

# **PROCUREMENT OF WORKS: SMALL CONTRACTS STANDARD BIDDING DOCUMENT**

---

**For Single-Stage: Two-Envelope Bidding Procedure Without  
Prequalification, without Merit Point Criteria (MPC)**

**JANUARY 2026**

For projects governed by Procurement Directive for ADB Borrowers: Goods,  
Works, Nonconsulting and Consulting Services (2026, as amended time to time)

**ASIAN DEVELOPMENT BANK**



# Contents

Contents

Abbreviations

The Bidding Process

Invitation for Bids

STANDARD BIDDING DOCUMENT

Section 1: Instructions to Bidders

Section 2: Bid Data Sheet

Section 3: Evaluation and Qualification Criteria

Section 4: Bidding Forms

Section 5: Eligible Countries

Section 6: Employer's Requirements

Section 7: General Conditions of Contract

Section 8: Particular Conditions of Contract

Section 9: Contract Forms

# Abbreviations

ADB	Asian Development Bank
BDS	bid data sheet
CON	historical contract nonperformance
DAAB	Dispute Avoidance and Adjudication Board
EHSMP	Environmental, Health, and Safety Management Plan
ELI	eligibility form
EQC	evaluation and qualification criteria
EXP	experience form
FIDIC	Fédération Internationale des Ingénieurs-Conseil (International Federation of Consulting Engineers)
FIN	financial data form
GCC	general conditions of contract
IFB	invitation for bids
ITB	instructions to bidders
JV	joint venture
MPC	merit point criteria
OCB	open competitive bidding
PCC	particular conditions of contract
PER	personnel form
SBD	standard bidding document
SPS	ADB safeguard policy statement 2009

**STANDARD BIDDING DOCUMENT**

**PROCUREMENT OF WORKS**

**SMALL CONTRACTS**

**- Single-Stage: Two-Envelope Bidding Procedure**

**-**

**- Without Prequalification -**

For projects governed by Procurement Directive for ADB Borrowers:  
Goods, Works, Nonconsulting and Consulting Services (2026, as amended  
time to time)

**Asian Development Bank**  
**January 2026**

# **PROCUREMENT OF WORKS: SMALL CONTRACTS**

## **Nagaland Urban Infrastructure Development Project (NUIDP)**

### **Bidding Document for**

### **Procurement of**

## **Improvement of Roads, Roadside Drains in Dimapur**

**Issued on: June 4, 2026**

**Invitation for Bids No: *NO.UD/ADB-22/IFB/2026/***

**OCB No: N/RRD/DMP**

**Employer: PMU, Directorate of Urban Development (DUD), Government of Nagaland**

**Country: India.**

# Section 1: Instructions to Bidders

This section specifies the procedures to be followed by Bidders when preparing and submitting their Bids. Information is also provided on the submission, opening, evaluation of bids, and award of contract.

## Table of Contents

A.	General.....	3
1.	Scope of Bid .....	3
2.	Source of Funds .....	3
3.	Fraud and Corruption.....	3
4.	Eligible Bidders.....	5
5.	Eligible Materials, Equipment, and Services .....	6
B.	Contents of Bidding Document .....	6
6.	Sections of Bidding Document.....	6
7.	Clarification of Bidding Document, Site Visit, Pre-Bid Meeting .....	7
8.	Amendment of Bidding Document .....	8
C.	Preparation of Bids .....	8
9.	Cost of Bidding .....	8
10.	Language of Bid .....	8
11.	Documents Comprising the Bid .....	8
12.	Letter of Bid and Schedules.....	9
13.	Alternative Bids.....	9
14.	Subcontractors .....	9
	Documents Establishing .....	9
15.	the Qualifications of the Bidder .....	9
16.	Documents Comprising the Technical Proposal.....	10
17.	Bid Prices and Discounts.....	10
18.	Currencies of Bid and Payment .....	11
19.	Period of Validity of Bids.....	11
20.	Bid Security/ Bid-Securing Declaration .....	11
21.	Format and Signing of Bid .....	12
D.	Submission and Opening of Bids .....	12

22.	Sealing and Marking of Bids .....	12
23.	Deadline for Submission of Bids .....	13
24.	Late Bids .....	13
25.	Withdrawal, Substitution, and Modification of Bids.....	13
26.	Bid Opening.....	14
E.	Evaluation and Comparison of Bids .....	15
27.	Confidentiality .....	15
28.	Clarification of Bids .....	16
29.	Qualification of the Bidder.....	16
30.	Deviations, Reservations, and Omissions.....	16
31.	Determination of Responsiveness .....	16
32.	Nonmaterial Nonconformities.....	17
33.	Technical Scoring.....	17
34.	Correction of Arithmetical Errors.....	17
35.	Conversion to Single Currency .....	18
36.	Domestic Preference .....	18
37.	Financial Evaluation.....	18
38.	Combined Technical and Financial Scores.....	18
39.	Abnormally Low Bids .....	18
40.	Unbalanced or Front-Loaded Bids .....	19
41.	Employer's Right to Accept Any Bid, and to Reject Any or All Bids.....	19
F.	Award of Contract .....	19
42.	Award Criteria.....	20
43.	Notice of Intention for Award of Contract .....	20
44.	Invitation to Finalization of the Draft Contract Before Notification of Award.....	20
45.	Standstill Period.....	20
46.	Notification of Award.....	20
47.	Signing of Contract.....	21
48.	Performance Security .....	21
49.	Bidding-Related Complaints .....	21

## **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; and



- (vi) “integrity violation” means any act, as defined under ADB’s Investigation and Enforcement Framework (as amended from time to time),, which violates ADB’s Anticorruption Policy, including to (v) above and the following: failure to disclose and manage conflict of interest<sup>1</sup>, obstructive practice, violations of debarment, 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 enforcement and disclosure actions on a firm or an individual, at any time, in accordance with ADB’s Anticorruption Policy and Investigation and Enforcement Framework,, including declaring ineligible, either indefinitely or for a stated period of time, to participate<sup>2</sup> 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 document 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.
- 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 required 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 is set out in detail in the Investigation and Enforcement Framework.
- 3.3 All Bidders, consultants, contractors and suppliers shall require their officers, directors, employees, personnel, and 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 required to cooperate fully in any investigation when requested by ADB to do so.

<sup>1</sup> 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.

<sup>2</sup> 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).

- 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 stated in GCC 28.3 and 73.2(i).

#### **4. Eligible Bidders**

- 4.1 A Bidder may be a natural person, private entity, or government-owned enterprises 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, associate, 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 Project Manager 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 the Employer's personnel including personnel of 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 Document 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 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 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 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) including:
  - Part A – Corrupt and Fraudulent Practices,
  - Part B – Environmental, Health, and Safety (EHS),
  - Part C – Performance Damages (optional), and
  - Part D – Bonuses (optional)
- 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 23.2.
- 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 the 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 23.2.

## **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 Bid;
  - (b) completed Schedules, in accordance with ITB 12 and ITB 17, or as stipulated in the BDS;
  - (c) Bid Security or Bid-Securing Declaration, in accordance with ITB 20;
  - (d) alternative Bids, if permissible, in accordance with ITB 13;
  - (e) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 21.2;

- (f) documentary evidence in accordance with ITB 15, establishing the Bidder's qualifications to perform the contract if its Bid is accepted;
- (g) Technical Proposal in accordance with ITB 16; and
- (h) 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 17;
- (c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13; and
- (d) any other document required in the BDS.

**11.4 In addition to the requirements under ITB 11.1, 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 Schedules, and all documents listed under Clause 11, shall be prepared using the relevant forms in Section 4 (Bidding Forms), if so provided. 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. If permitted, the evaluation method will be as specified in Section 3 (Evaluation and Qualification Criteria).**
- 13.2 Unless otherwise indicated in the BDS, alternative times for completion shall not be considered. If permitted, the evaluation method will be as specified in Section 3 (Evaluation and Qualification Criteria).**
- 13.3 Unless otherwise indicated in the BDS, alternative technical solutions shall not be considered. If 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 (Works' Requirements). The method for their evaluation will be stipulated in Section 3 (Evaluation and Qualification Criteria).**
- 13.4 Except as provided under ITB 13.3 above, 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 Most Advantageous Bid conforming to the basic technical requirements shall be considered by the Employer.).**

**14. Subcontractors**

- 14.1 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.**
- 14.2 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.**

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



- 15.1 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).
- 15.2 Domestic Bidders, individually or in Joint Ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility as described in ITB 36.

