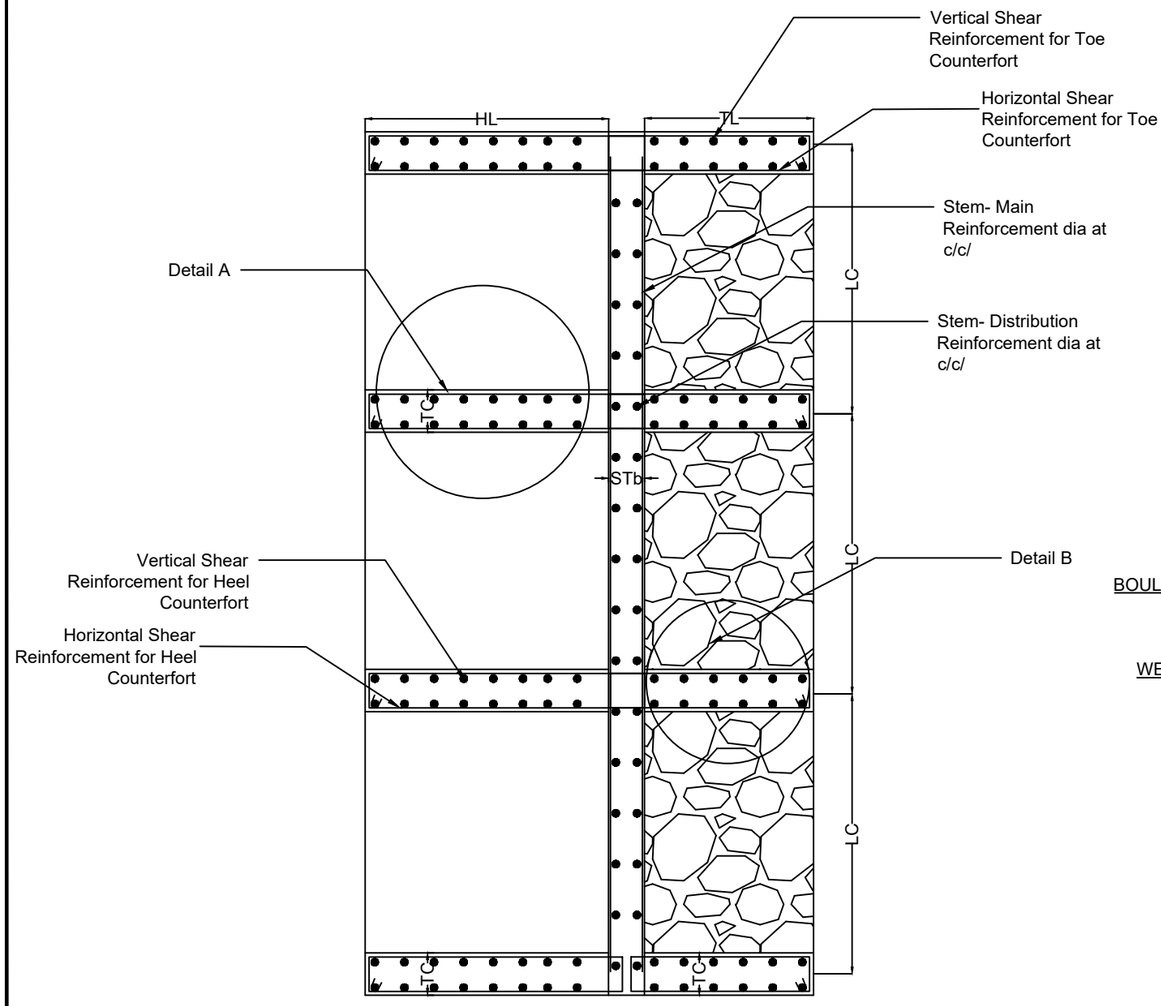
REAR ELEVATION OF RCC COUNTERFORT WALL



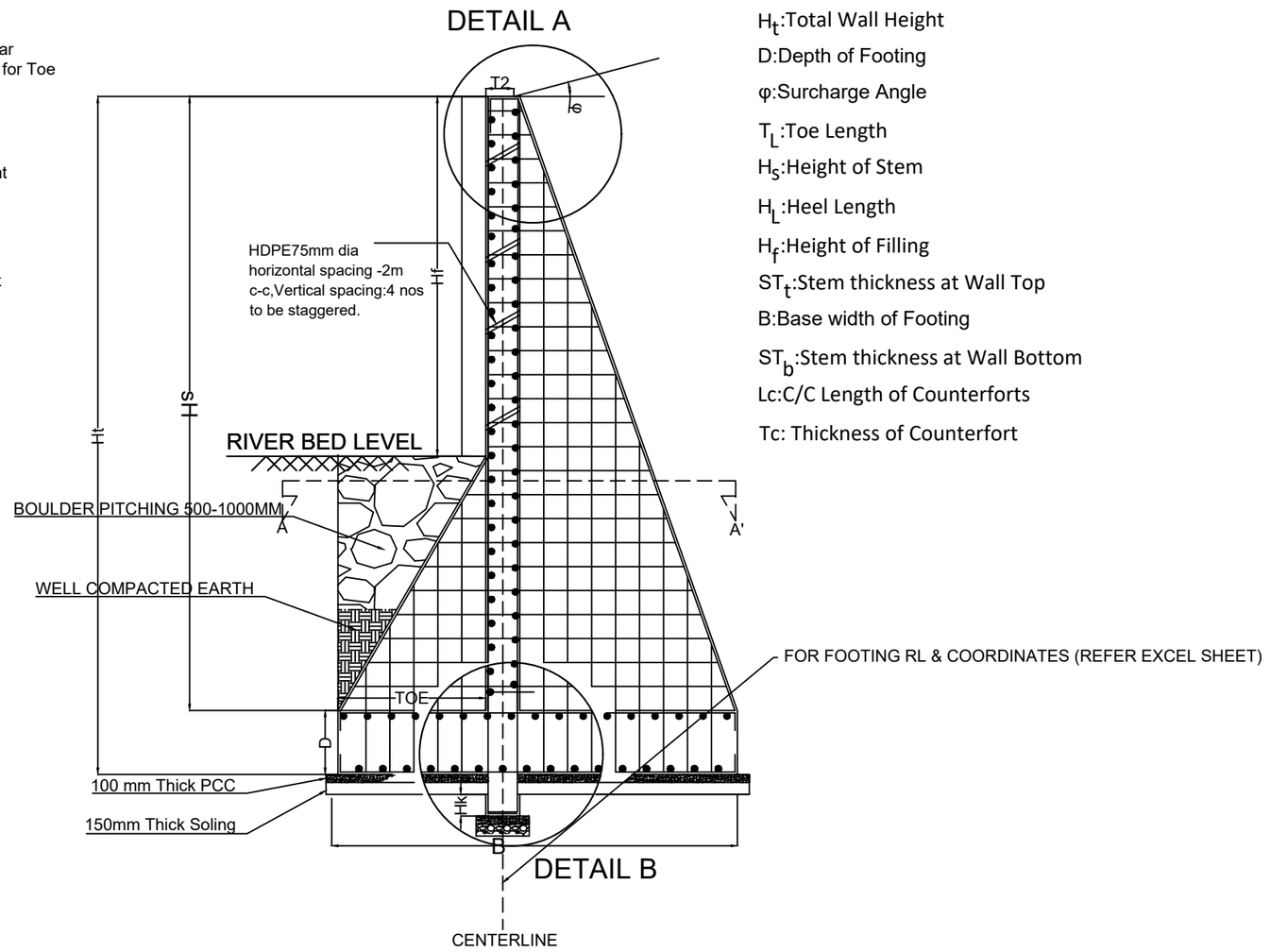
RCC COUNTERFORT WALL WITH HUME PIPE CONNECTION

NOTE: PROVISION FOR HUMP PIPES TO BE KEPT AFTER REFERING THE UTILITY DRAINAGE PLAN

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/11	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN RCC COUNTERFORT WALL ELEVATION Scale : NTS N Drawing No: Contract No/WP1/11 Sheet No: 11 of 26



Section AA'



SECTION BB'

NOTE:

H_t:Total Wall Height

D:Depth of Footing

φ:Surcharge Angle

T_L:Toe Length

H_S:Height of Stem

H_L:Heel Length

H_f:Height of Filling

ST_t:Stem thickness at Wall Top

B:Base width of Footing

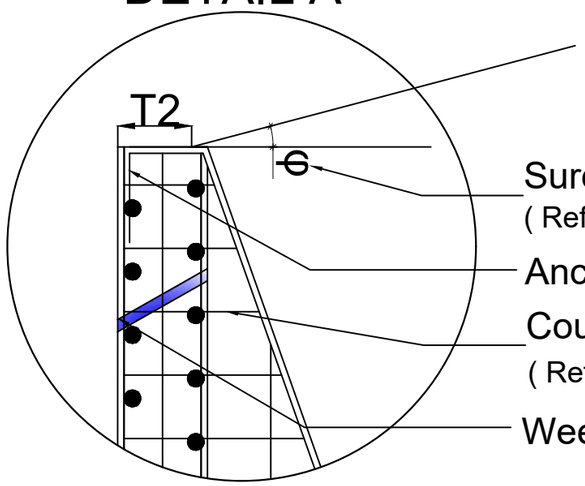
ST_b:Stem thickness at Wall Bottom

Lc:C/C Length of Counterforts

Tc: Thickness of Counterfort

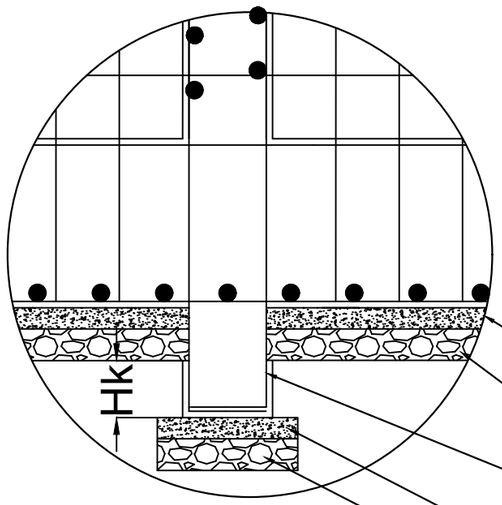
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/12	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN REINFORCEMENT DETAIL OF RCC COUNTERFORT WALL Scale : NTS N Drawing No: Contract No/WP1/12 Sheet No: 12 of 26

DETAIL A



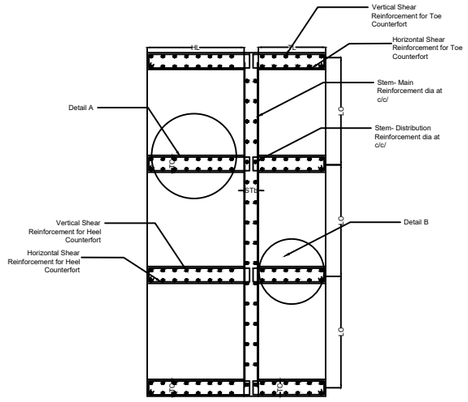
Note:
Refer Bar Bending Schedule for reinforcement details