## **16. Documents Comprising the Technical Proposal**

- 16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule as well as the bidder's, environmental, health, and safety management plan (Bidder's EHSMP) and other environmental, health, and safety (EHS) management documents required in the BDS commensurate with the proposed scope of works, and any other information 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. Bid Prices and Discounts**

- 17.1 The prices and discounts quoted by the Bidder in the Letter of Bid and in the Schedules shall conform to the requirements specified below.
- 17.2 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.
- 17.3 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 Bid may result in the rejection of the Bid.
- 17.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1.
- 17.5 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 the 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.
- 17.6 If so indicated in ITB 1.1, bids are 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 17.4, provided the Bids for all contracts are submitted and

opened at the same time.

- 17.7 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.

## **18. Currencies of Bid and Payment**

- 18.1 The currency(ies) of the Bid and payment shall be as specified in the BDS.
- 18.2 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.

## **19. Period of Validity of Bids**

- 19.1 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 23.1. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.
- 19.2 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 20, it shall also be extended 28 days beyond the deadline of the extended bid 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.

## **20. Bid Security/ Bid-Securing Declaration**

- 20.1 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.
- 20.2 If a Bid-Securing Declaration is required pursuant to ITB 20.1, 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 a Bid-Securing Declaration is executed.
- 20.3 If a bid security is specified pursuant to ITB 20.1, 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 source from an eligible country as described in Section 5 (Eligible Countries). In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section 4 (Bidding Forms) or another form acceptable to the Employer. The form must include the complete name of the Bidder. The bid security shall be valid for 28 days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 19.2.
- 20.4 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 20.1, shall be rejected by the Employer as nonresponsive.
- 20.5 If a bid security is specified pursuant to ITB 20.1, 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 48.
- 20.6 If a bid security is specified pursuant to ITB 20.1, 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.
- 20.7 .The bid security may be forfeited or the Bid-Securing Declaration executed, if
- (a) notwithstanding ITB 25.3, a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letter of Bid, except as provided in ITB 19.2; or
  - (b) the successful Bidder fails to
    - (i) sign the Contract in accordance with ITB 46;
    - (ii) furnish a Performance Security in accordance with ITB 47;
    - (iii) accept arithmetical corrections in accordance with ITB 33; or
    - (iv) furnish a domestic preference security, if applicable.
- 20.8 If the bid security is required as per ITB 20.1, 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 20.1, 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.

## **21. Format and Signing of Bid**

- 21.1. The Bidder shall prepare one original set of documents comprising the Technical Bid and one original set of the Price Bid as described in ITB 11 and clearly mark it "ORIGINAL-TECHNICAL BID and ORIGINAL PRICE BID." Alternative Bids, if permitted in accordance with ITB 13, shall be clearly marked "ALTERNATIVE." In addition, the Bidder shall submit copies of the Technical and Price 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.
- 21.2. 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 Price Bid or the Bid-Securing Declaration (if applicable) is not signed, the Bid shall be rejected.
- 21.3. 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**

### **22. Sealing and Marking of Bids**

- 22.1 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 22.2 and ITB 22.5.
  - (b) Bidders submitting Bids electronically shall follow the electronic bid submission procedures specified in the BDS.
- 22.2 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 23.1;
  - (c) bear the specific identification of this bidding process indicated in BDS 1.1; and
  - (d) bear a warning not to open before the time and date for bid opening.
- 22.3 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.
- 22.4 The inner envelopes containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 26.7.
- 22.5 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.

## **23. Deadline for Submission of Bids**

- 23.1 Bids must be received by the Employer at the address and no later than the date and time indicated in the BDS.
- 23.2 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.

## **24. Late Bids**

- 24.1 The Employer shall not consider any Bid that arrives after the deadline for submission of bids, in accordance with ITB 23. Any Bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.

## **25. Withdrawal, Substitution, and Modification of Bids**

- 25.1 A Bidder may withdraw, substitute, or modify its Technical Bid or Price Bid 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 21.2 (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 21 and ITB 22 (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 23.
- 25.2 Bids requested to be withdrawn in accordance with ITB 25.1 shall be returned unopened to the Bidders.
- 25.3 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.

## **26. Bid Opening**

- 26.1 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 22.1, shall be as specified in the BDS. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and the Price Bid are submitted together in one envelope, the Employer may reject the entire Bid. Alternatively, the Price Bid may be immediately resealed for later evaluation.
- 26.2 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.
- 26.3 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 26.1. 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.
- 26.4 Next, outer envelopes marked "MODIFICATION" shall be opened. No Technical Bid and/or Price Bid shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original as well as Modification, will remain unopened in accordance with ITB 26.1.
- 26.5 All other envelopes holding the Technical Bids shall be opened one at a time, and the following read out and recorded:
  - (a) the name of the Bidder;
  - (b) whether there is a modification or substitution;
  - (c) the presence of a bid security or Bid-Securing Declaration, if required; and
  - (d) any other details as the Employer may consider appropriate.

Only Technical Bids and alternative Technical Bids read out and recorded at bid opening shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Technical Bid are to be initialed by at least three representatives of the Employer attending bid opening. No Bid shall be rejected at the opening of Technical Bids except for late bids, in accordance with ITB 23.1.

- 26.6 The Employer shall prepare a record of the Technical bid opening, which shall include, as a

- minimum, the name of the Bidder and whether there is a withdrawal, substitution, or modification; alternative bids; and the presence or absence of a bid security or Bid-Securing Declaration, if one was required. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders who submitted Bids on time, and posted online when electronic bidding is permitted.
- 26.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given reasonable notice of the opening of Price Bids.
- 26.8 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.
- 26.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, and who passed the minimum MPC threshold, if applicable, 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.
- 26.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:
- (a) the name of the Bidder;
  - (b) whether there is a modification or substitution;
  - (c) the Bid Prices, including any discounts and alternative offers; and
  - (d) any other details as the Employer may consider appropriate.
- Only Price Bids discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Price Bid and Bill of Quantities are to be initialed by at least three representatives of the Employer attending bid opening. No Bid shall be rejected at the opening of Price Bids.
- 26.11 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**

### **27. Confidentiality**

- 27.1 Information relating to the examination, qualification, evaluation, and comparison of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on the Contract award is communicated to all Bidders.
- 27.2 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.
- 27.3 Notwithstanding ITB 27.2, 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.

## **28. Clarification of Bids**

- 28.1 To assist in the examination, evaluation, and comparison of the Technical Bids and Price Bids, and qualification of the Bidders, 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 prices or 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 Bids, in accordance with ITB 34.
- 28.2 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.

## **29. Qualification of the Bidder**

- 29.1 The Employer shall determine to its satisfaction whether the Bidder meets the qualifying criteria specified in Section 3 (Evaluation and Qualification Criteria).
- 29.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 15.1. 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.
- 29.3 An affirmative determination shall be a prerequisite for proceeding the next step of the evaluation process under ITB 31. 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 in disqualification of the Bid in which event the Employer shall return the unopened Price Bid to the Bidder.

## **30. Deviations, Reservations, and Omissions**

- 30.1 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.

## **31. Determination of Responsiveness**

- 31.1 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.
- 31.2 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.

- 31.3 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.
- 31.4 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.
- 31.5 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.
- 31.6 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.

## **32. Nonmaterial Nonconformities**

- 32.1 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.
- 32.2 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 of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.
- 32.3 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 may be adjusted, for comparison purposes only, to reflect the price of a missing or nonconforming item or component. The adjustment shall be made using the methods indicated in Section 3 (Evaluation and Qualification Criteria).

## **33. Correction of Arithmetical Errors**

- 33.1 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 Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Bid will be



corrected.

- (d) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b) and (c) above.

33.2 If the Bidder that submitted the Most Advantageous 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.

#### **34. Conversion to Single Currency**

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

#### **35. Domestic Preference**

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

#### **36. Financial Evaluation**

36.1 Provided that a Bid is substantially responsive with the technical evaluation in accordance with Section 3 (Evaluation and Qualification Criteria), the Employer will proceed with the detailed evaluation of financial aspects. The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

36.2 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 Grand Summary, 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 17.4;
- (d) price adjustment for nonmaterial nonconformities in accordance with ITB 32.3;
- (e) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 35;
- (f) assessment whether the bid is abnormally low in accordance with ITB 39; 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 the bid evaluation.

37.4 If this Bidding Document allows Bidders to submit separate bids for different contracts (or lots), and the award to a single Bidder of multiple contracts (or lots), the methodology to determine the Most Advantageous Bid combinations, including any discounts offered in the Letter of Price Bid and Schedule, is specified in Section 3 (Evaluation and Qualification Criteria).

37.5 After the detailed financial evaluation, the Employer will determine the financial score of the Bids using the formula and methodology specified in Section 3 (Evaluation and Qualification Criteria).

#### **37. Lowest Evaluated Bid**

37.1 The Employer will proceed with the comparison of the Bids prices amongst the substantially responsive bids. The Bid with the lowest price will be determined as the Most Advantageous Bid.

#### **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 of the Most Advantageous Bid 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 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) 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 Most Advantageous Bid, 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 47.2; 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.

### **F. Award of Contract**



#### **41. Award Criteria**

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

#### **42. Notice of Intention for Award of Contract**

- 42.1 If standstill provisions apply as specified in the BDS 44, 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
- 42.2 Prior to the expiration of the period of bid validity the Employer shall transmit the Notice of Intention for Award of Contract using the form included in Section 9 (Contract Forms) to the successful Bidder, in writing.

#### **43. Invitation to Finalization of the Draft Contract Before Notification of Award<sup>3</sup>**

- 43.1 Prior to the expiration of the period of bid validity, the Employer shall invite the successful Bidder to finalize the provisions of the draft contract, before issuing the Notification of Award through issuance of the Letter of Acceptance.
- 43.2 Invitation for finalization of the draft contract shall be done through the issuance of the corresponding form in Section 9 (Contract Forms) to the successful Bidder, in writing.
- 43.3 This step must be finalized as soon as possible, but no later than 14 days.

#### **44. Standstill Period**

- 44.1 The purpose of a standstill period is to allow unsuccessful bidders an opportunity to challenge an intended contract award decision before the actual notification of award. If standstill provisions apply this shall be defined in the BDS to specify the duration subsequent to notification of intention for award of contract (before issuing the Notification of Award as per ITB 46) within which any unsuccessful bidder can challenge the proposed award.
- 44.2 If standstill period applies, unsuccessful bidders may request a debriefing request during the standstill period.
- 44.3 In the event there are any complaints during the standstill period, prior to issuance of the Notification of Award, it will be a condition that the Employer satisfactorily addresses the complaint. However, continuation of a complaint shall not be a ground for the Employer not to proceed in accordance with ITB 45.
- 44.4 If the standstill period does not apply, upon notification of award through the issuance of a Letter of Acceptance under ITB 45.1, 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.

#### **45. Notification of Award**

- 45.1 Prior to the expiration of the period of bid validity; and upon satisfactorily addressing any complaints received during the standstill period, if applicable, and after finalization of the draft contract provisions, the Employer shall transmit the Notification of Award through the issuance of a Letter of Acceptance using the form included in Section 9 (Contract Forms) to the successful Bidder, in writing, that its Bid has been accepted, together with the finalized contract, and a request to submit the Beneficial Ownership Disclosure Form providing additional information on its beneficial ownership. The Beneficial Ownership Disclosure Form

---

<sup>3</sup> The Employer may issue this invitation to finalization of the draft contract provisions. In parallel with the notice of intention for award of contract i.e. at the commencement of the standstill period, if applicable

- shall be submitted within 14 days of receiving this request
- 45.2 Until the formal contract is executed by the contracting parties, the notification of award through the issuance of a Letter of Acceptance shall constitute a binding Contract between the Employer and the Contractor.
- 45.3 Within 2 weeks of the award of contract 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:
- i. name of each Bidder who submitted a Bid;
  - ii. bid prices as read out at bid opening;
  - iii. name and evaluated prices of each Bid that was evaluated;
  - iv. name(s) of Bidders whose bids were rejected and the reasons for their rejection; and
  - v. name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded.
  - vi. successful Bidder's Beneficial Ownership Disclosure Form.

#### **46. Signing of Contract**

- 46.1 The Employer shall send the successful Bidder the Contract Agreement together with or promptly after the issuance of Letter of Acceptance.
- 46.2 Unless agreed otherwise between the parties, within 28 days of receipt of Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

#### **47. Performance Security**

- 47.1 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 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.
- 47.2 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 ranked Bidder whose offer is substantially responsive and Most Advantageous Bid as determined by the Employer to be qualified to perform the Contract satisfactorily.
- 47.3 The above provision shall also apply to the furnishing of a domestic preference security, if so required.

#### **48. Bidding-Related Complaints**

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

# Section 2: Bid Data Sheet

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

## A. General

ITB 1.1	The number of the Invitation for Bids (IFB) is: <b>NO.UD/ADB-22/IFB/2026/</b>
ITB 1.1	The Employer is: <b>PMU, Directorate of Urban Development (DUD), Government of Nagaland</b>
ITB 1.1	The name of the bidding process is: <b>Improvement of Roads, Roadside Drains in Dimapur</b> The identification number of the bidding process is: <b>N/RRD/DMP</b> The number and identification of lots comprising this bidding process is: <b>None.</b>
ITB 2.1	The Borrower is: <b>India</b>
ITB 2.1	The name of the Project is: <b>Nagaland Urban Infrastructure Development Project (NUIDP).</b>

## B. Contents of Bidding Documents

ITB 6.3	The following is added at the end of ITB 6.3:  The Bidding Document, its addenda and other documents and information arising out of or related to the requirements of the Bidding Document will be posted on e-procurement website <a href="https://nagalandtenders.gov.in">https://nagalandtenders.gov.in</a> , as also mentioned in point 6 (a) and 11 of the IFB
ITB 7.1	For <b><u>clarification purposes</u></b> only, the Employer's address is:  Attention: <b>Project Director, NUIDP.</b>  Street address: Project Director, NUIDP, Directorate of Urban Development, New Secretariat Road, Kohima - 797001, Nagaland Country: India  E-mail: <a href="mailto:nuidp.ngl@gmail.com">nuidp.ngl@gmail.com</a>  Requests for clarification should be received by the Employer no later than: <b>10 days</b> before the bid submission deadline

ITB 7.4	<p>A Pre-Bid meeting <b>shall</b> take place.</p> <p>Date: 15<sup>th</sup> <b>June 2026</b></p> <p>Time: <b>11:00 AM (11:00 Hrs) IST</b></p> <p>Place:</p> <p><b>Project Director, NUIDP, Directorate of Urban Development, New Secretariat Road, Kohima - 797001, Nagaland India.</b></p> <p>Additionally, there will also be online (virtual) pre-bid meeting at the same date and time through VC. Bidders interested to attend virtual pre-bid meeting should inform to the Employer through e mail at nuidp.ngl@gmail.com. Interested bidder should convey their details including name of bidder, mobile phone number and mail ID to connect them. Meeting link will be shared with the interested bidders to attend pre-bid meeting.</p> <p>A site visit will be organized by the Employer on 14<sup>th</sup> <b>June 2026</b>.</p>
---------	--

## C. Preparation of Bids

ITB 10.1	The language of the Bid is: <b>English</b>
ITB 11.2(g)	<p>The Bidder shall submit with its Bid the following additional documents:</p> <p><b>(a) MOU/ Letter of Intent to execute a MOU in the event of a successful Bid</b>, with Specialist Contractors, if applicable, and</p> <p><b>(b) GST registration certificate</b> Bidders shall also submit the following documents in <b>original/hard copies</b> within 7 calendar days from the scheduled bid submission deadline, to the Employer in the address given in ITB 7.1 above;</p> <ul style="list-style-type: none"> <li>✓ A non-refundable Bid Document Fee as per IFB</li> <li>✓ Bid Security as per ITB 20.1</li> <li>✓ JV Agreement, if applicable and Power of Attorney of authorized signatory to sign the bid.</li> </ul>
ITB 11.3(d)	<p>The Bidder shall submit with its Price Bid the following additional documents (uploaded on PDF, in the Folder named: Addition Documents, under Price bid folder):</p> <p><b>Letter of Price bid</b></p>
ITB 12.1	In the e-procurement portal, the bidders will be required to enter only the rates of each item in the Bill of Quantities and Daywork Schedule, in excel format and all the other cells will be locked.
ITB 13.1	Alternative Bids <b>will not</b> be permitted.
ITB 13.2	Alternative times for completion <b>will not</b> be permitted.
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Works: <b>Not applicable</b> .