DETAIL B

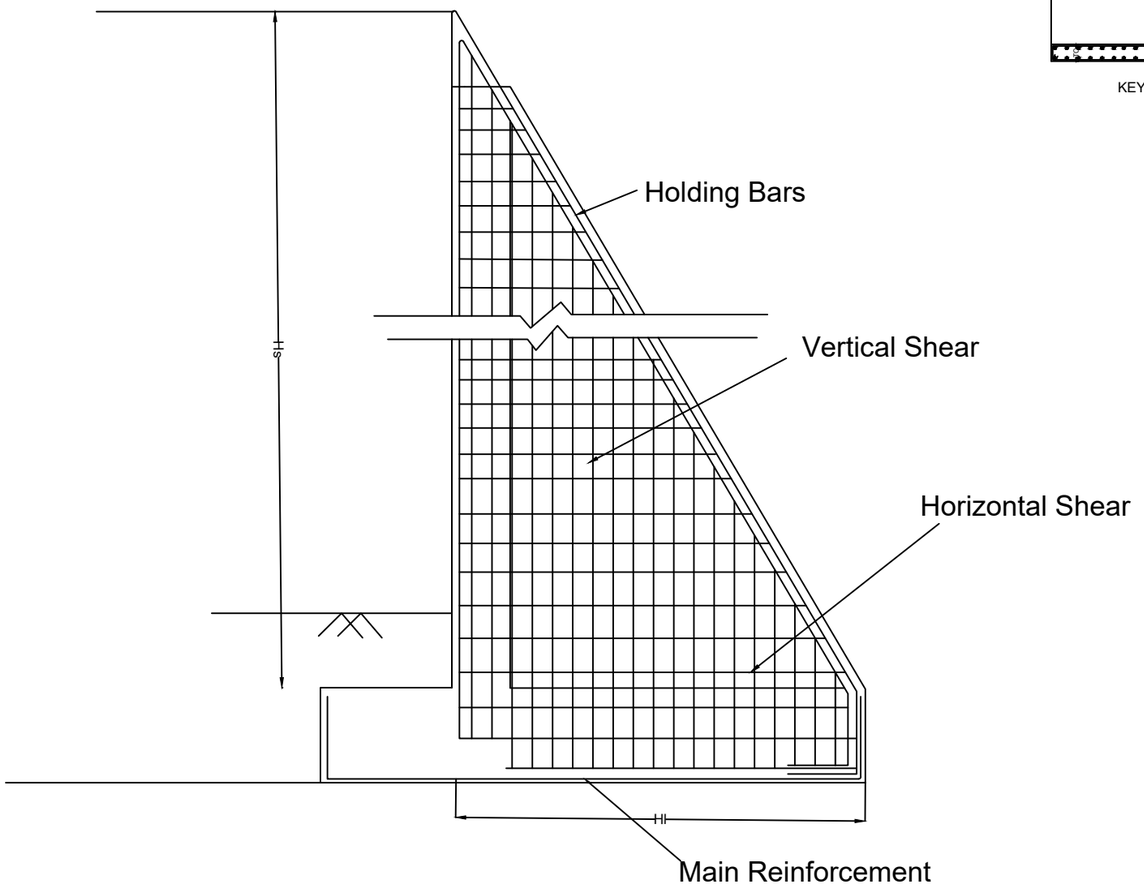


Note:
Refer Bar Bending Schedule for reinforcement details

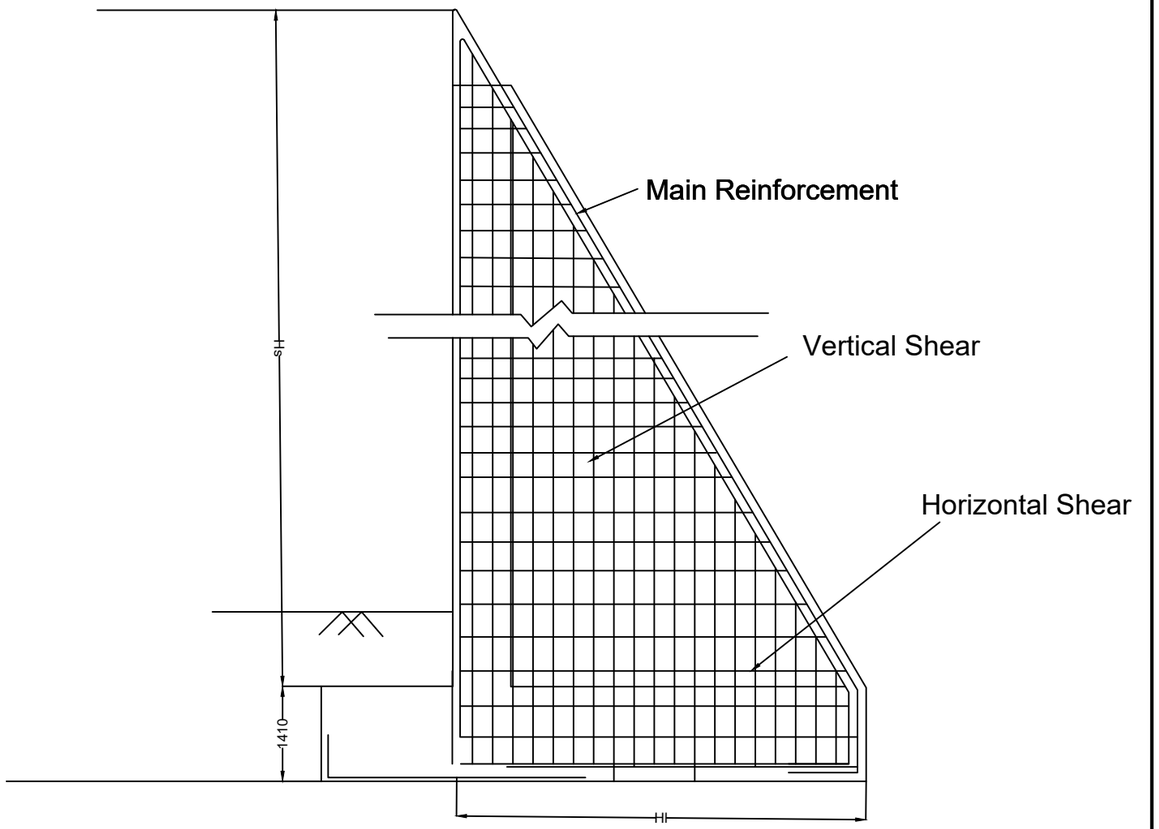
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/12.1	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN REINFORCEMENT DETAIL OF RCC COUNTERFORT WALL Scale : NTS	N Drawing No: Contract No/WP1/12.1 Sheet No: 12.1 of 26



KEY PLAN

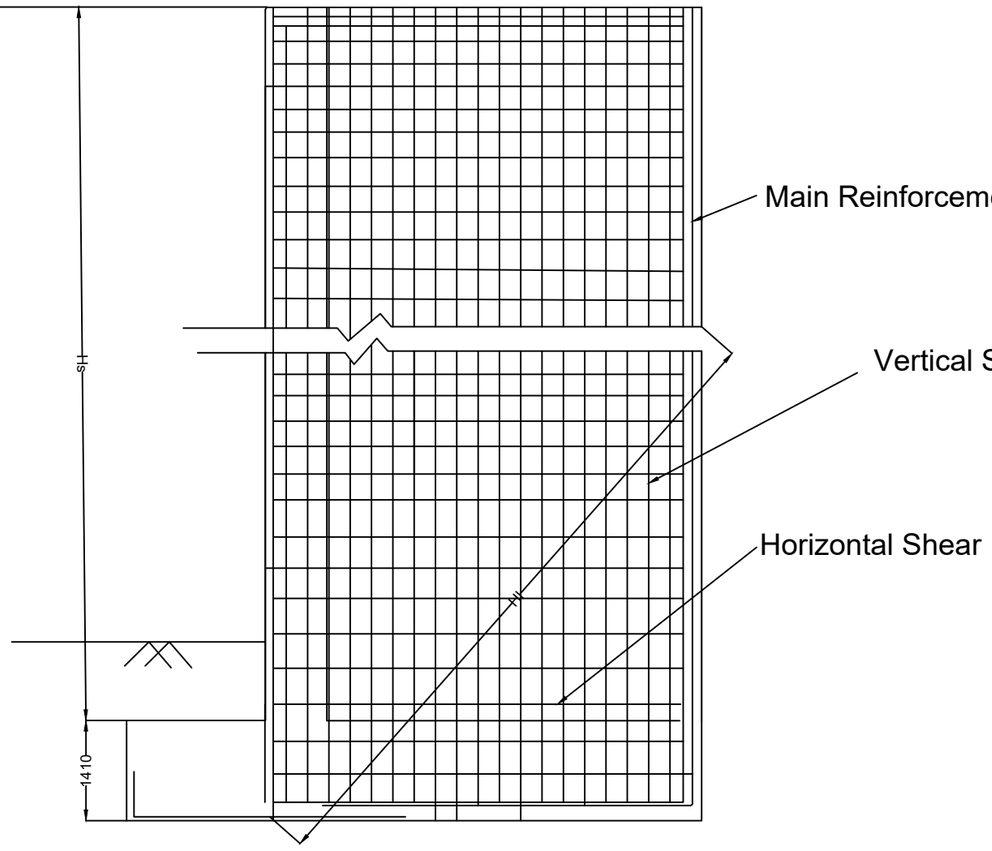


Detail B

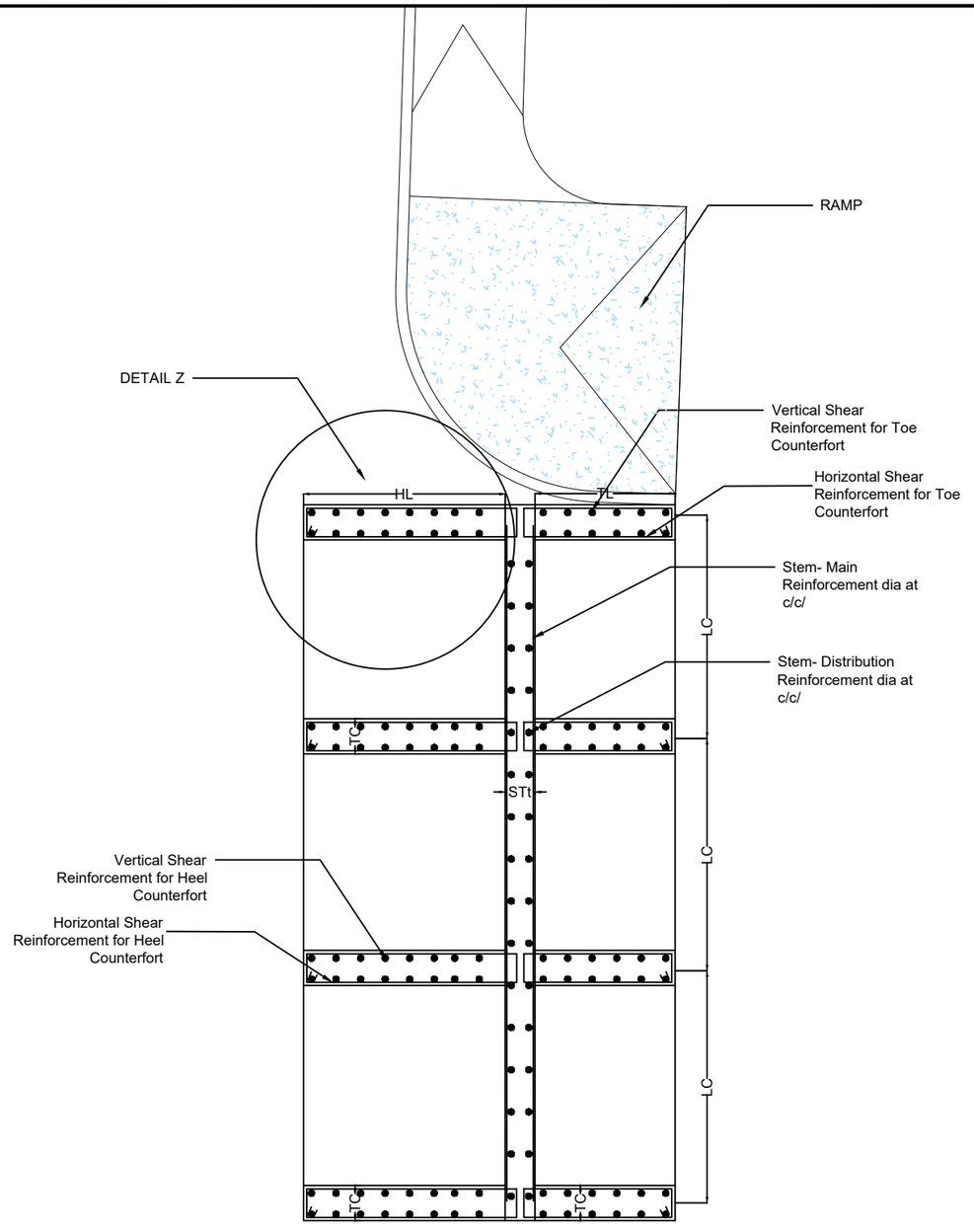


Detail A

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/13	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN REINFORCEMENT DETAIL OF RCC COUNTERFORT WALL Scale : NTS	N Drawing No: Contract No/WP1/13 Sheet No: 13 of 26

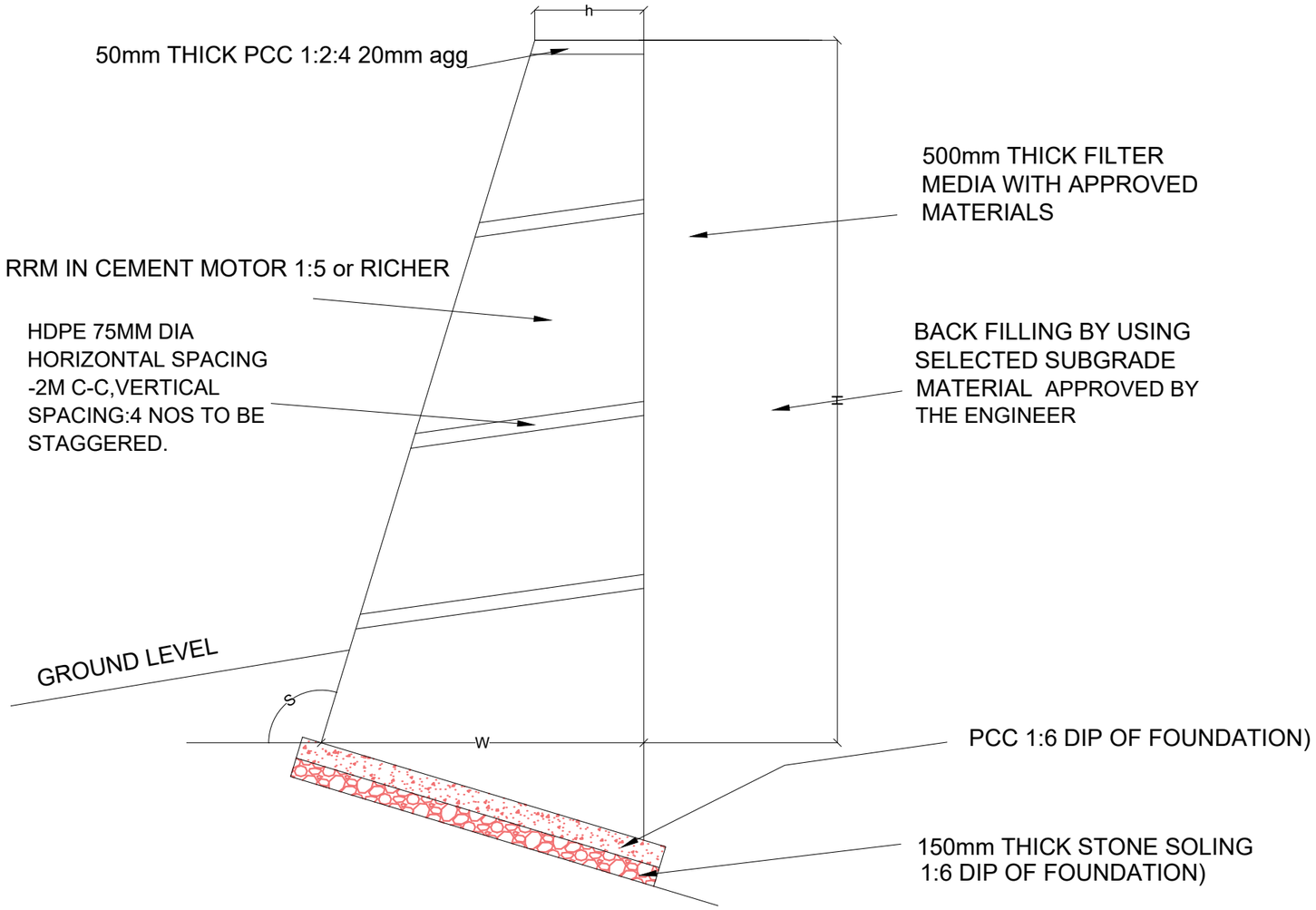


DETAIL Z
(Heel counterfort section at ramp junction)



PLAN

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/14	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN COUNTERFORT HEEL DETAIL AT RAMP JUNCTION Scale : NTS	N Drawing No: Contract No/WP1/14 Sheet No: 14 of 26



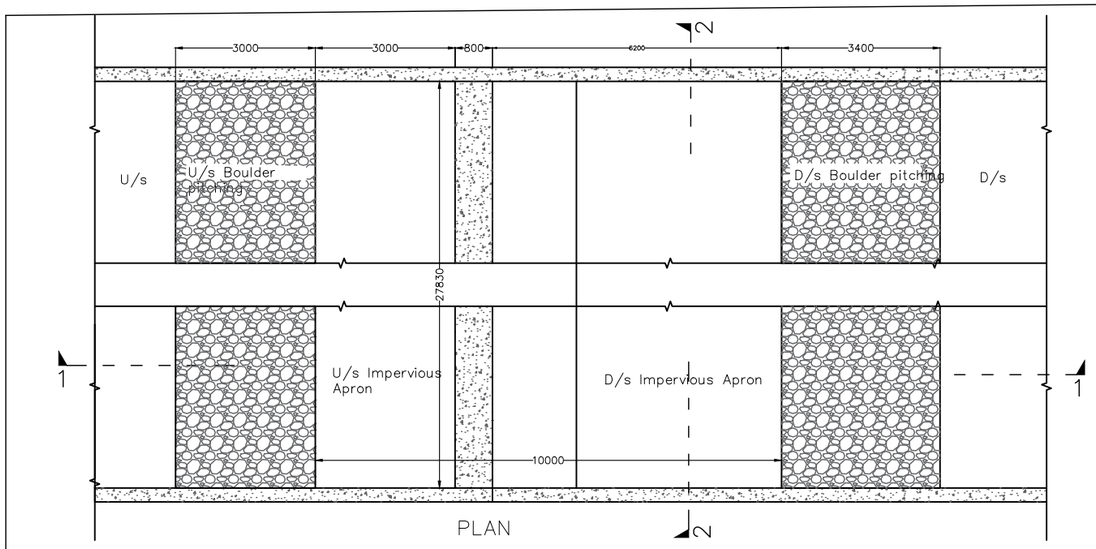
1:4 front batter, 1:10 back batter, top of wall 700mm			
H	h	W	S=hyp(W+h)
1	0.26	1.08	1.11
1.5	0.31	1.26	1.29
2	0.35	1.44	1.48
2.5	0.39	1.61	1.66
3	0.44	1.79	1.85
3.5	0.48	1.97	2.03
4	0.53	2.15	2.22
4.5	0.57	2.33	2.4
5	0.61	2.51	2.58
6	0.7	2.87	2.95
7	0.79	3.23	3.32
8	0.88	3.59	3.69
9	0.96	3.95	4.05
10	1.05	4.31	4.43

Notes:

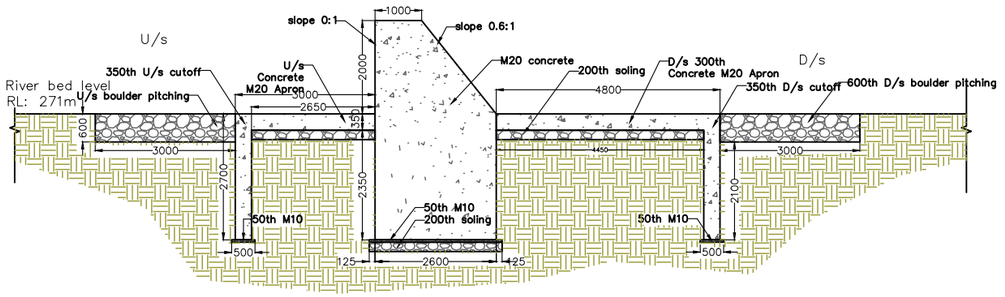
1. At least one bond stone or a set of bond stones to be provided for every 0.5m^2 of the wall surface.

2. Provide 110mm HDPE weep holes of @1200c/c vertically & horizontally

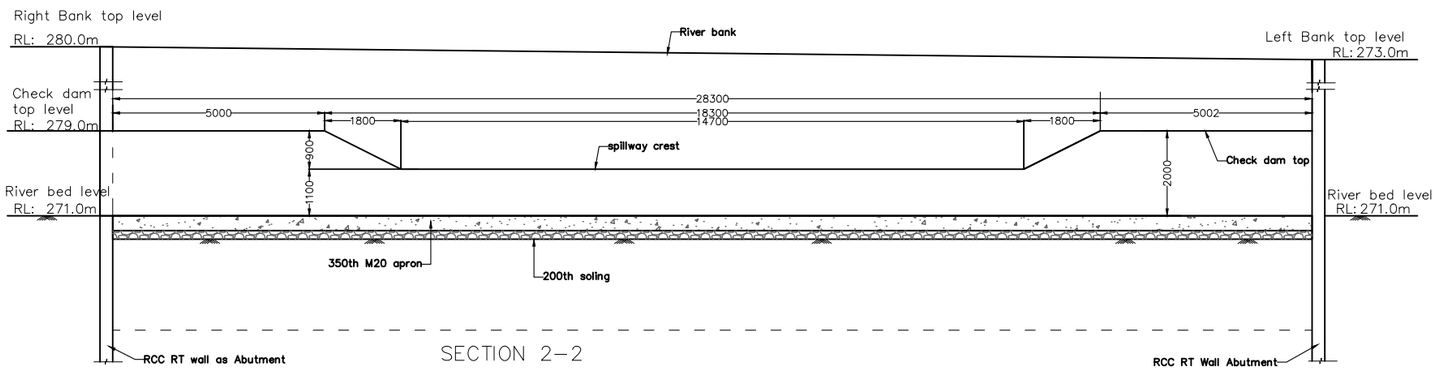
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/15	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN TYPICAL RRM WALL DETAIL Scale : NTS Drawing No: Contract No/WP1/15 Sheet No: 15 of 26



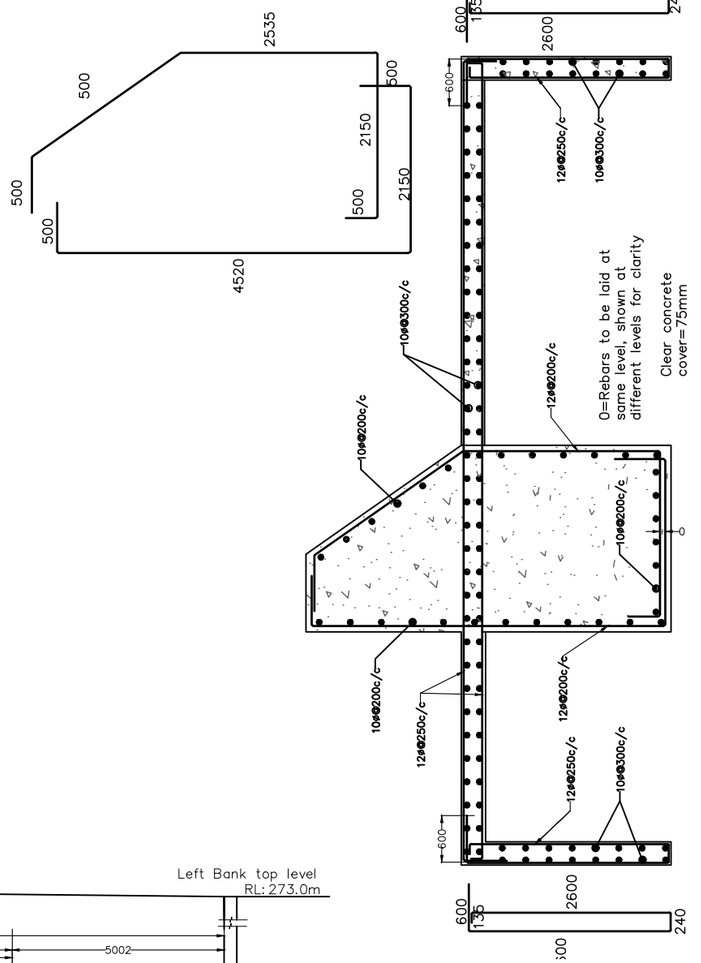
PLAN



SECTION 1–1



SECTION 2–2

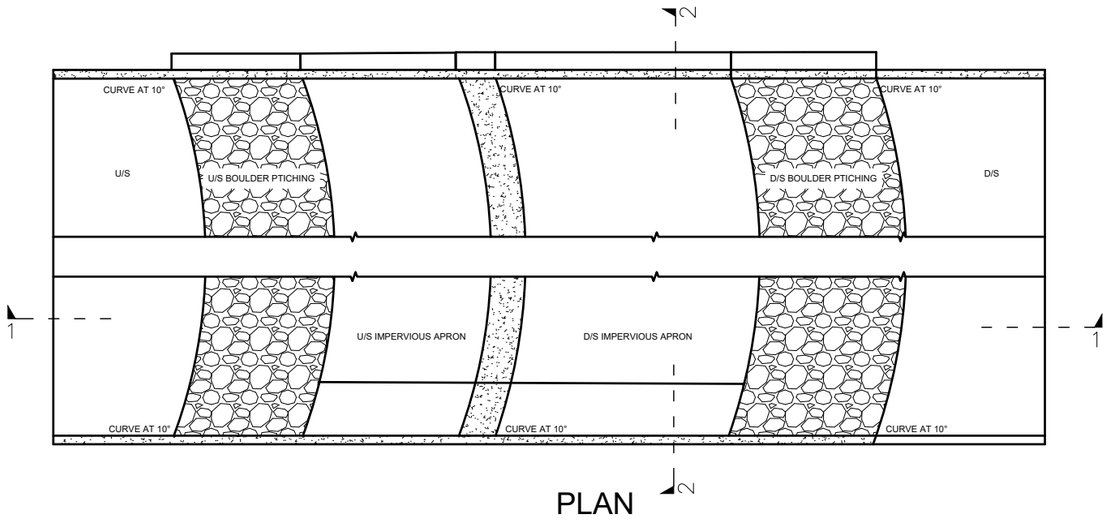


Reinforcement details in Apron

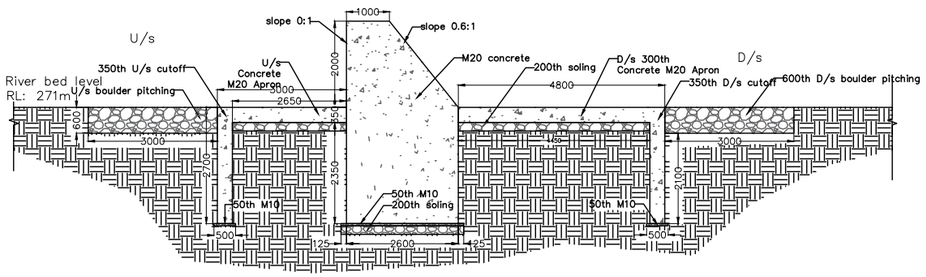
CHECK DAM AT Chainage 3290m

NOTE: This Check dams are replicable at locations identified where the length of the dams will vary as per that site and also the bed levels and bank top levels.

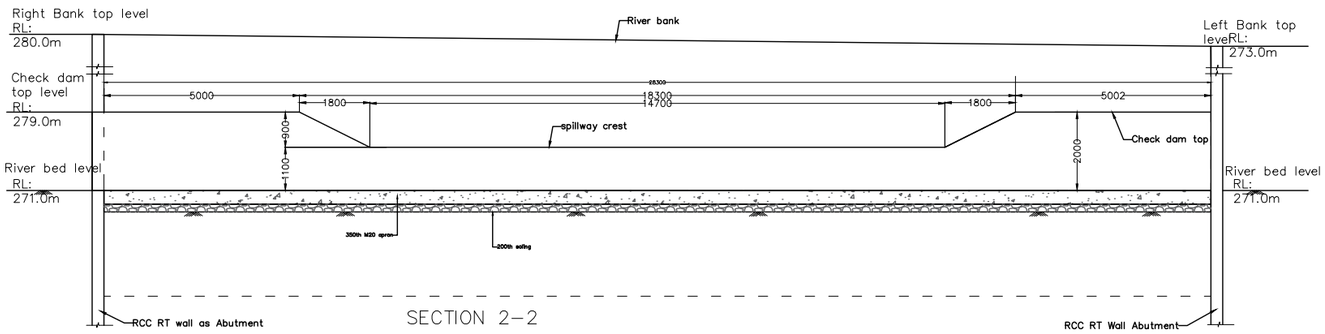
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/16	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN STRAIGHT CHECK DAM DETAIL Scale : NTS Drawing No: Contract No/WP1/16 Sheet No: 16 of 26