ITB 14.1	The Employer <b>does not intend</b> for the contractor to execute any specific elements of the Works through nominated Subcontractors.
ITB 16.1	The Bidder shall submit the following additional documents in the Technical Proposal of its Bid: <ul style="list-style-type: none"> <li>• Site specific Environmental Health and Safety Management Plan (EHSMP)</li> </ul>
ITB 17.5	The prices quoted by the Bidder <b>shall be</b> subject to adjustment during the performance of the Contract.  The formula for adjusting the prices and explanatory details are specified in the GCC Clause 54.1. Bidder shall fill out the Tables of Adjustment Data in Section 4 (Bidding Forms).
ITB 18.1	The prices shall be quoted by the Bidder and shall be paid in: <b>INR</b> .
ITB 19.1	The bid validity period shall be <b>120 days</b> .
ITB 20.1	<p>"The Bidder shall furnish a bid security in the amount of <b>INR 7.00 Million (INR 0.70 Cr)</b> in the form of an unconditional bank guarantee using the Form included in Section 4 (Bidding Forms).</p> <p>The scanned copy of the bank guarantee should be uploaded on the e-procurement portal along with technical bid. The original Bank guarantee is required to be submitted to the Office of Employer Indicated at ITB 23.1 within 7 calendar days from the scheduled bid submission deadline.</p> <p>The bank guarantee shall be issued by a reputable bank located in the Employer's country, which may include scheduled banks or nationalized banks, or by a foreign reputable bank (from an eligible country as described in Section 5: Eligible Countries) outside the Employer's country, through a correspondent bank located in the Employer's country. All such bank guarantees must necessarily be payable at Kohima</p>
ITB 20.2	The ineligibility period will be: Not Applicable.
ITB 20.4	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 <b>14</b> 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 21.1	In addition to the original Bid, the number of copies is: <b>None</b>
ITB 21.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: <i>"An organizational document, board resolution or its equivalent, or power of attorney specifying the representative's authority to sign the Bid on behalf of, and to legally bind, the Bidder. If the Bidder is an intended or an existing Joint Venture, the power of attorney should be signed by all partners and specify the authority of the named representative of the Joint Venture to sign on behalf of, and legally bind, the intended or existing Joint Venture. If the Joint Venture has not yet been formed, also include evidence from all proposed Joint Venture partners of their intent to enter into a Joint Venture in the event of a contract award in accordance with ITB 11.2."</i>
ITB 21.2	The Bidder shall submit an acceptable authorization within 14 days days.

## D. Submission and Opening of Bids

ITB 22.1	<p>Bidders shall submit their Bids electronically, through Nagaland Government e-Procurement website <a href="https://nagalandtenders.gov.in">https://nagalandtenders.gov.in</a>,</p> <p>Bids shall be digitally signed. Submission by any other mode shall render the bidder non-responsive.</p>
ITB 22.1(b)	<p>Electronic bidding submission procedures shall be:          “E-Tendering” means submission of a digitally signed bid (by a valid digital certificate which has been issued by a licensed Certifying Agency, as approved by Controller of Certifying Agency) which is stored in Time Stamped electronic sealed tender box.          Special Instructions to the Contractors/Bidders for the e-submission of the bids online through this eProcurement Portal - <a href="https://nagalandtenders.gov.in">https://nagalandtenders.gov.in</a>,</p> <p>Non-submission of bids due to any reasons within due date / time following due process prevalent at that time in the portal for which bidder shall be held solely responsible. Neither National Informatics Centre nor concerned Procuring Entity will be held responsible for the same in any manner. The following information helps bidders in overcoming last minute hassles and guide towards successful bid submission.</p> <ol style="list-style-type: none"> <li>1. <b>System readiness:</b> <ol style="list-style-type: none"> <li>1.1 Bidders are advised to keep ready well in advance, their computer system in order like Original Operating System having sufficient RAM, high speed internet connectivity like broad band, with network providing static IP (avoid using mobile data/network), right internet browser, right Java Runtime Environment, un restricted access to the eProcurement portal from the bidder computer system. Bidders are also advised to procure and keep ready well in advance valid Digital Signature Certificate (Signing) of Class III issued by CA under CCA India.</li> <li>1.2 To know about prevalent system requirements, portal enrollment and online bidding and other procedures, bidders can avail Help Desk facility. Bidders are also advised to refer FAQs, Bidder Manual Kit, System Malfunction Procedure available on the portal in addition to the instructions provided in the Tender.</li> </ol> </li> <li>2. Portal Enrollment/registration: Bidders are advised to complete well in advance online enrollment / registration in the portal by following due process prevalent at that time.</li> <li>3. Bid Submission:             <ol style="list-style-type: none"> <li>3.1. The server time (which is displayed on the bidders’ dash board) shall be considered as the standard time for referencing the deadlines for submission of the document by the bidders.</li> <li>3.2. Bidder, in advance, should go through the notice inviting tender / advertisement, tender &amp; its related document(s) carefully to understand the requirements of the tender and various documents that are required to be submitted as part of the bid.</li> <li>3.3. In case of any clarifications pertaining to the tender, bidders are advised to check with concerned procuring authority in advance so that they can participate in the tender well within scheduled due date/time. Regarding any clarifications on the technical related matter in using the portal, same may kindly be get clarified from help desk facility or any other established technical support mechanism prevalent at that time.</li> <li>3.4. Bidder, in advance should get ready with the required bid document(s) having correct file format / acceptable file name / optimal file size that are acceptable for online bid submission.</li> </ol> </li> </ol>

3.5. Generally, the permitted file format in the portal are pdf / xls / rar/ dwf/ jpg formats. File name should not contain special characters like &, comma etc. File size of the bid documents can be reduced by scanning of bid documents with 100 dpi with black and white option and also some time it may require to increase local Java Runtime Environment memory at bidder end computer, while uploading bid document having huge size.

3.6. Mail/SMSs alerts are in-built in the eProcurement portal as an additional feature to inform procuring entities as well as bidders on various events that are happening in the portal. However, delivery of such mail/sms to concerned individual will always depends on the configuration of individual account in the portal, receiver's mail / sms server, mail box / mobile capacity and other factors. Hence, bidders are also advised to visit the website/portal regularly till bid submission due date/time to keep themselves updated and to act upon with respect to changes/modification deemed fit in any manner carried out in the tender by concerned procuring authority.

3.7. As bidder have been provided with the facility to submit bid documents at any time and also resubmit any number of times till bid submission due date/time, bidders are advised to submit their bid complete in all respect (free from virus/uncorrupted file/ correct file format/ right file size capable enough to upload from the bidder system) well in advance before the last date/time of the bid submission to avoid the last minute hassles.

3.8. Most importantly bidders are advised to get an acknowledgement containing Bid ID along with other vital information indicating successful submission of bids from the portal by following due process (like Freezing of Bid).

3.9. If a bidder withdraws their already submitted bid against a tender in the portal, then the bidder will not be allowed to participate in the same tender once again.