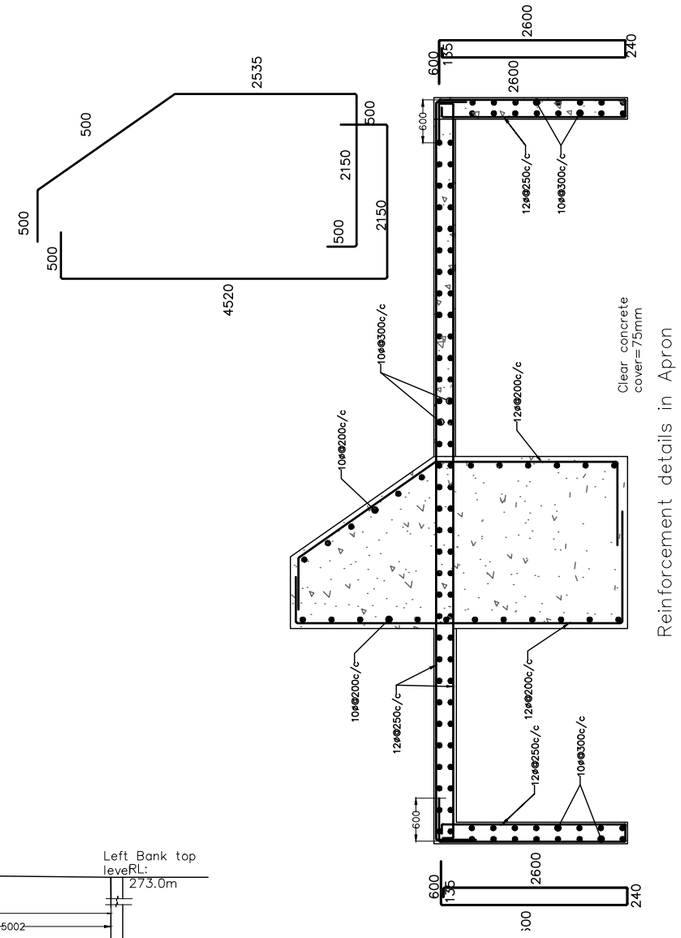
PLAN



SECTION 1–1



SECTION 2–2

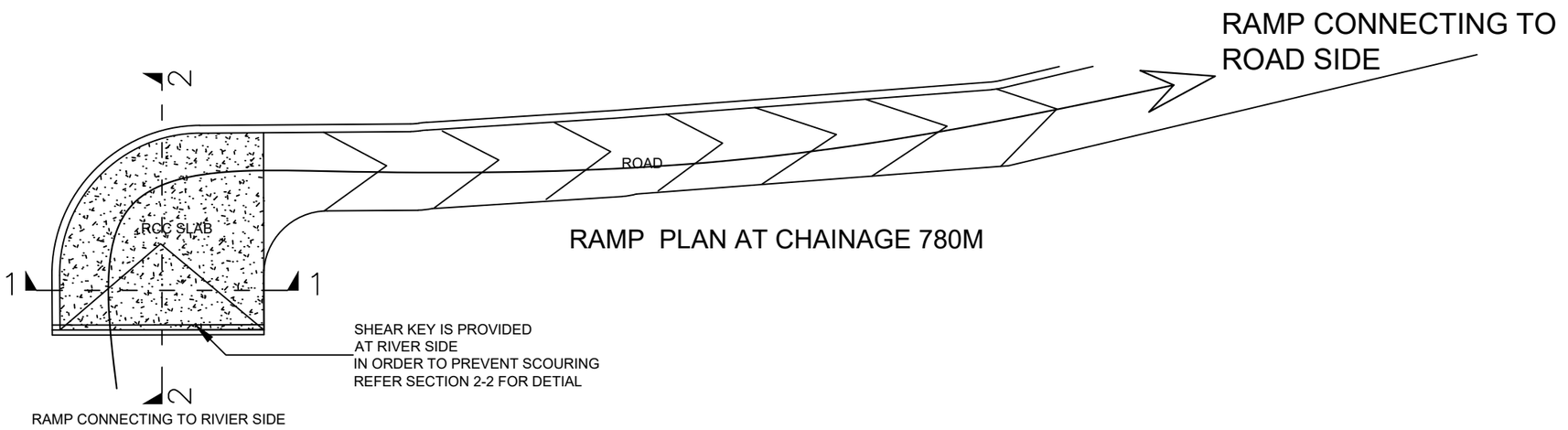


Reinforcement details in Apron

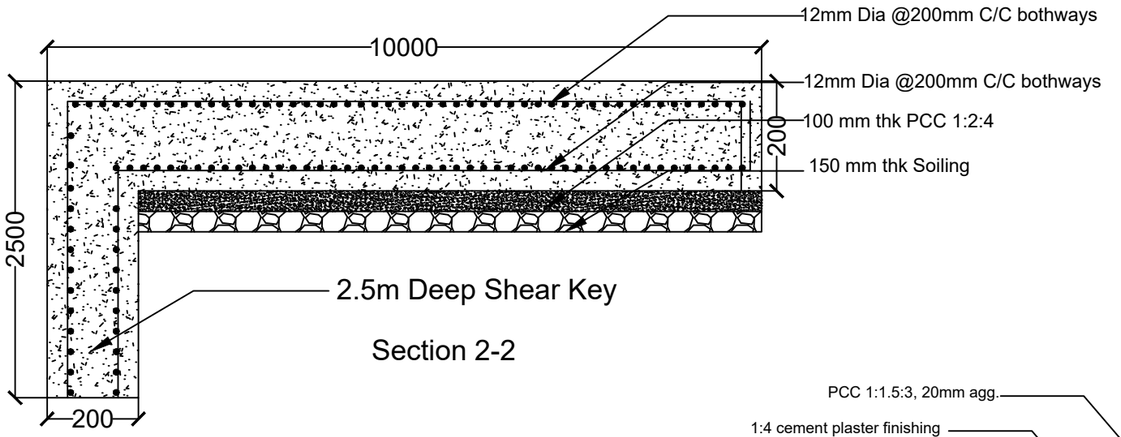
Clear concrete cover=75mm

NOTE: This Check dams are replicable at locations identified where the length of the dams will vary as per that site and also the bed levels and bank top levels.

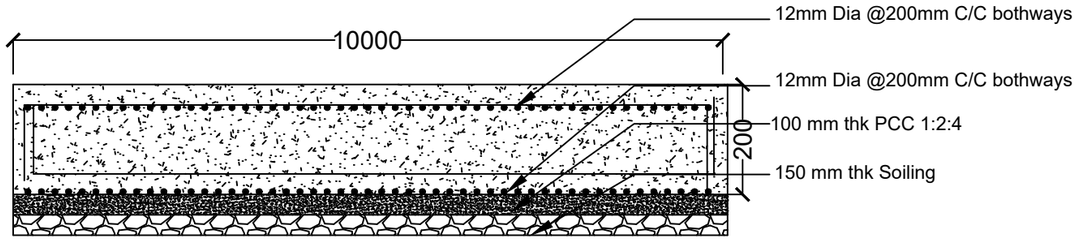
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/17	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN CIRCULAR CHECK DAM DETAIL Scale : NTS Drawing No: Contract No/WP1/17 Sheet No: 17 of 26 N



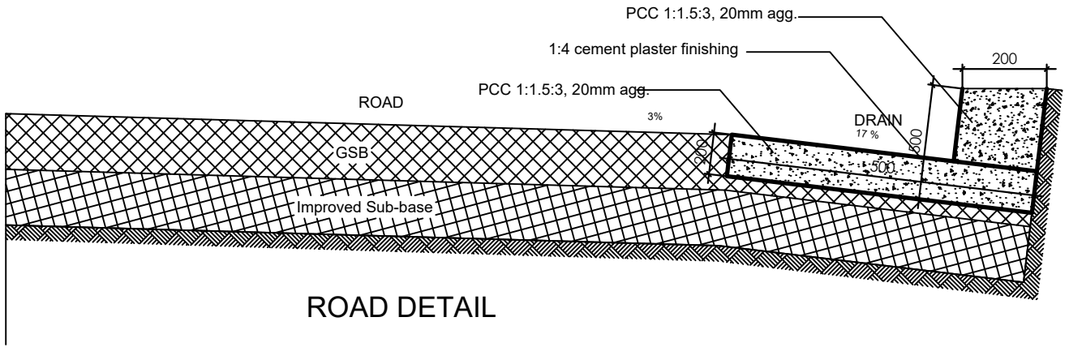
RAMP PLAN AT CHAINAGE 780M



Section 2-2



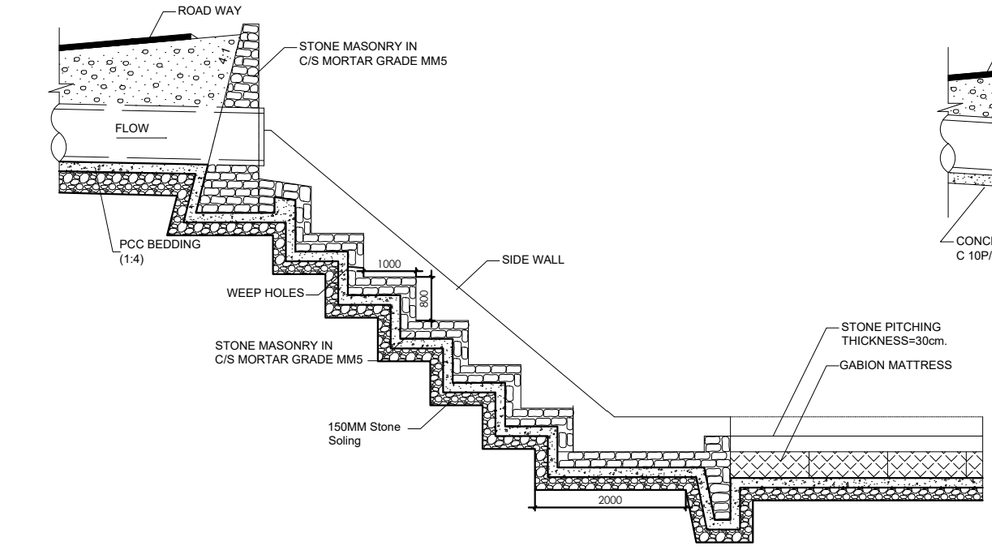
Section 1-1



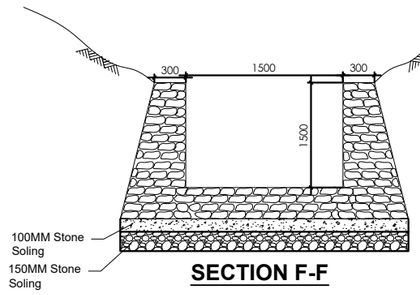
ROAD DETAIL

NOTE: This ramp DETAILS are replicable at locations identified where the length of the ramps will vary as per that site

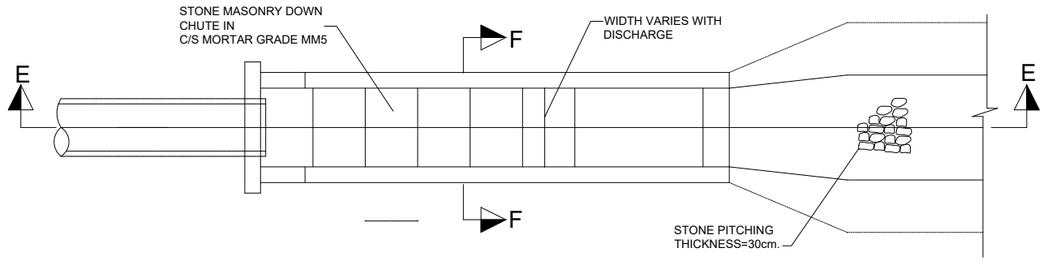
PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/18	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN TYPICAL RAMP REINFORCEMENT DETAIL Scale : NTS Drawing No: Contract No/WP1/18 Sheet No: 18 of 26 N



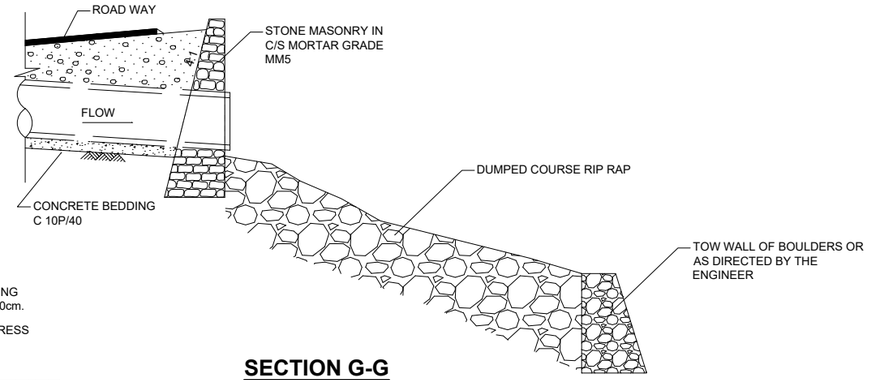
SECTION E-E



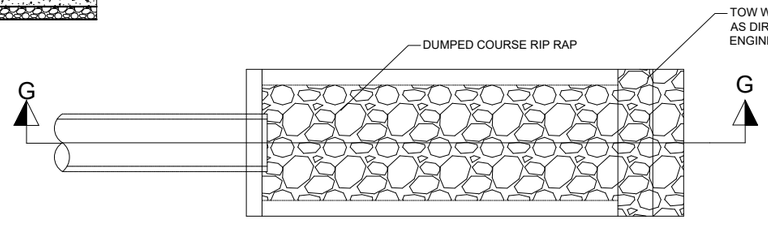
SECTION F-F



PLAN (TYPE -OPW 1)



SECTION G-G



PLAN (TYPE -OPW 2)

NOTES:

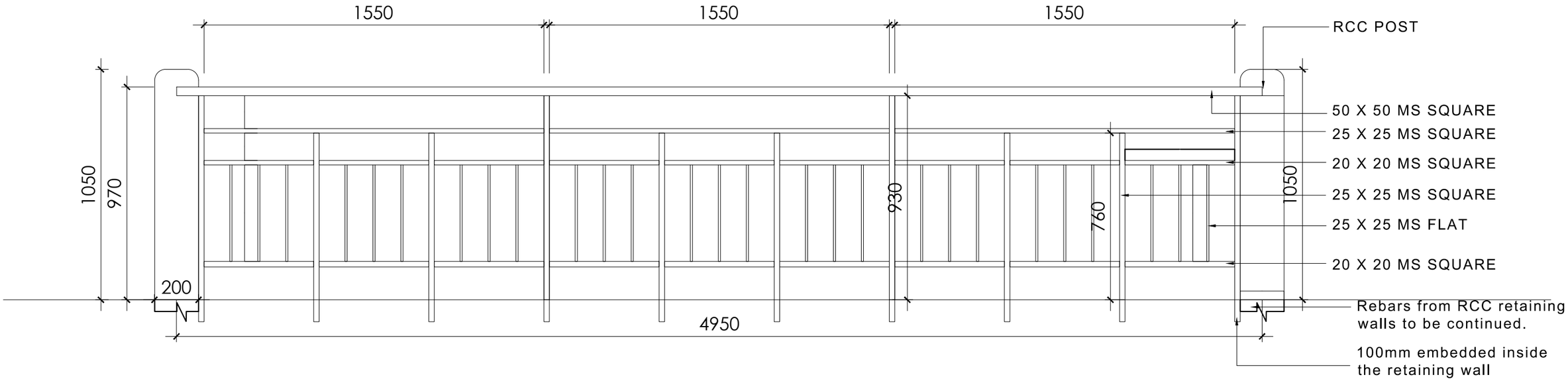
1.THE TYPE, SIZE AND LENGTH OF OUTLET PROTECTION WORKS ARE DECIDED BY THE ENGINEER AS PER SITE CONDITIONS.