3.10. The bid documents submitted by the bidders are encrypted using PKI Technology involving digital signature certificates of pre-designated bid openers of the procuring entity to ensure the secrecy of the data. The encrypted bids are stored safely and securely in the server. Only designated bid openers shall be able to decrypt and open the bid on or after the pre-defined bid opening date/time. These assure bidders that their bids are kept confidential, safe and secure.

3.11. Bidders are advised to complete the online payment (if applicable) for Tender Fee, EMD and other fees well in advance at least one day in advance prior to the bid submission due date/time.

3.12. In case exemption is claimed on account of Tender Fee/EMD/others, then the bidders are advised to doubly check all entries and ensure exemption details are correctly entered. The exemption details cannot be changed once it is confirmed by clicking on "Confirm" button or any process prevalent at that time and leaving that page.

3.13. As the banker of the bidder will take their own time for payment processing / clearing, the bidder can use the "Payment Verification" button or any other process prevalent at that time to check the completion of the online payment process from the bank to the eProcurement portal. Only upon successful receipt of online payment, bidder can able to freeze / finally submit their bid to the procuring entity and get bid acknowledgment regarding successful bid submission.

3.14. All users have to note that after logging into the portal, if the user is not doing anything in the portal i.e idle for more than 20 minutes continuously then the system will automatically logout the user and they will have to login again to carry out any activity in the portal.



	<ol style="list-style-type: none"> <li>4. Special Instructions to the Contractors/Bidders for the e-submission of the bids online through this eProcurement Portal</li> <li>5. Bidder should do Online Enrolment in this Portal using the option Click Here to Enroll available in the Home Page. Then the Digital Signature enrollment has to be done with the e-token, after logging into the portal. The e-token may be obtained from one of the authorized Certifying Authorities such as eMudhraCA/GNFC/IDRBT/MtnITrustline/ SafeScrip/ TCS.</li> <li>6. Bidder then logs into the portal giving user id / password chosen during enrollment.</li> <li>7. The e-token that is registered should be used by the bidder and should not be misused by others.</li> <li>8. DSC once mapped to an account cannot be remapped to any other account. It can only be Inactivated.</li> <li>9. The Bidders can update well in advance, the documents such as certificates, purchase order details etc., under My Documents option and these can be selected as per tender requirements and then attached along with bid documents during bid submission. This will ensure lesser upload of bid documents.</li> <li>10. After downloading / getting the tender schedules, the Bidder should go through them carefully and then submit the documents as per the tender document, otherwise, the bid will be rejected.</li> <li>11. The BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for that tender. Bidders are allowed to enter the Bidder Name and Values only.</li> <li>12. If there are any clarifications, this may be obtained online through the eProcurement Portal, or through the contact details given in the tender document. Bidder should take into account of the corrigendum published before submitting the bids online.</li> <li>13. Bidder, in advance, should prepare the bid documents to be submitted as indicated in the tender schedule and they should be in PDF/XLS/RAR/DWF formats. If there is more than one document, they can be clubbed together.</li> <li>14. Bidder should arrange for the EMD as specified in the tender. The original should be posted/couriered/given in person to the Tender Inviting Authority, within the bid submission date and time for the tender.</li> <li>15. The bidder reads the terms and conditions and accepts the same to proceed further to submit the bids</li> <li>16. The bidder has to submit the tender document(s) online well in advance before the prescribed time to avoid any delay or problem during the bid submission process.</li> <li>17. There is no limit on the size of the file uploaded at the server end. However, the upload is decided on the Memory available at the Client System as well as the Network bandwidth available at the client side at that point of time. In order to reduce the file size, bidders are suggested to scan the documents in 75-100 DPI so that the clarity is maintained and also the size of file also gets reduced. This will help in quick uploading even at very low bandwidth speeds.</li> <li>18. It is important to note that, the bidder has to Click on the Freeze Bid Button, to ensure that he/she completes the Bid Submission Process. Bids Which are not Frozen are</li> </ol>
--	---



	<p>considered as Incomplete/Invalid bids and are not considered for evaluation purposes.</p> <p>19. In case of Offline payments, the details of the Earnest Money Deposit (EMD) document submitted physically to the Department and the scanned copies furnished at the time of bid submission online should be the same otherwise the Tender will be summarily rejected</p> <p>20. The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders due to local issues.</p> <p>21. The bidder may submit the bid documents online mode only, through this portal. Offline documents will not be handled through this system.</p> <p>22. At the time of freezing the bid, the eProcurement system will give a successful bid updation message after uploading all the bid documents submitted and then a bid summary will be shown with the bid no, date &amp; time of submission of the bid with all other relevant details. The documents submitted by the bidders will be digitally signed using the e-token of the bidder and then submitted.</p> <p>23. After the bid submission, the bid summary has to be printed and kept as an acknowledgement as a token of the submission of the bid. The bid summary will act as a proof of bid submission for a tender floated and will also act as an entry point to participate in the bid opening event.</p> <p>24. Successful bid submission from the system means, the bids as uploaded by the bidder is received and stored in the system. System does not certify for its correctness.</p> <p>25. The bidder should see that the bid documents submitted should be free from virus and if the documents could not be opened, due to virus, during tender opening, the bid is liable to be rejected</p> <p>26. The time that is displayed from the server clock at the top of the tender Portal, will be valid for all actions of requesting bid submission, bid opening etc., in the e-Procurement portal. The Time followed in this portal is as per Indian Standard Time (IST) which is GMT+5:30. The bidders should adhere to this time during bid submission.</p> <p>27. All the data being entered by the bidders would be encrypted at the client end, and the software uses PKI encryption techniques to ensure the secrecy of the data. The data entered will not be viewable by unauthorized persons during bid submission and not viewable by any one until the time of bid opening. Overall, the submitted bid documents become readable only after the tender opening by the authorized individual.</p> <p>28. During transmission of bid document, the confidentiality of the bids is maintained since the data is transferred over secured Socket Layer(SSL) with 256 bit encryption technology. Data encryption of sensitive fields is also done.</p> <p>29. The bidders are requested to submit the bids through online eProcurement system to the TIA well before the bid submission end date and time (as per Server System Clock).</p> <p>30. Purchase of Bid Document</p> <p>For purchasing of the bid document bidders have to pay the charges as mentioned in the detailed IFB. The Bid Document shall be available for purchase to eligible bidders immediately after online release of the bids and up to scheduled time and</p>
--	---

	<p>date as set in the IFB. The payment for the cost of bid document shall be made through Demand Draft / Banker's Cheque in favor of "Project Director, Nagaland Urban Infrastructure Development Project (NUIDP)", prior to the bid submission deadline and time.</p> <p>31. Withdrawal, Substitution and Modification of Bids</p> <p>Bidder can withdraw, substitute and modify the bid before submission end date.</p>
ITB 23.1	<p>Bidders shall submit their Bids electronically, through Nagaland Government e-Procurement website <a href="https://nagalandtenders.gov.in">https://nagalandtenders.gov.in</a></p> <p><b>The deadline for bid submission is:</b></p> <p>Date: <b>6<sup>th</sup> July 2026</b></p> <p>Time: <b>Till 03:00 PM (15:00 Hrs) IST</b></p>
ITB 26.1	<p>The opening of the Technical Bid shall take place at:</p> <p>Street address:</p> <p>Project Director, NUIDP, Directorate of Urban Development, New Secretariat Road, Kohima - 797001, Nagaland</p> <p>Country: India</p> <p>Date: <b>6<sup>th</sup> July 2026</b></p> <p>Time: <b>Till 03:30 PM (15:30 Hrs) IST</b></p> <p>Bid submission and bid opening timelines will be defined as per the e-Procurement server clock only. The e-procurement system <b>would not allow any late submission</b> of Bids after due date and time as per <b>server system clock</b>.</p> <p>After electronic online proposal submission, the system will generate a unique Identification number which is time stamped. This shall be treated as acknowledgement of the Bid submission.</p>
ITB 26.1	<p>Electronic bid opening procedure shall be as follows:</p> <ol style="list-style-type: none"> <li>1. The Employer shall open the technical bids online in public in the presence of Bidders or designated representative of the Bidders, who chose to attend on the date, time and place as provided in ITB 22.1 Bid Data Sheet.</li> <li>2. The Bidders' name and any other details will be announced by the Bid opening authority in presence of the Bidders who may choose to attend the opening of technical Bids.</li> <li>3. The Technical Bids recorded and opened at the time of opening shall be considered for evaluation.</li> </ol> <p>The Price Bid will remain unopened in its encrypted form until the specified time of its opening.</p>
ITB 26.5	<p>The Letter of Technical Bid shall be <b>digitally signed</b> by <b>Three (3)</b> representatives of the Employer attending Bid opening.</p>
ITB 26.10	<p>The Letter of Price Bid and Bill of Quantities shall be <b>digitally signed</b> by <b>Three (3)</b> representatives of the Employer attending Bid opening.</p>