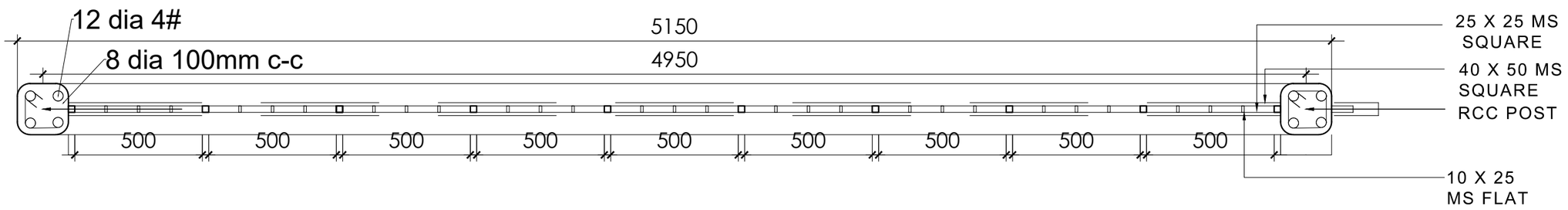
2.AS THIS IS A TYPICAL DRAWING, SITE LAYOUT AND DIMENSIONS SHALL BE AS DIRECTED BY THE ENGINEER

3. MASONRY CHUTE MAY ALSO BE APPLICABLE FOR INLET TO CULVERT

OPW: OUTLET PROTECTION WORK

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/19	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN TYPICAL CASCADING DETAIL Scale : NTS Drawing No: Contract No/WP1/19 Sheet No: 19 of 26





PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/20	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: STRUCUTRAL DESIGN M.S RAILING DETAIL Scale : NTS Drawing No: Contract No/WP1/20 Sheet No: 20 of 26

Coordinates and location of Counterfort Retaining walls
Channel: Om Chhu Main Channel
Refer Master Plan to identify the location of each wall type and Drawing Details for individual details

Chainage	Chainage of Coordinate	Bed Level	Wall type RB	COORDINATES		
				Easting RB	Northing RB	Footing RL RB
200-220	200	193.2	No wall			
220-240	220	193.2	1.c	X = 188060.0182	Y = 2972977.3713	189.87
240-260	240	193.3	1.b	X = 188060.0182	Y = 2972977.3713	189.98
260-280	260	193.7	1.b	X = 188096.7525	Y = 2972959.2748	190.37
280-300	280	193.7	1.b	X = 188113.7762	Y = 2972948.7458	190.43
300-330	300	193.9	5.c	X = 188130.6588	Y = 2972937.9662	190.58
310	320	193.9	Check Dam	X = 188147.8891	Y = 2972927.8001	193.88
330-340	330	194.3	Ramp	X = 188155.3197	Y = 2972923.4950	194.28
340-360	340	194.3	6.e	X = 188163.8020	Y = 2972918.5763	190.97
360-380	360	194.5	6.e	X = 188181.1843	Y = 2972908.4990	191.21
380-400	380	194.6	6.e	X = 188198.5825	Y = 2972898.4125	191.26
400-420	400	194.5	6.h	X = 188215.9807	Y = 2972888.3260	191.18
420-440	420	194.4	6.d	X = 188234.7286	Y = 2972877.4345	191.09
440-460	440	194.7	6.e	X = 188251.1709	Y = 2972866.6308	191.38
460-480	460	196.0	6.c	X = 188267.0563	Y = 2972854.3006	192.70
480-500	480	195.6	6.e	X = 188284.1611	Y = 2972845.0495	192.31
500-520	500	195.8	6.d	X = 188302.0527	Y = 2972836.1648	192.52
510	510	195.8	Check Dam	X = 188311.0034	Y = 2972831.7199	195.82
520-540	520	196.2	6.e	X = 188319.9207	Y = 2972827.6957	192.86
540-560	540	196.4	6.e	X = 188319.9207	Y = 2972827.6957	193.06
560-580	560	197.2	6.e	X = 188356.8722	Y = 2972812.1769	193.94
580-600	580	197.8	6.b	X = 188374.8613	Y = 2972803.4356	194.48
600-620	600	198.2	24.b	X = 188390.9429	Y = 2972796.4711	192.66
620-637	620	198.0	Foot Bridge	X = 188409.8394	Y = 2972789.7316	197.98
			Foot Bridge			
637-660	637	199.1	22.e	X = 188425.7440	Y = 2972783.8811	193.58
660-680	660	199.3	22.c	X = 188448.3166	Y = 2972776.6149	193.79
680-700	680	199.1	22.c	X = 188467.3230	Y = 2972770.3866	193.64
700-720	700	199.8	22.c	X = 188486.3063	Y = 2972764.0902	194.28
720-740	720	200.0	22.c	X = 188505.2896	Y = 2972757.7939	194.53
740-760	740	200.3	22.c	X = 188524.1163	Y = 2972751.0348	194.82
760	760	200.3	Check Dam	X = 188543.2221	Y = 2972745.0948	200.29
760-780	760	200.3	24.b	X = 188543.2221	Y = 2972745.0948	194.79
780-790	780	201.0	Ramp	X = 188561.6117	Y = 2972737.1548	201.00
790-820	790	202.4	22.h	X = 188570.7459	Y = 2972733.2108	196.94
820-840	820	203.2	22.c	X = 188599.4638	Y = 2972718.8826	197.73
840-860	840	203.7	22.c	X = 188617.4519	Y = 2972709.9170	198.22
850	850	203.7	Check Dam	X = 188625.9529	Y = 2972704.7786	203.72
860-880	860	204.2	24.b	X = 188633.9708	Y = 2972698.5995	198.68
880-900	880	204.9	24.b	X = 188650.5397	Y = 2972687.3829	199.37
900-920	900	205.6	24.b	X = 188667.4053	Y = 2972676.6751	200.14
920-940	920	206.0	24.b	X = 188684.9380	Y = 2972667.0493	200.50
940-960	940	205.9	22.a	X = 188702.9814	Y = 2972658.2518	200.41
960-980	960	206.1	22.c	X = 188717.5971	Y = 2972655.9829	200.63
980-1000	980	206.9	22.b	X = 188737.5644	Y = 2972654.8260	201.42

Chainage	Chainage of Coordinate	Bed Level	Wall type LB	COORDINATES		
				Easting LB	Northing LB	Footing RL LB
200-220	200	193.2	No wall			193.17
220-240	220	193.2	1.a	X = 188042.6077	Y = 2972942.8197	189.87
240-260	240	193.3	1.b	X = 188060.3025	Y = 2972935.3051	189.98
260-280	260	193.7	1.b	X = 188078.2765	Y = 2972926.4638	190.37
280-300	280	193.7	1.b	X = 188096.2506	Y = 2972917.6225	190.43
300-330	300	193.9	5.a	X = 188114.2246	Y = 2972908.7812	190.58
310	320	193.9	Check Dam	X = 188132.1957	Y = 2972899.9347	0.00
330-340	330	194.3	5.b	X = 188142.1701	Y = 2972895.2255	190.98
340-360	340	194.3	6.e	X = 188151.3963	Y = 2972890.8694	190.97
360-380	360	194.5	6.e	X = 188169.9645	Y = 2972883.4037	191.21
380-400	380	194.6	6.e	X = 188187.7861	Y = 2972874.2610	191.26
400-420	400	194.5	6.b	X = 188205.5353	Y = 2972864.9597	191.18
420-440	420	194.4	6.f	X = 188220.7798	Y = 2972856.5391	191.09
440-460	440	194.7	6.e	X = 188238.6894	Y = 2972846.5199	191.38
460-480	460	196.0	6.g	X = 188256.0033	Y = 2972836.5010	192.70
480-500	480	195.6	6.e	X = 188274.0729	Y = 2972826.0591	192.31
500-520	500	195.8	6.f	X = 188292.0078	Y = 2972817.0990	192.52
510	510	195.8	Check Dam	X = 188300.9473	Y = 2972812.6330	0.00
520-540	520	196.2	6.e	X = 188310.1697	Y = 2972808.0255	192.86
540-560	540	196.4	6.e	X = 188328.2749	Y = 2972799.5186	193.06
560-580	560	197.2	6.e	X = 188346.6431	Y = 2972791.5421	193.94
580-600	580	197.8	6.h	X = 188365.2431	Y = 2972784.0332	194.48
600-620	600	198.2	24.b	X = 188385.9149	Y = 2972777.8399	192.66
620-637	620	198.0	Foot Bridge	X = 188405.0206	Y = 2972771.8756	0.00
			Foot Bridge			0.00
637-660	637	199.1	22.e	X = 188420.1507	Y = 2972766.8804	193.58
660-680	660	199.3	22.c	X = 188442.5315	Y = 2972759.5880	193.79
680-700	680	199.1	22.c	X = 188461.6072	Y = 2972753.5523	193.64
700-720	700	199.8	22.c	X = 188480.6929	Y = 2972747.5574	194.28
720-740	720	200.0	22.c	X = 188499.2116	Y = 2972739.8928	194.53
740-760	740	200.3	22.c	X = 188517.7400	Y = 2972732.2537	194.82
760	760	200.3	Check Dam	X = 188536.1546	Y = 2972724.2793	0.00
760-780	760	200.3	24.b	X = 188536.1546	Y = 2972724.2793	194.79
780-790	780	201.0	24.b	X = 188554.2984	Y = 2972715.6155	195.50
790-820	790	202.4	22.b	X = 188572.1690	Y = 2972707.0822	196.94
820-840	820	203.2	22.c	X = 188587.7401	Y = 2972699.7969	197.73
840-860	840	203.7	22.c	X = 188605.9548	Y = 2972691.2684	198.22
850	850	203.7	Check Dam	X = 188614.0974	Y = 2972685.5488	0.00
860-880	860	204.2	24.b	X = 188622.3505	Y = 2972679.7513	198.68
880-900	880	204.9	24.b	X = 188639.2107	Y = 2972668.9957	199.37
900-920	900	205.6	24.b	X = 188656.9346	Y = 2972659.6915	200.14
920-940	920	206.0	24.b	X = 188674.6639	Y = 2972650.3846	200.50
940-960	940	205.9	22.f	X = 188693.0250	Y = 2972642.1423	200.41
960-980	960	206.1	22.c	X = 188716.3350	Y = 2972635.3671	200.63
980-1000	980	206.9	22.d	X = 188736.3867	Y = 2972635.5607	201.42

PROJECT TITLE:

CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT

CONTRACT NUMBER: PT2025/CRORBP/WP1/21

DESIGN CONSULTANT:

APECS Consultancy

CLIENT:

Phuentsholing Thromde

NOTES:

1. The drawings shall not be scaled off. Only written dimensions are to be followed.
2. All dimensions are in mm unless specified otherwise.
3. Any discrepancy in drawing shall be brought to the notice of the consulting team.

DESIGNED & DRAWN BY:

Purna Chetri
Rohit Adhikari
Bikash Nepal
Roma Adhikari

CHECKED/ APPROVED BY:

Phuentsholing Thromde

Drawing Title:
COORDINATES OF WALLS

N

Drawing No: Contract No/WP1/21

Scale : NTS

Sheet No: 21 of 26

Chainage	Chainage of Coordinate	Bed Level	Wall type RB	COORDINATES		
				Easting RB	Northing RB	Footing RL RB
1000-1020	1000	207.2	22.c	X = 188754.7630	Y = 2972654.7272	201.74
1020-1040	1020	207.5	22.c	X = 188774.5985	Y = 2972657.6422	202.01
1040-1055	1040	207.3	Bridge	X = 188794.2902	Y = 2972661.2152	207.31

Chainage	Chainage of Coordinate	Bed Level	Wall type LB	COORDINATES		
				Easting LB	Northing LB	Footing RL LB
1000-1020	1000	207.2	22.c	X = 188758.7640	Y = 2972636.4074	201.74
1020-1040	1020	207.5	22.c	X = 188778.2540	Y = 2972640.9044	202.01
1040-1055	1040	207.3	RSTA Brde	X = 188797.8183	Y = 2972645.0609	0.00

PROJECT TITLE:

CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT

CONTRACT NUMBER: PT2025/CRORBP/WP1/22

DESIGN CONSULTANT:

APECS Consultancy

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CLIENT:

Phuentsholing Thromde

NOTES:

1. The drawings shall not be scaled off. Only written dimensions are to be followed.
2. All dimensions are in mm unless specified otherwise.
3. Any discrepancy in drawing shall be brought to the notice of the consulting team.

DESIGNED & DRAWN BY:

Purna Chetri
Rohit Adhikari
Bikash Nepal
Roma Adhikari

CHECKED/ APPROVED BY:

Phuentsholing Thromde

Drawing Title:
STRUCUTRAL DESIGN

N

M.S RAILING DETAIL

Drawing No: Contract No/WP1/22

Scale : NTS

Sheet No: 22 of 26

Wall Details along with Reinforcement Details (Omchhu Main Channel- Counterfort)

Channel: Om Chhu Main Channel

Refer Master Plan to identify the location of each wall type and Drawing Details (and Bar Bending Schedule) for individual details

Nomenclature:

H_t: Total Wall Height
L_P: Length of Panel
φ: Surcharge Angle
H_s: Height of Stem
H_f: Height of Filling
ST_t: Stem thickness at Wall Top
ST_b: Stem thickness at Wall Bottom
D: Depth of Footing
T_L: Toe Length
H_L: Heel Length
D_s: Depth of Shear Key
H_{RC}: Height of Rear Counterfort
H_{FC}: Height of Front Counterfort
T_c: Thickness of Counterfort
Lc: C/C distance between Counterforts
B: Base width of Footing

Wall Type	H_t	L_P	φ	H_s	H_f	ST_t	ST_b	D	T_L	H_L	D_s	H_{RC}	H_{FC}	T_c	Lc	B	Bottom Rein footing slab			Top Rein footing slab		
																	Main	Distribution	Shear Rein	Main	Distribution	Shear Rein
1.a	8.07	9.50	20.00	7.00	4.50	0.39	0.39	0.80	1.87	2.54	0.00	7.00	2.15	0.39	3.04	4.80	16mm Dia @ 160mm c-c	16mm Dia @160mm c-c	4Legs12mm Dia @300mm c-c	16mm Dia @160mm c-c	16mm Dia @160mm c-c	12mm Dia @ 300 mm c-c
1.b	9.26	10.00	20.00	7.00	4.50	0.39	0.39	0.80	1.87	2.54	0.00	7.00	2.15	0.39	3.20	4.80	16mm Dia @ 160mm c-c	16mm Dia @160mm c-c	4Legs12mm Dia @300mm c-c	16mm Dia @160mm c-c	16mm Dia @160mm c-c	12mm Dia @ 300 mm c-c
1.c	10.52	10.50	20.00	7.00	4.50	0.39	0.39	0.80	1.87	2.54	0.00	7.00	2.15	0.39	3.37	4.80	16mm Dia @ 160mm c-c	16mm Dia @160mm c-c	4Legs12mm Dia @300mm c-c	16mm Dia @160mm c-c	16mm Dia @160mm c-c	12mm Dia @ 300 mm c-c
5.a	12.37	10.00	20.00	8.60	6.50	0.49	0.49	1.20	2.28	3.13	0.00	8.60	2.64	0.49	3.17	5.90	16mm Dia @ 100mm c-c	16mm Dia @110mm c-c	4Legs12mm Dia @0mm c-c	16mm Dia @100mm c-c	16mm Dia @110mm c-c	4Legs12mm Dia @0mm c-c
5.b	12.33	10.50	20.00	8.60	6.50	0.49	0.49	1.20	2.28	3.13	0.00	8.60	2.64	0.49	3.34	5.90	16mm Dia @ 100mm c-c	16mm Dia @110mm c-c	4Legs12mm Dia @0mm c-c	16mm Dia @100mm c-c	16mm Dia @110mm c-c	4Legs12mm Dia @0mm c-c
5.c	10.93	14.00	20.00	8.60	6.50	0.49	0.49	1.20	2.28	3.13	0.00	8.60	2.64	0.49	3.38	5.90	16mm Dia @ 100mm c-c	16mm Dia @110mm c-c	4Legs12mm Dia @0mm c-c	16mm Dia @100mm c-c	16mm Dia @110mm c-c	4Legs12mm Dia @0mm c-c
6.b	11.89	8.70	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	4.08	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
6.c	11.89	9.65	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	3.04	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
6.d	10.80	9.85	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	3.10	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
6.e	10.92	10.00	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	3.15	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
6.f	10.80	10.15	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	3.20	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
6.g	10.80	10.40	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	3.29	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
6.h	10.80	10.75	20.00	9.40	7.50	0.54	0.54	1.40	2.52	3.45	0.00	9.40	2.91	0.54	3.40	6.50	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
22.a	12.00	14.70	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.53	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	12mm Dia @ 300 mm c-c
22.b	12.00	8.55	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.98	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	12mm Dia @ 300 mm c-c
22.c	12.23	10.00	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.13	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @0mm c-c
22.d	12.00	11.20	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.53	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	12mm Dia @ 300 mm c-c

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/23	DESIGN CONSULTANT: APECS Consultancy C:\Users\User\Pictures\NEW LOGO.png	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WALL DETAILS FOR COUNTERFORTS Drawing No: Contract No/WP1/23 Scale : NTS Sheet No: 23 of 26	N

Wall Details along with Reinforcement Details (Omchhu Main Channel- Counterfort)

Channel: Om Chhu Main Channel

Refer Master Plan to identify the location of each wall type and Drawing Details (and Bar Bending Schedule) for individual details

Nomenclature:

H_t: Total Wall Height
L_P: Length of Panel
φ: Surcharge Angle
H_s: Height of Stem
H_f: Height of Filling

ST_t: Stem thickness at Wall Top
ST_b: Stem thickness at Wall Bottom
D: Depth of Footing
T_L: Toe Length
H_L: Heel Length

D_s: Depth of Shear Key
H_{RC}: Height of Rear Counterfort
H_{FC}: Height of Front Counterfort
T_c: Thickness of Counterfort
Lc: C/C distance between Counterforts
B: Base width of Footing

22.e	12.00	11.75	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.72	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	12mm Dia @ 300 mm c-c
22.f	12.00	12.30	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.90	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	12mm Dia @ 300 mm c-c
22.h	12.00	10.67	20.00	10.60	6.50	0.60	0.60	1.40	2.64	3.66	0.00	10.60	3.06	0.60	3.36	6.90	20mm Dia @ 140mm c-c	20mm Dia @150mm c-c	4Legs12mm Dia @300mm c-c	20mm Dia @140mm c-c	20mm Dia @150mm c-c	12mm Dia @ 300 mm c-c
24.b	13.00	10.00	20.00	11.40	7.50	0.63	0.63	1.60	2.71	3.76	0.30	11.40	3.14	0.63	3.13	7.10	20mm Dia @ 120mm c-c	20mm Dia @130mm c-c	4Legs12mm Dia @0mm c-c	20mm Dia @120mm c-c	20mm Dia @130mm c-c	4Legs12mm Dia @0mm c-c

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/24	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WALL DETAILS FOR COUNTERFORTS Drawing No: Contract No/WP1/20 Scale : NTS Sheet No: 24 of 26

N

Wall Details along with Reinforcement Details (Omchhu Main Channel- Counterfort)

Channel: Om Chhu Main Channel

Refer Master Plan to identify the location of each wall type and Drawing Details (and Bar Bending Schedule) for individual details

Nomenclature:

H_t: Total Wall Height
L_p: Length of Panel
φ: Surcharge Angle
H_s: Height of Stem
H_f: Height of Filling
ST_t: Stem thickness at Wall Top
ST_b: Stem thickness at Wall Bottom
D: Depth of Footing
T_t: Toe Length
H_t: Heel Length
D_s: Depth of Shear Key
H_{RC}: Height of Rear Counterfort
H_{FC}: Height of Front Counterfort
T_c: Thickness of Counterfort
Lc: C/C distance between Counterforts
B: Base width of Footing

Wall Type	Stem Reinforcement on both the sides		Rear Counterfort Rein			Front Counterfort Rein				Shear Key Rein
	Main	Distribution	Main	Vertical Shear	Horizontal shear	Main	Vertical Shear	Horizontal Shear	Holding Bars	
1.a	16mm Dia @250mm c-c	16mm Dia @ 300mm c-c	20mm Dia 8 numbers	16mm Dia @ 150 mm c-c	16mm Dia @ 270 mm c-c	20mm Dia 10 numbers	16mm Dia @ 160 mm c-c	16mm Dia @ 160 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
1.b	16mm Dia @250mm c-c	16mm Dia @250mm c-c	20mm Dia 8 numbers	16mm Dia @ 150 mm c-c	16mm Dia @ 250 mm c-c	20mm Dia 10 numbers	16mm Dia @ 150 mm c-c	16mm Dia @ 150 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
1.c	16mm Dia @250mm c-c	16mm Dia @250mm c-c	20mm Dia 8 numbers	16mm Dia @ 150 mm c-c	16mm Dia @ 240 mm c-c	20mm Dia 10 numbers	16mm Dia @ 150 mm c-c	16mm Dia @ 150 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
5.a	16mm Dia @190mm c-c	16mm Dia @200mm c-c	25mm Dia 11 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 210 mm c-c	25mm Dia 9 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 130 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
5.b	16mm Dia @190mm c-c	16mm Dia @200mm c-c	25mm Dia 11 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 200 mm c-c	25mm Dia 9 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 130 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
5.c	16mm Dia @190mm c-c	16mm Dia @200mm c-c	25mm Dia 11 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 200 mm c-c	25mm Dia 9 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 130 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.b	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 150 mm c-c	32mm Dia 8 numbers	16mm Dia @ 110 mm c-c	16mm Dia @ 110 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.c	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 210 mm c-c	32mm Dia 7 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 120 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.d	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 210 mm c-c	32mm Dia 7 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 120 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.e	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 200 mm c-c	32mm Dia 7 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 120 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.f	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 200 mm c-c	32mm Dia 7 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 120 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.g	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 190 mm c-c	32mm Dia 7 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 120 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
6.h	16mm Dia @170mm c-c	16mm Dia @180mm c-c	32mm Dia 8 numbers	16mm Dia @ 130 mm c-c	16mm Dia @ 180 mm c-c	32mm Dia 7 numbers	16mm Dia @ 120 mm c-c	16mm Dia @ 120 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
22.a	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 90 mm c-c	16mm Dia @ 160 mm c-c	32mm Dia 9 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
22.b	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 90 mm c-c	16mm Dia @ 140 mm c-c	32mm Dia 10 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
22.c	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 180 mm c-c	32mm Dia 9 numbers	16mm Dia @ 110 mm c-c	16mm Dia @ 110 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
22.d	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 90 mm c-c	16mm Dia @ 160 mm c-c	32mm Dia 9 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
22.e	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 90 mm c-c	16mm Dia @ 150 mm c-c	32mm Dia 9 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/26	DESIGN CONSULTANT: APECS Consultancy	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri, Rohit Adhikari, Bikash Nepal, Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WALL DETAILS FOR COUNTERFORTS Drawing No: Contract No/WP1/20 Scale : NTS Sheet No: 25 of 26

N

Wall Details along with Reinforcement Details (Omchhu Main Channel- Counterfort)

Channel: Om Chhu Main Channel

Refer Master Plan to identify the location of each wall type and Drawing Details (and Bar Bending Schedule) for individual details

Nomenclature:

H_t: Total Wall Height
L_P: Length of Panel
φ: Surcharge Angle
H_s: Height of Stem
H_f: Height of Filling
ST_t: Stem thickness at Wall Top
ST_b: Stem thickness at Wall Bottom
D: Depth of Footing
T_L: Toe Length
H_L: Heel Length
D_s: Depth of Shear Key
H_{RC}: Height of Rear Counterfort
H_{FC}: Height of Front Counterfort
T_c: Thickness of Counterfort
Lc: C/C distance between Counterforts
B: Base width of Footing

22.f	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 90 mm c-c	16mm Dia @ 140 mm c-c	32mm Dia 9 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
22.h	16mm Dia @150mm c-c	16mm Dia @170mm c-c	32mm Dia 10 numbers	16mm Dia @ 90 mm c-c	16mm Dia @ 170 mm c-c	32mm Dia 9 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 0 mm C-C
24.b	16mm Dia @140mm c-c	16mm Dia @170mm c-c	32mm Dia 12 numbers	16mm Dia @ 80 mm c-c	16mm Dia @ 170 mm c-c	32mm Dia 9 numbers	16mm Dia @ 100 mm c-c	16mm Dia @ 100 mm c-c	20mm Dia 6 numbers	12mm Dia@ 220 mm C-C

PROJECT TITLE: CLIMATE RESILIENT OMCHHU RIVER BASIN PROJECT CONTRACT NUMBER: PT2025/CRORBP/WP1/26	DESIGN CONSULTANT: APECS Consultancy C:\Users\User\Pictures\NEW LOGO.png	CLIENT: Phuentsholing Thromde	NOTES: 1. The drawings shall not be scaled off. Only written dimensions are to be followed. 2. All dimensions are in mm unless specified otherwise. 3. Any discrepancy in drawing shall be brought to the notice of the consulting team.	DESIGNED & DRAWN BY: Purna Chetri Rohit Adhikari Bikash Nepal Roma Adhikari	CHECKED/ APPROVED BY: Phuentsholing Thromde	Drawing Title: WALL DETAILS FOR COUNTERFORTS Drawing No: Contract No/WP1/26 Scale : NTS Sheet No: 26 of 26

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Section 7: General Conditions of Contract

Table of Clauses

A. General

1. Definitions

1.1 Boldface type is used to identify defined terms.

(a) The **Accepted Contract Amount** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

(b) The **Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.

(c) The **Adjudicator** is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 29.1 [Appointment of Adjudicator] hereunder.

(d) **Bank** means the financing institutions named in the **Particular Conditions of Contract (PCC)**.

(e) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

(f) **Compensation Events** are those defined in GCC 51.1 [Compensation Events] hereunder.

(g) The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 69.1 [Completion].

(h) The **Contract** is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below.

(i) The **Contractor** is the party whose Bid to carry out the Works has been accepted by the Employer.

(j) The **Contractor's Bid** is the completed bidding document submitted by the Contractor to the Employer.

(k) The **Contract Price** is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.

(l) **Days** are calendar days; months are calendar months.

(m) **Dayworks** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

(n) A **Defect** is any part of the Works not completed in accordance with the Contract.

(o) The **Defects Liability Certificate** is the certificate issued by the Project Manager upon correction of defects by the Contractor.

(p) The **Defects Liability Period** is the period calculated from the Completion Date where the Contractor remains responsible for remedying defects.

(q) **Drawings** include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

(r) The **Employer** is the party who employs the Contractor to carry out the Works, as specified in the **PCC.**

(s) **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

(t) **Force Majeure** means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party.

(u) **In writing** or **written** means hand-written, type-written, printed, or electronically made, and resulting in a permanent record.

(v) The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

(w) The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the **PCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

(x) **Letter of Acceptance** means the formal acceptance by the Employer of the Bid and denotes the formation of the Contract at the date of acceptance.

(y) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

(z) **Party** means the Employer or the Contractor, as the context requires.

(aa) **PCC** means Particular Conditions of Contract.

(bb) **Plant** is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

(cc) The **Project Manager** is the person named in the **PCC** (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.

(dd) **Retention Money** means the aggregate of all monies retained by the Employer pursuant to GCC 55.1 [Retention].

(ee) **Schedules** means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Bid, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.

(ff) The **Site** is the area defined as such in the **PCC**.

(gg) **Site Investigation Reports** are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

(hh) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

(ii) The **Start Date** is given in the **PCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

(jj) A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

(kk) **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

(ll) A **Variation** is an instruction given by the Project Manager which varies the Works.

(mm) The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the **PCC.**

2. Interpretation

2.1 In interpreting these GCC, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

2.2 If sectional completion is specified in the **PCC**, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(a) Contract Agreement,

(b) Letter of Acceptance,

(c) Letter of Bid,

(d) Particular Conditions of Contract,

(e) the List of Eligible Countries that was specified in Section 5 of the bidding document,

(f) General Conditions of Contract,

(g) Specifications,

(h) Drawings,

(i) Completed Activity Schedules or Bill of Quantities, and

(j) any other document listed in the **PCC** as forming part of the Contract.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are stated in the **PCC**.

3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer's country when

(a) 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 from, or any payments to, a particular country, person, or entity. Where the Borrower's country prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded.

4. Contract Agreement

4.1 The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section 8. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

5. Assignment

5.1 Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party

(a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party; and

(b) may, as security in favor of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.

6. Care and Supply of Documents

6.1 The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, two copies of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.

6.2 Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.

6.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times.

6.4 If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.

7. Confidential Details

7.1 The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify the Contractor's compliance with the Contract and allow its proper implementation.

7.2 Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.

7.3 Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause.

8. Compliance with Laws

8.1 The Contractor shall, in performing the Contract, comply with applicable Laws.

8.2 Unless otherwise stated in the Particular Conditions,

(a) the Employer shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which (i) such authorities or undertakings require the Employer to obtain in the Employer's name, and (ii) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract;

(b) the Contractor shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals, and/or licenses that are not the responsibility of the Employer under Subclause 8.2(a) hereof and that are necessary for the performance of the Contract. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties, and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, including the Subcontractors and their personnel, but without prejudice to Subclause 8.1 hereof.