## E. Evaluation and Comparison of Bids

ITB 29.2	The qualifications of other firms such as the Bidder's subsidiaries, parent entities, or affiliates shall not be permitted.
ITB 34.1	<p>The currency that shall be used for Bid evaluation and comparison purposes to convert all Bid prices expressed in various currencies into a single currency is: <b>Indian Rupees (INR)</b></p> <p>The source of the selling exchange rate shall be: <b>as mandated by Reserve Bank of India (RBI).</b></p> <p>The date for the selling exchange rate shall be: <b>28 days prior to the deadline for submission of bids.</b></p>
ITB 35.1	Domestic preference <b>shall not</b> apply.
ITB 44	Standstill provisions shall not apply.

## F. Award of Contract

ITB 48.1	<p>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:</p> <p>Attention: <b>Project Director, NUIDP.</b></p> <p>Street address: Project Director, NUIDP, Directorate of Urban Development, New Secretariat Road, Kohima - 797001, Nagaland Country: India</p> <p>E-mail: <a href="mailto:nuidp.ngl@gmail.com">nuidp.ngl@gmail.com</a></p>
----------	--

# **Section 3: Evaluation and Qualification Criteria**

# Table of Criteria

<b>Section 3: Evaluation and Qualification Criteria</b>	<b>1</b>
Table of Criteria	2
<b>1. Qualification</b>	<b>3</b>
<b>1.1 Eligibility</b>	<b>3</b>
<b>1.1.1 Nationality</b>	<b>3</b>
<b>1.1.2 Conflict of Interest</b>	<b>3</b>
<b>1.1.3 ADB Eligibility</b>	<b>3</b>
<b>1.1.4 Government-Owned Enterprise</b>	<b>3</b>
<b>1.1.5 United Nations Eligibility</b>	<b>3</b>
<b>1.2 Historical Contract Nonperformance</b>	<b>4</b>
<b>1.2.1 History of Nonperforming Contracts</b>	<b>4</b>
<b>1.2.2 Suspension Based on Execution of Bid-Securing Declaration</b>	<b>5</b>
<b>1.2.3 Pending Litigation and Arbitration</b>	<b>5</b>
<b>1.3 Financial Situation</b>	<b>5</b>
<b>1.3.1 Historical Financial Performance</b>	<b>5</b>
<b>1.3.2 Average Annual Construction Turnover</b>	<b>6</b>
<b>1.3.3 Financial Resources</b>	<b>7</b>
<b>1.4 Construction Experience</b>	<b>8</b>
<b>1.4.1 Contracts of Similar Size and Nature</b>	<b>8</b>
<b>1.4.2 Construction Experience in Specialized Key Activities which may be met by the Bidder or Specialist Subcontractors</b>	<b>10</b>
<b>2. Evaluation</b>	<b>11</b>
<b>2.1 Technical Evaluation</b>	<b>11</b>
<b>2.1.1 Determination of Substantial Responsiveness</b>	<b>11</b>
<b>2.1.2 Completion Time</b>	<b>11</b>
<b>2.1.3 Technical Alternatives</b>	<b>11</b>
<b>2.2 Financial Evaluation</b>	<b>11</b>
<b>2.2.1 Detailed Financial Evaluation</b>	<b>12</b>
<b>2.3 Multiple Contracts: Not Applicable</b>	<b>12</b>

# 1. Qualification

## 1.1 Eligibility

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

### 1.1.1 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
---	-----------------------	-----------------------	-----------------------	----------------	---

### 1.1.2 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 Bid
--	-----------------------	-----------------------	-----------------------	----------------	---------------

### 1.1.3 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 Bid
--	-----------------------	-----------------------	-----------------------	----------------	---------------

### 1.1.4 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
--	-----------------------	-----------------------	-----------------------	----------------	---

### 1.1.5 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 Bid
--	-----------------------	-----------------------	-----------------------	----------------	---------------

## 1.2 Historical Contract Nonperformance

### 1.2.1 History of Nonperforming Contracts

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Nonperformance of a contract <sup>a</sup> did not occur as a result of contractor default since <b>1<sup>st</sup> January 2022</b> .	Must meet requirement	Must meet requirement	Must meet requirement <sup>b</sup>	Not applicable	Form CON – 1

<sup>a</sup> Nonperformance, as decided by the Employer, shall include all contracts where, any of the two conditions<sup>1</sup> below have been met:

- 1) a) the contract was terminated for cause by the employer due to the contractor's default(s) in fulfilling its obligations (including any environmental, health, and safety (EHS) obligations),  
and  
b) the contractor did not challenge such termination and/or call of the performance security or employer's claims, including referral to the dispute resolution mechanism under the respective contract  
or  
c) contracts that were so challenged, but fully settled against the contractor.

OR

- 2) (a) the performance security was called partly or wholly,  
or  
(b) claims were made against the contractor by the employer due to the contractor's default(s), which have led to works not being completed, i.e. taking-over certificate not having been issued;  
  
and  
  
(c) the contractor did not challenge the call of the performance security or employer's claims, including referral to the dispute resolution mechanism under the respective contract  
or  
(d) contracts that were so challenged, but fully settled against the contractor as a result of the dispute resolution mechanisms.

In cases where challenged by the contractor, 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.

<sup>b</sup> This requirement also applies to contracts executed by the Bidder as a Joint Venture partner.

<sup>1</sup> For example, non-performance should meet condition 1 or condition 2. Condition 1 within itself should meet 1a "and" 1b or 1c; condition 2 within itself should meet 2a or 2b "and 2c or 2d.

## 1.2.2 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 Bid

## 1.2.3 Pending Litigation and Arbitration

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

## 1.3 Financial Situation

### 1.3.1 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 <b>3 Financial Years (FY - 2022-23, 2023-24 and 2024-25)</b> to demonstrate the current soundness of the Bidder's financial position. As a minimum, the Bidder's <b>net worth for the last year</b> calculated as the difference between total assets and total liabilities should be <b>positive</b> .	Must meet requirement	Not applicable	Must meet requirement	Not applicable	Form FIN – 1 with attachments



### 1.3.2 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 <b>INR 516.00 Million (INR 51.60 Cr)</b> calculated as total certified payments received for contracts in progress or completed, within the last <b>3 Financial Years (FY - 2022-23, 2023-24 and 2024-25)</b> .	Must meet requirement	Must meet requirement	Must meet <b>25%</b> of the requirement	Must meet <b>40%</b> of the requirement	Form FIN – 2

### 1.3.3 Financial Resources

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
<b>For Single Entities</b> 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 <b>INR 86.00 Million (INR 8.60 Cr)</b>	Must meet requirement	Not applicable	Not applicable	Not applicable	Form FIN – 3 and Form FIN – 4
<b>For Joint Ventures</b> (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 <b>INR 34.00 Million (INR 3.40 Cr)</b> from the total requirement for the Subject Contract.	Not applicable	Not applicable	Not applicable	Must meet requirement	Form FIN – 3 and Form FIN – 4
<b>AND</b>					
(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 <b>INR 22.00 Million (INR 2.20 Cr)</b> from the total requirement for the Subject Contract.	Not applicable	Not applicable	Must meet requirement	Not applicable	Form FIN – 3 and Form FIN – 4
<b>AND</b>					
(1) 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 <b>INR 86.00 Million (INR 8.60 Cr)</b>	Not applicable	Must meet requirement	Not applicable	Not applicable	Form FIN – 3 and Form FIN – 4

## 1.4 Construction Experience

### 1.4.1 Contracts of Similar Size and Nature

#### (a) Similar Size - Must be complied with by the Bidder

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 the following contracts that have been satisfactorily completed <sup>b</sup> between <b>1<sup>st</sup> April 2019</b> and bid submission deadline:  <b>One</b> contract of minimum <b>INR 344.00 million (INR 34.40 Cr)</b>	Must meet requirement	Must meet requirement	Not applicable	Must meet requirement	Form EXP – 1

#### (b) Similar Nature - Must be complied with by the Bidder<sup>d</sup>

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.