9. Joint and Several Liability

9.1 If the Contractor is a Joint Venture of two or more persons, all such persons shall be jointly and severally liable to the Employer for the fulfillment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the Joint Venture. The composition or the constitution of the Joint Venture shall not be altered without the prior consent of the Employer.

10. Project Manager's Decisions

10.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

11. Delegation

11.1 The Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

12. Communications

12.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

13. Subcontracting

13.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

14. Other Contractors

14.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the **PCC.** The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

15. Personnel and Equipment

15.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid to carry out the functions stated in the Schedule or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.

15.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within 7 days and has no further connection with the work in the Contract.

15.3 Should any employee of the Contractor be determined, based on reasonable evidence, to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the execution of the Works, then that employee shall be removed in accordance with Clause 15.2 above.

16. Employer's and Contractor's Risks

16.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

17. Employer's Risks

17.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to

(i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works, or

(ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

17.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or

(c) the activities of the Contractor on the Site after the Completion Date.

18. Contractor's Risks

18.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks, are Contractor's risks.

19. Insurance

19.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the **PCC** for the following events, which are due to the Contractor's risks:

(a) loss of or damage to the Works, Plant, and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

(d) personal injury or death.

19.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

19.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance, which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

19.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

19.5 Both parties shall comply with any conditions of the insurance policies.

20. Site Investigation Reports

20.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **PCC,** supplemented by any information available to the Contractor.

21. Contractor to Construct the Works

21.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

22. The Works to Be Completed by the Intended Completion Date

22.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

23. Designs by Contractor and Approval by the Project Manager

23.1 The Contractor shall carry out design to the extent specified in the **PCC**. The Contractor shall promptly submit to the Employer all designs prepared by him. Within 14 days of receipt, the Employer shall notify any comments. The Contractor shall not construct any element of the permanent work designed by him within 14 days after the design has been submitted to the Employer or where the design for that element has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on, taking these comments into account as necessary.

23.2 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, who is to approve them if they comply with the Specifications and Drawings..

23.3 The Contractor shall be responsible for design of Temporary Works.

23.4 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

23.5 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

23.6 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.

24. Safety

24.1 The Contractor shall be responsible for the safety of all activities on the Site.

25. Discoveries

25.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.

26. Possession of the Site

26.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the **PCC,** the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

27. Access to the Site

27.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place

where work in connection with the Contract is being carried out or is intended to be carried out.

28. Instructions, Inspections, and Audits

28.1 The Contractor shall carry out all instructions of the Project Manager, which comply with the applicable laws where the Site is located.

28.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and subconsultants to keep accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.

28.3 The Contractor shall permit ADB or its representative to inspect the Contractor's site, assets, accounts, records, and other documents relating to the submission of bids and contract performance and to have them audited by auditors appointed by ADB. The Contractor shall maintain all documents and records related to the bid submission and execution of the Contract for at least 5 years after completing the works contemplated in the relevant contracts or the period prescribed in applicable law, whichever is longer. The Contractor shall provide any documents necessary for the investigation of allegations of corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations and require its employees or agents with knowledge of the Contract to respond to questions from ADB.

28.4 ADB's right to inspect the Site and/or the Contractor's accounts and records relating to the performance of the Contract stated in Sub-Clause 28.3 and 74.2 (e) shall survive termination and/ or expiration of this Contract.

29. Appointment of the Adjudicator

29.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority designated in the **PCC**, to appoint the Adjudicator within 14 days of receipt of such request.

29.2 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract, a new Adjudicator shall be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority at the request of either party, within 14 days of receipt of such request.

30. Procedure for Disputes

30.1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 14 days of the notification of the Project Manager's decision.

30.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

30.3 The Adjudicator shall be paid by the hour at the rate specified in the **PCC,** together with reimbursable expenses of the types specified in the **PCC**, and the cost shall be divided equally between the Employer and the

Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision shall be final and binding.

30.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place specified in the **PCC**.

B. Staff and Labor

31. Forced Labor

31.1 The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor–contracting arrangements.

32. Child Labor

32.1 The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where national laws have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

33. Workers' Organizations

33.1 In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the Contractor shall comply with national law. Where national law substantially restricts workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. In either case described above, and where national law is silent, the Contractor shall not discourage the Contractor's Personnel from forming or joining workers' organizations of their choosing or from bargaining collectively, and shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and bargain collectively. The Contractor shall engage with such workers representatives. Worker organizations are expected to fairly represent the workers in the workforce.

34. Nondiscrimination and Equal Opportunity

34.1 The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on nondiscrimination in employment, the Contractor shall meet this Subclause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.

C. Time Control

35. Program

35.1 Within the time stated in the **PCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.

35.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

35.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the **PCC.** If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the **PCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.

35.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

36. Extension of the Intended Completion Date

36.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

36.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

37. Acceleration

37.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.

37.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

38. Delays Ordered by the Project Manager

38.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

39. Management Meetings

39.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

39.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

40. Early Warning

40.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

40.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

D. Quality Control

41. Identifying Defects

41.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

42. Tests

42.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

43. Correction of Defects

43.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the **PCC.** The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

43.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

44. Uncorrected Defects

44.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.

E. Cost Control

45. Contract Price

45.1 In the case of an admeasurement contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

45.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for Materials on Site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.

46. Changes in the Contract Price

46.1 In the case of an admeasurement contract:

(a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25%, provided the change exceeds 1% of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change.

(b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15%, except with the prior approval of the Employer.

(c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

46.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

47. Variations

47.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.

47.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

47.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

47.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

47.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

47.6 In the case of an admeasurement contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC 46.1 [Changes in the Contract Price] or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.

48. Cash Flow Forecasts

48.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

49. Payment Certificates

49.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

49.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

49.3 The value of work executed shall be determined by the Project Manager.

49.4 The value of work executed shall comprise,

(a) in the case of an admeasurement contract, the value of the quantities of work in the Bill of Quantities that have been completed; or

(b) in the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule.

49.5 The value of work executed shall include the valuation of Variations and Compensation Events.

49.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

50. Payments

50.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If

the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.

50.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

50.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.

50.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

51. Compensation Events

51.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC 26.1 [Possession of the Site].

(b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

51.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

51.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.

51.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

52. Tax

52.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC 54.1 [Price Adjustment].

53. Currencies

53.1 Where payments are made in currencies other than the currency of the Employer's country specified in the **PCC,** the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.

54. Price Adjustment

54.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the **PCC.** If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type indicated below applies to each Contract currency:

$$\mathbf{P_c = A_c + B_c\ Imc/Ioc}$$

where:

P_c is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."

A_c and B_c are coefficients[1] specified in the **PCC,** representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and

Imc is a consolidated index prevailing at the end of the month being invoiced and Ioc is the same consolidated index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."

54.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

55. Retention

55.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the **PCC** until Completion of the whole of the Works.

55.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 69.1 [Completion], half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" bank guarantee.

56. Liquidated Damages

56.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the **PCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the **PCC.** The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

56.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC 50.1 [Payments].

57. Bonus

57.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the **PCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

58. Advance Payment

58.1 The Employer shall make advance payment to the Contractor of the amounts stated in the **PCC** by the date stated in the **PCC,** against provision by the Contractor of an unconditional bank guarantee in a form and by a bank acceptable to the Employer in amounts and currencies

[1] The sum of the two coefficients A_c and B_c should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulas for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a very approximate figure (usually 0.10 ~ 0.20) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency is added to the Contract Price.

equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.

58.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

58.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

59. Securities

59.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount specified in the **PCC,** by a bank acceptable to the Employer, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a bank guarantee.

60. Dayworks

60.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

60.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within 2 days of the work being done.

60.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

61. Cost of Repairs

61.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

F. Force Majeure

62. Definition of Force Majeure

62.1 In this Clause, "Force Majeure" means an exceptional event or circumstance,

(a) which is beyond a Party's control;

(b) which such Party could not reasonably have provided against before entering into the Contract;

(c) which, having arisen, such Party could not reasonably have avoided or overcome; and

(d) which is not substantially attributable to the other Party.

62.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

(a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies;

(b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war;

(c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel;

(d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity; and

(e) natural catastrophes such as earthquake, hurricane, typhoon, or volcanic activity.

63. Notice of Force Majeure

63.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

63.2 The Party shall, having given notice, be excused from performance of its obligations for so long as such Force Majeure prevents it from performing them.

63.3 Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

64. Duty to Minimize Delay

64.1 Each Party shall at all times use all reasonable endeavours to minimize any delay in the performance of the Contract as a result of Force Majeure.

64.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

65. Consequences of Force Majeure

65.1 If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC Subclause 63 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to GCC Subclause 30.1 [Procedure for Disputes] to

(a) an extension of time for any such delay, if completion is or will be delayed, under GCC Subclause 36 [Extension of the Intended Completion Date]; and

(b) if the event or circumstance is of the kind described in sub-paragraphs (a) to (d) of GCC Subclause 62.2 [Definition of Force Majeure] and, in the case of subparagraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC Subclause 19 [Insurance].

65.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC Subclause 10 [Project Manager's Decisions] to agree or determine these matters.

66. Force Majeure Affecting Subcontractor

66.1 If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader Force Majeure events or circumstances shall not excuse the Contractor's nonperformance or entitle him to relief under this Clause.

67. Optional Termination, Payment and Release

67.1 If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under GCC Subclause 63 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with GCC Subclause 73.5 [Termination].

67.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate, which shall include

(a) the amounts payable for any work carried out for which a price is stated in the Contract;

(b) the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal;

(c) other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;

(d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and

(e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.

68. Release from Performance

68.1 Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises, which makes it impossible or unlawful for either or both Parties to fulfill its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance,

(a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract; and

(b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC Subclause 67 [Optional Termination, Payment and Release] if the Contract had been terminated under GCC Subclause 67.

G. Finishing the Contract

69. Completion

69.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.

70. Taking Over

70.1 The Employer shall take over the Site and the Works within 7 days of the Project Manager's issuing a certificate of Completion.

71. Final Account

71.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

72. Operating and Maintenance Manuals

72.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the **PCC.**

72.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the **PCC** pursuant to GCC 72.1**,** or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the **PCC** from payments due to the Contractor.

73. Termination

73.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

73.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager;

(b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 84 days of the date of the Project Manager's certificate;

(e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

(f) the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Subclause 22.1 [The Works to Be Completed by the Intended Completion Date] and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager;

(g) the Contractor does not maintain a Security, which is required;

(h) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the **PCC**; and

(i) if the Contractor, in the judgment of the Employer has engaged in integrity violations in competing for or in executing the Contract, pursuant to GCC 74.1 [Fraud and Corruption].

73.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 73.2 above, the Project Manager shall decide whether the breach is fundamental or not.

73.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

73.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

74. Fraud and Corruption

74.1 If the Employer determines, based on reasonable evidence, that the Contractor has engaged in corrupt, fraudulent, collusive or coercive practices, or other integrity violations, including the failure to disclose any required information which constitutes a fraudulent practice, in competing for or in executing the Contract, then the Employer may, after giving 14 days notice to the Contractor, terminate the Contract and expel him from the Site, and the provisions of Clause 73 {Termination] shall apply as if such termination had been made under Sub-Clause 73.2 (i).

74.2 ADB requires Borrowers (including beneficiaries of ADB-financed activity) and their personnel, as well as firms and individuals participating in an ADB-financed activity, including but not limited to, Bidders,

Suppliers, Contractors, agents, subcontractors, subconsultants, service providers, subsuppliers, manufacturers (including their respective officers, directors, employees and personnel) under ADB-financed contracts to observe the highest standard of ethics during the procurement and execution of such contracts in accordance with ADB's Anticorruption Policy (1998, as amended from time to time). In pursuance of this policy, the 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; and

(vii) "integrity violation" is any act, as defined under ADB's Integrity Principles and Guidelines (2015, as amended from time to time), which violates ADB's Anticorruption Policy, including (i) to (vi) above and the following: obstructive practice, 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 or any of its officers, directors, employees, personnel, subconsultants, subcontractors, service providers, suppliers or manufacturers 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, including by failing to inform ADB in a timely manner at the time they knew of the integrity violations;

(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, including declaring ineligible, either indefinitely or for a stated period of time, to participate[2] 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, administered, or supported by ADB, requiring Bidders, suppliers and contractors, consultants, manufacturers, service providers and other third parties engaged or involved in ADB-related activities, and their respective officers, directors, employees and personnel, to permit ADB or its representative to inspect the site and their assets, accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by ADB.

74.3 All Bidders, consultants, contractors, suppliers, manufacturers, service providers, and other third parties engaged or involved in ADB-related activities and their respective officers, directors, employees and personnel are obliged to cooperate fully in any investigation when requested by ADB to do so. As determined on a case by case basis by ADB, 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 Information and Communications Technology

[2] 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).

(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.

74.4 All Bidders, consultants, contractors and suppliers shall require their officers, directors, employees, personnel, agents to ensure that, in its contracts with its subconsultants, Subcontractors and other third parties engaged or involved in ADB-related activities, such subconsultants, Subcontractors and other third parties similarly are obliged to cooperate fully in any investigation when requested by ADB to do so.

74.5 The Contractor undertakes that no fees, gratuities, rebates, gifts, commissions or other payments, other than those shown in the bid, have been given or received in connection with the procurement process or in the contract execution.[3]

75. Payment upon Termination

75.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the **PCC.** Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

75.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

76. Property

76.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

77. Release from Performance

77.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterward to which a commitment was made.

[3] The undertaking also applies during the period of performance of the contract

78. Suspension of ADB Loan or Credit

78.1 In the event that ADB suspends the Loan or Credit to the Employer, from which part of the payments to the Contractor are being made,

(a) the Employer is obligated to notify the Contractor, with copy to the Project Manager, of such suspension within 7 days of having received ADB's suspension notice.

(b) if the Contractor has not received sums due it within the 28 days for payment provided for in GCC 50.1 [Payments], the Contractor may immediately issue a 14-day termination notice.

79. Eligibility

79.1 The Contractor shall have the nationality of an eligible country as specified in Section 5 (Eligible Countries) of the bidding document. The Contractor shall be deemed to have the nationality of a country if the Contractor 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.

79.2 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as specified in Section 5 (Eligible Countries) of the bidding document 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.

79.3 For purposes of GCC 79.2, "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.

Section 8: Particular Conditions of Contract

The following Particular Conditions of Contract shall supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

A. General	
GCC 1.1 (d)	The financing institutions is Asian Development Bank
GCC 1.1 (r)	The Employer is Phuentsholing Thromde (PT)
GCC 1.1 (w)	The Intended Completion Date for the whole of the Works shall be 36 months
GCC 1.1 (cc)	The Project Manager is Chief Engineer, Infrastructure Division (PT). Wherever in the contract documents “Engineer” is used, it is synonymous with “Project Manager”
GCC 1.1 (ff)	The Site is located at Phuentsholing city and is defined in drawings in Section 6 (Employer’s requirements)
GCC 1.1 (ii)	The Start Date shall be one week after the date of issue of notice to proceed with works to the Contractor.
GCC 1.1 (mm)	The Works consist of Construction in the Omchhu River of counterfort RCC flood walls, riverbank protection (including increasing use of large rocks), check dams, scour protection for cross drainages, footpaths & cycling tracks along both riverbanks, and access ramp.
GCC 2.2	Sectional Completions are: not applicable
GCC 2.3 (j)	The following documents also form part of the Contract: none
GCC 3.1	The language of the contract is English The law that applies to the Contract is the law of Bhutan
GCC 11.1	The Project Manager may delegate any of his duties and responsibilities.
GCC 14.1	Schedule of other contractors: not applicable
GCC 19.1	The minimum insurance amounts and deductibles shall be: (a) for loss or damage to the Works, Plant and Materials: equal to the contract value and the materials as per the contract price. Deductible Bhutanese Ngultrum (Nu) 1,000,000. (b) for loss or damage to Equipment: Nu 5 million. Deductible Nu 200,000. (c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract Nu 5 million. Deductible Nu 200,000. (d) for personal injury or death:

	(i) of the Contractor's employees: Nu 5 million. Deductible Nu 200,000. (ii) of other people: Nu 5 million. Deductible Nu 200,000.
GCC 20.1	Site Investigation Reports are: as in the Detailed Project Report (DPR) [https://phuenthrom.bt/wp-content/uploads/2025/09/DPR-2023.pdf]
GCC 22.2	"The Contractor shall adequately record the condition of roads, agricultural land and other infrastructure prior to the start of transporting materials, goods and equipment, and construction."
GCC 23.1	The following shall be designed by the Contractor: not applicable
GCC 24.2	"The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel and to provide a safe work environment. The Contractor shall conduct health and safety programs for workers employed under the project and shall include information on the trafficking of women and the risk of sexually transmitted diseases, including HIV/AIDs in such programs."
GCC 24.3	The Contractor is responsible for providing site workers with safe and healthy working conditions and establish an operating system to prevent accidents, injuries, and disease. This includes the establishment of preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks of the construction site work to the health and safety of local communities. Within 28 days from the date of the Letter of Acceptance, the Contractor shall submit a detailed Site Specific Environmental, Health and Safety Management Plan (SSEHSMP) for the Project Manager's no objection showing how it intends to comply with environmental, health and safety laws and regulations and other specific requirements prescribed in the Contract, addressing all the monitoring and mitigation measures set forth in the Initial Environmental Examination (IEE) and the Environmental Management Plan ("EMP") of the project as well as related Supplementary Information attached in Section 6- Employer's Requirements. Work shall not commence on the Site until the no objection of SSEHSMP has been obtained from the Project Manager. Such confirmation of no objection by the Project Manager shall not relieve the Contractor of any of his obligations or responsibilities under the Contract. The Contractor is required to provide all personnel on site including Employer's Personnel and visitors with personal protective equipment, including protection for feet (safety boots), head, eyes, ears (safety helmets) and hands, etc., in accordance with the Contractor's SSEHSMP. The Contractor should ensure that his Subcontractors comply with the SSEHSMP and provide all such necessary equipment to their personnel. Where unanticipated health and safety hazards, or environmental risks or impacts become apparent during the Contract, the Contractor is required to update the SSEHSMP to outline the potential impacts to site works and associated mitigation measures for the Project Manager's approval. In the event of a significant injury involving medical treatment or hospitalization and fatal accident the Contractor shall notify the Project Manager immediately by verbal communication and submit a formal report as soon as practicable after its

	occurrence. For all accidents, whether fatal or not, the Contractor shall also notify the appropriate local authorities in accordance with the Laws of the Country.
GCC 26.1	The Site Possession Date(s) shall be: one week after the date of issue of notice to proceed with works to the Contractor.
GCC 29.1	Appointing Authority for the Adjudicator: Chief Administrator, Bhutan Alternative Dispute Resolution Centre, Gongphel Lam, Near Expressway, Changzamtog, Thimphu, Bhutan.
GCC 30.3	The Adjudicator shall be paid as prescribed at https://www.bhutanadrcentre.bt/badrc-domestic-arbitration-fees.html The reimbursable expenses are: as prescribed at https://www.bhutanadrcentre.bt/badrc-domestic-arbitration-fees.html
GCC 30.4	Institution whose arbitration procedures shall be used: (a) Contracts with foreign contractors: International arbitration shall be conducted in accordance with the rules of the Singapore International Arbitration Centre (SIAC) shall apply. Arbitration shall be administered by SIAC The place of arbitration shall be: the place of the institution administering the arbitration. (b) Contracts with domestic contractors: Arbitration shall be conducted in accordance with the laws of the Employer's country.
GCC 32.1	"Child" means a child below the statutory minimum age specified under the laws of Bhutan."
GCC 34.2	The following sentence shall apply: **Respectful Work Environment** The Contractor shall ensure that its employees and Subcontractors 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 Subcontractors, 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.

C. Time Control	
GCC 35.1	The Contractor shall submit for approval a Program for the Works (using PERT/CPM/Project Management software's) within 10 days from the date of the Letter of Acceptance.
GCC 35.3	The period between Program updates is 90 days. The amount to be withheld for late submission of an updated Program is Nu 200,000.
D. Quality Control	
GCC 43.1	The Defects Liability Period is: 365 days.
E. Cost Control	
GCC 53.1	The currency of the Employer's country is: Bhutanese Ngultrum (Nu)
GCC 54.1	The Contract is subject to price adjustment in accordance with GCC Clause 54, and the following information regarding coefficients shall apply. If during the contract, there is an increase or decrease in the cost of materials as reflected by the Material Index Numbers published by the National Statistical Bureau (NSB), a corresponding increase or decrease in the payment to the contractor or recoverable from the Contractor shall be effected on the basis of the following formulae, such calculation being done for every successive period of 3 months after the12th month of the Contract duration: **Adjustment for variation of material prices**: V = Wx0.80x0.75 x (M-M0)/M0 where: V= amount of variation for materials payable to/recoverable from the contractor for the period under review; W= value of the work done during the period under review minus (amount of secured advance recovered in the same period + value of works executed under variations for which the variations are paid in the new rate); M0 = Material Index for the month in which the tender was submitted; M = the average value of the above Index Number for the 3 months period under review; **Price adjustment formula for Labor shall be calculated as follows:** VL=W*0.80*0.25*(L-L0)/L0 V= amount of variation for lab our payable to/recoverable from the contractor for the period under review;

	W = value of the work done during the period under review minus (amount of secured advance recovered in the same period + value of works executed under variations for which the variations are paid in the new rate); L0= National Wage Rate at the time of tender preparation; L= Revised National Wage Rate for the period under review. For the applications of the above formulae, the appropriate Index Numbers published by the National Statistical Bureau shall be adopted. To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs. The price adjustments shall be mandatorily applicable for contract duration of more than twelve (12) months. No price adjustments shall be allowed within first twelve (12) months of any contract. Price Adjustment shall apply only for work carried out within the stipulated time or extensions granted by the Procuring Agency and shall not apply to work carried out beyond the stipulated time for reasons attributable to the Contractor.
GCC 55.1	The proportion of payments retained is: 5%
GCC 56.1	The liquidated damages for the whole of the Works are 0.05% of the final Contract Price per day. The maximum amount of liquidated damages for the whole of the Works is 10% of the final Contract Price.
GCC 57.1	Not applicable
GCC 58.1	The Advance Payments shall be 10% of contract price and shall be paid to the Contractor no later than 28 days after submission of unconditional Bank Guarantee and after obtaining confirmation from the issuing bank.
GCC 58.3	The advance shall be repaid with percentage deductions from the interim payments certified by the Project Manager under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the contractor has reached not less than 15 percent of the Contract Price or nine (9) months from the date of payment of first instalment of advance, whichever period concludes earlier, and shall be made at the rate of 15% of the amounts of all Interim Payment Certificates until such time as the advance has been repaid.
GCC 59.1	(a) The Performance Security amount is 5% of the Contract price (b) If the institution issuing the performance security is located outside the country of the Employer, it shall be counter-guaranteed or encashable by a bank in the Employer's country.

GCC 69.2	"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 Clause 22."

G. Finishing the Contract	
GCC 72.1	The date by which "as built" drawings are required is within 15 days of issue of certificate of completion of whole of the work. The digitized drawings in 2 sets to be submitted in 2 electronic flash drives and print copies of A3 size.
GCC 72.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC 72.1 is Nu 500,000
GCC 73.2 (h)	The maximum number of days is: 200
GCC 75.1	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is 20%
GCC 80	"The Contractor shall comply with all applicable national, provincial, and local environmental 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 relevant to the Contractor set forth in the Initial Environmental Examination ("IEE"), Environmental Management Plan ("EMP"), Environmental Assessment and Review Framework ("EARF"), (c) allocate a budget to ensure that such measures are carried out, and (d) comply with any corrective or preventative actions set out in safeguards monitoring reports that the Employer will prepare from time to time to monitor implementation of the initial environmental examination and the environmental management plan. The Contractor shall submit quarterly reports on the carrying out of such measures to the Employer."
GCC 81	"The Contractor shall provide the Employer with quarterly reports of its activities, including each of its obligations in Sub-Clauses 2.3, 22, 24, 31, 32, 33, 34, 80, and 82."
GCC 82	"The Contractor shall comply with all relevant (a) labour laws and regulations applicable to the Contractors personnel, including staff, consultants, contractors, and agents; and (b) workplace health and safety laws."
GCC 83	In this Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trade mark, trade name, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement. Whenever a Party does not give notice to the other Party of any claim within 28 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnify under this Sub-Clause. The Employer shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was: (a) an unavoidable result of the Contractor's compliance with the Contract, or (b) a result of any Works being used by the Employer: for a purpose other than that indicated by, or reasonably to be inferred from, the Contract, or

	in conjunction with anything not supplied by the Contractor, unless such use was disclosed to the Contractor within 28 days prior to submission of tender or is stated in the Contract. The Contractor shall indemnify and hold the Employer harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible. If a Party is entitled to be indemnified under this Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party, shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party."

Section 9: Contract Forms

Table of Forms

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:	
Accepted Contract Amount:	
Duration of Contract:	
Scope of the Contract Awarded:	
Amount Performance Security Required:	

Authorized Signature: ……

Name and Title of Signatory: ……

Name of Agency: ……

Notice of Intention for Award of Contract

(Letterhead paper of the Procuring Agency)

(Insert date)

To----------[Name and address of the Contractor]

This is to notify you that it is our intention to award the contract for your Bid dated [Insert date] for execution of the.....*[Insert name of the contract and identification number, as given in the BDS/SCC]* for the Contract Price of *[Insert amount in figure and words & name of the currency]* as corrected and modified *[if any corrections]* in accordance with the Instructions to Bidders.

Authorized Signature: ----------

Name and Title of Signatory: ----------

Name of Agency: ----------

CC: [Insert name and address of all other Bidders who submitted the Bids]

Letter of Acceptance

[*on letterhead paper of the Employer*]

[*date*]

To: [*Name and address of the contractor*]

Subject: Contract No. [*please specify*]

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 and evidence of insurances 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.

[Choose one of the following statements:]

We accept that *[insert the name of adjudicator proposed by the Bidder]* be appointed as the Adjudicator.

[or]

We do not accept that *[insert the name of the adjudicator proposed by the Bidder]* be appointed as the Adjudicator, and by sending a copy of this Letter of Acceptance to *[insert name of the appointing authority]*, the Appointing Authority, we are hereby requesting such Authority to appoint the Adjudicator in accordance with GCC 29.1.

Authorized Signature: .....

Name and Title of Signatory: .....

Name of Agency: .....

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the [*date*] day of [*month*], [*year*], 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) Letter of Acceptance,

   (b) Letters of Technical Bid and Price Bid,

   (c) Addenda Nos. [*insert addenda number if any*][1]

   (d) Particular Conditions of Contract,

   (e) List of Eligible Countries that was specified in Section 5 of the bidding document,

   (f) General Conditions of Contract,

   (g) Specifications,

   (h) Drawings,

   (i) Completed Activity Schedules or Bill of Quantities, and

   (j) any other documents shall be added here.[2]

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.

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[1] Information contained in the addenda and or addendum should preferably be included in the contract documents to avoid potential ambiguities during contract implementation. If however, unavoidable priority should be decided depending on the nature of information provided in the addenda/addendum.

[2] Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 54.1).

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	for and on behalf the Contractor
in the presence of:	in the presence of:
Witness, Name, Signature, Address, Date	Witness, Name, Signature, Address, Date

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 [*date*] 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*][1] [*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 [*date*] day of [*month*], [*year*][2], 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 (URDG) 2010 Revisions, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded. [3]

. . . . . .

[*Signature(s) and seal of bank (where appropriate)*]

-- Note to Bidder --

If the bank issuing performance security is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.

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1 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 in any freely convertible currency acceptable to the Employer. If the bank 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.

2 Insert the date 28 days after the defect liability period. 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."

3 Or the employer may use "Uniform Rules for Demand Guarantees (URDG), ICC Publication No. 458, except that subparagraph (ii) of Sub-article 20(a) is hereby excluded" as appropriate.

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 [*date*] 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*][1] [*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*][2] [*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 eighty percent (80%) of the Contract Price has been certified for payment, or on the [*date*] day of [*month*], [*year*][3], 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 (URDG) 2010 Revisions, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded. [4]

. . . . . .

[*Signature(s) and seal of bank (where appropriate)*]

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1 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 any freely convertible currency acceptable to the Employer.

2 Footnote 1.

3 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."

4 Or the employer may use "Uniform Rules for Demand Guarantees (URDG), ICC Publication No. 458, except that subparagraph (ii) of Sub-article 20(a) is hereby excluded" as appropriate.

-- Note to Bidder --

If the bank issuing advance payment security is located outside the Employer's country, it shall be counter-guaranteed or encashable by a bank in the Employer's country.