Participation and successful implementation, between <b>1<sup>st</sup> April 2019</b> and bid submission deadline as a contractor, Joint Venture partner, or Subcontractor, in the following technical requirements <sup>e</sup> ,  <b>1 Construction of at least two-lane road for National Highway, State Highways, or Major District Roads, in urban area having a minimum length of 6.00 km, executed in a single contract</b>	Must meet requirement	Must meet requirement	Not applicable	Must meet requirement	Form EXP – 1
--	-----------------------	-----------------------	----------------	-----------------------	--------------

<sup>b</sup> The requirement of "satisfactorily completed contract" shall meet the following submission requirements:

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. If the documents are other than in English, an accurate certified translation of these documents in English shall be provided.
- For contracts implemented by a Joint Venture contractor, if the Bidder comprises the same Joint Venture, the "Single Entity" requirements will apply.

- <sup>d</sup> i) The requirements under 1.4.1 (b) can be met under separate contracts and it is not a requirement to have completed all requirements under a single contract.
- ii) Each technical requirement must have been completed under a "single" contract.

iii) *The Bidder shall submit evidence that the relevant technical requirement (e.g. Interim payment certificate, approval by the Engineer (Project Manager), etc.) has been satisfactorily completed. It is not a requirement that the particular contract within which the technical requirement has been implemented must have been substantially and/or satisfactorily completed yet.*

e

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

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

*The specified key technical requirements should define the similarity of contracts from a technical perspective and should include only key and relevant items, which, if not complied with, should result in the disqualification of the bidder. Similarity requirements may include experience in managing Environmental, Health, and Safety (EHS) including labor and working conditions related risks and impacts, depending on the nature of the works, the package and the project.*

### 1.4.2 Construction Experience in Specialized Key Activities which may be met by the Bidder or Specialist Subcontractors <sup>2</sup>

The Employer accepts any of the following activities to be subcontracted. They may be complied with by the Bidder itself or by its proposed Specialist Subcontractor(s).

If any of the below technical requirements under 1.4.2 is/are to be undertaken by a Specialist Subcontractor, the Employer shall require evidence of the subcontracting agreement from the Bidder. The experience of Specialist Subcontractors shall be considered only for the following stipulated technical requirements and other aspects of qualification criteria (e.g. value of contracts under 1.4.1 (a) and (b) above, and their financial resources, etc.) shall not be added to and cannot be combined with those of the Bidder for purposes of qualification of the Bidder.

Criteria	Compliance Requirements		Documents
Requirement	Single Entity or Its Specialist Subcontractors	Joint Venture or Its Specialist Subcontractors	Submission Requirements
For the above or other contracts executed during the period stipulated in 1.4.1, a minimum construction experience is required in the following key activities: <sup>a</sup>	Must meet requirement	Must meet requirement	Form EXP – 2 <sup>b</sup>
NIL			

<sup>b</sup> 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.

<sup>2</sup> The 1.4.2. “key activities” criterion should only test the Bidder’s experience or its specialized subcontractor(s)’ experience, in performing highly specialized construction activities (e.g., tunneling, dredging, and bridge construction).

## 2. Evaluation

The evaluation methodology shall be to determine the Most Advantageous Bid.

The Most Advantageous Bid is the one that:

- (i) is substantially responsive to the bidding document, and
- (ii) has the lowest evaluated cost.

### 2.1 Technical Evaluation

#### 2.1.1 Determination of Substantial Responsiveness

Prior to financial evaluation, a determination of responsiveness shall be carried out in accordance with ITB 30 and ITB 31. This determination may include the verification of the following criteria:

Criteria	Compliance	Documents
Requirement	Single Entity or Joint Venture	Submission Requirements
Compliance with the requirement for a defined completion time (when no alternative completion time is allowed).	Must meet requirement without material deviation, reservation, or omission	Technical Proposal
Responsiveness of the bidder's Environmental, Health, and Safety Management Plan (EHSMP) to the requirements of the project Environmental Management Plan (EMP).	Must meet requirement without material deviation, reservation, or omission	Technical Proposal
<b>Sustainable procurement, - Usage of Green cement conforming to- IS: 1489 (I)- 2015 Portland Pozzolana Cement (PPC) is mandatory, for all item of civil works to be carried out under the subject contract.</b>	Must meet requirement without material deviation, reservation, or omission	Technical Proposal
Other compliance requirements indicated in the Bidding Document.	Must meet requirement without material deviation, reservation, or omission	Technical Proposal

<sup>1</sup> All ADB-financed works contracts with international advertisement must ensure that at least 50% of the total project labor force (by person-days) is sourced within the country, except where ADB approves otherwise in writing.

If the technical proposal is declared not substantially responsive to the requirements of the Bidding Document, the Bid shall be rejected, and it shall not be evaluated further. However, 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.

#### 2.1.2 Completion Time

An alternative Completion Time, if permitted under ITB 13.2, will be evaluated as follows: **Not Applicable**

#### 2.1.3 Technical Alternatives

Technical alternatives, if permitted under ITB 13.3, will be evaluated as follows: **Not Applicable**

### 2.2 Financial Evaluation

## **2.2.1 Detailed Financial Evaluation**

It is necessary to conduct a detailed price comparison on the following criteria described below in addition to the criteria listed in ITB 36.2 (a–g), the evaluated bid price shall be determined using the following method:

### **2.2.1.1 Quantifiable Nonconformities and Omissions**

Subject to ITB 17.2 and ITB 37.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows:

“Pursuant to ITB 32.3, 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.”

### **2.2.1.2 Domestic Preference: Not Applicable**

### **2.2.1.3 Life Cycle Costs (for Financial Evaluation): Not Applicable**

## **2.3 Multiple Contracts: Not Applicable**

# Section 4: Bidding Forms

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

## Table of Forms

Letter of Technical Bid.....	4
Letter of Price Bid.....	7
Bid Security .....	9
Bid-Securing Declaration: Not Applicable.....	10
Affiliate Company Guarantee: Not Applicable.....	11
Bidder's Qualification .....	12
Form ELI – 1: Bidder's Information Sheet.....	12
Form ELI – 2: Joint Venture Information Sheet.....	13
Form CON – 1: Historical Contract Nonperformance .....	14
Form FIN – 1: Historical Financial Performance .....	15
Form FIN – 2: Average Annual Construction Turnover .....	16
Form FIN – 3: Availability of Financial Resources .....	17
Form FIN – 3A: Evidence of Availability of Credit Line Financial Resources .....	18
Form FIN – 4: Financial Requirements for Major Contract Commitments.....	19
Form FIN – 5: Self-Assessment Tool for Bidder's Compliance to Financial Resources (Criterion 1.3.3 of Section 3) .....	20
Form EXP – 1: Contracts of Similar Size and Nature .....	21
Form EXP – 2: Construction Experience in Key Activities.....	23
Technical Proposal.....	24
Schedules .....	33
Table(s) of Adjustment Data .....	34
Bill of Quantities .....	35
Preamble to Bill of Quantities .....	35



A Technical Proposal must necessarily contain the following:

S. No.	Description	Documents to be furnished by Bidder (in addition to the forms given in Section 4)	Bidder to fill up the details below;	
			Yes/ No	Page Number
1	<b>Bid Document Fee</b>	Proof of transfer through RTGS / NEFT/DD/Bankers' Cheque, in the Employers Bank account given in IFB		
2	<b>Bid Security</b>	Proof of bid security through unconditional Bank Guarantee,, as given in BDS 20.1		
3	<b>Letter of Technical Bid</b>	to be submitted with Technical bid		
4	<b>Letter of Price Bid</b>	to be submitted with Price Bid only.		
5	<b>Power of Attorney</b>	POA authorising the bidder's representative to sign the bid on his behalf, to legally bind the bidder to the bid to be submitted.		
6	<b>JV Agreement</b>	If bidder is an existing JV, then JV Agreement shall be attached		
7	<b>MOU with Specialised subcontractors</b>	If the bidder proposes specialized subcontractors for executing Key Experience/s (Form 1.4.2, Section 3), then MOU with the selected specialized subcontractor shall be submitted.		
8	<b>Information regarding the constitution of the applicant/firm</b>	Evidence of establishment of Proprietary/ Partnership/ Private limited with the copy of Registration Certificate/ Incorporation Certificate / Partnership deed (with clear definition of lead bidder)		
9	<b>GST Registration</b>	Valid GST registration Certificate		
10	<b>CA certified Audited Balance Sheet</b>	Bidder Shall submit the CA certified audited balance sheets for last 3 years.		
11	<b>Average Annual Construction Turnover</b>	AACT for the last Three Financial Years certified by Chartered Accountant shall be submitted.		
12	<b>Letter of Credit</b>	LOC from bank mentioning the name of the work, shall be submitted in the format given in form FIN 3A, to demonstrate availability of Financial Resources, if required		
13	<b>Major Contract Commitment</b>	To be submitted certified by CA		
14	<b>Similar Nature of Work</b>	To be submitted in the format (EXP 1) given in Section 4		
15	<b>Key Experience</b>	To be submitted in the format (EXP 2) given in Section 4		
16	<b>Personnel</b>	In the formats PER 1 and 2 given in Section 4		
17	<b>Equipment</b>	In the formats EOU given in Section 4		
18	<b>Site Organisation</b>	As required in Section 4		
19	<b>Method statement</b>	As required in Section 4		
20	<b>Environmental Health and Safety Management Plan</b>	As required in Section 4		

S. No.	Description	Documents to be furnished by Bidder (in addition to the forms given in Section 4)	Bidder to fill up the details below;	
			Yes/ No	Page Number
	<b>specific to the scope of work of the bid.</b>			
21	<b>Mobilisation Schedule</b>	As required in Section 4		
22	<b>Construction Schedule</b>	As required in Section 4		
23	<b>Form ELI 1 and ELI 2</b>	In the Format given in Section 4		
24	<b>Form CON 1 and CON 2</b>	In the Format given in Section 4		
25	<b>Form FIN 1 to FIN 5</b>	In the Format given in Section 4		
26	<b>Schedule of Payment Currencies</b>	To be submitted with the Price Bid only		
27	<b>Tables of Adjustment Data</b>	To be submitted with the Price Bid only		
28	<b>Signed copy of Pre-Bid Meeting / corrigendum uploaded online</b>	Bidder shall submit the signed copy of Pre-bid meeting or any other document uploaded online as corrigendum, annexure etc.		

Note: Bidders are to fill up the applicable details in the table above

# Letter of Technical Bid

## NOTE

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

Date: .....

OCB No.: **N/RRD/DMP**

Invitation for Bid No.: **NUIDP/N/RRD/DMP**

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: **Improvement of Roads, roadside drains in Dimapur**
- d) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of **120** 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.<sup>1</sup>
- 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

<sup>1</sup> 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](http://www.adb.org/integrity) for updates.

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*]: \_\_\_\_\_

- 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 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 (g) of this Letter of Technical Bid.
- o) *[We are not a government-owned enterprise] / [We are a government-owned enterprise but meet the requirements of ITB 4.5]*<sup>2</sup>
- p) 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.
- q) We have paid, or intend to pay, either directly or indirectly, the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract:<sup>3</sup>

Name of Recipient	Address	Reason	Amount
_____	_____	_____	_____
_____	_____	_____	_____

- 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 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 and Investigation and Enforcement Framework, both as amended from time to time.

Name: *[insert complete name of person signing the bid]*

In the capacity of *[insert legal capacity of person signing the bid]*

Signed: *[insert signature of person whose name and capacity are shown above]*

Duly authorized to sign the Bid for and on behalf of *[insert complete name of the Bidder]*

Date: *[insert date of signing]*

<sup>2</sup> Use one of the two options as appropriate

<sup>3</sup> If none has been paid or is to be paid, indicate "None"

# Letter of Price Bid

## NOTE

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

Date:

OCB No.: **N/RRD/DMP**

Invitation for Bid No.: **NUIDP/N/RRD/DMP**

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 Investigation and Enforcement Framework, both as amended from time to time.
- (c) We offer to execute in conformity with the Bidding Documents and the Technical Bid submitted for the following Works.: **Improvement in Roads, roadside drains in Dimapur**
- (d) The total price of our Bid, excluding any discounts offered in item (d) below is:

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

The total bid price from the Summary of Bill of Quantities should be entered by the bidder inside this box. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the bid.

- (e) The discounts offered and the methodology for their application are: [insert discounts and methodology for their application if any]
- (f) Our Bid shall be valid for a period of **120** days starts from the date fixed for the bid submission deadline in accordance with ITB 23.1, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- (g) If our Bid is accepted, we commit to obtain a performance security in accordance with the Bidding Document.
- (h) We understand that this bid, together with your written acceptance thereof included in your notification of award through the issuance of Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed.
- (i) We understand that you are not bound to accept the first-ranked bid or any other bid that you may receive.
- (j) 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.

- (k) 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 5 years from the date of submission of the bid or the period prescribed in applicable law, whichever is longer.
- (l) 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 the works contemplated in the relevant contracts or the period prescribed in applicable law, whichever is longer.
- (m) We confirm and stand by our commitments and other declarations made in connection with the submission of our Letter of Technical Bid.
- (n) 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 enforcement and disclosure actions, in accordance with ADB's Anticorruption Policy and Investigation and Enforcement Framework (both as amended from time to time).

Name: *[insert complete name of person signing the bid]*

In the capacity of *[insert legal capacity of person signing the bid]*

Signed: *[insert signature of person whose name and capacity are shown above]*

Duly authorized to sign the Bid for and on behalf of *[insert complete name of the Bidder]*

Date: *[insert date of signing]*



## Bid Security<sup>4</sup>

### Bank Guarantee

[Bank's name, and address of issuing branch or office]<sup>5</sup>

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 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; or (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful Bidder, or (ii) 28 days after the expiration of the Bidder's bid.

Consequently, any demand for payment under this guarantee must be received by us at the office 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.<sup>6</sup>

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

<sup>4</sup> Delete this form if Bid-Securing Declaration is used in accordance with ITB 20.1 of the BDS

<sup>5</sup> All italicized text is for use in preparing this form and shall be deleted from the final document

<sup>6</sup> Or the employer may use "Uniform Rules for Demand Guarantees (URDG) ICC Publication No. 458" as appropriate



# **Bid-Securing Declaration<sup>7</sup>: Not Applicable**

---

<sup>7</sup> Delete this form if Bid Security is used in accordance with ITB 20.1 of the BDS

# **Affiliate Company Guarantee: Not Applicable**

# Bidder's 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)			
<p>Attached are copies of the following documents.</p> <ol style="list-style-type: none"> <li>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.</li> <li>2. Authorization to represent the firm or Joint Venture named above, in accordance with ITB 20.2.</li> <li>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.</li> <li>4. In case of a government-owned enterprise, any additional documents not covered under 1 above required to comply with ITB 4.5.</li> <li>5. Organizational chart and a list of Board of Directors. The successful Bidder shall provide additional information on beneficial ownership, using the Beneficial Ownership Disclosure Form.</li> </ol>			

## 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)			
<p>Attached are copies of the following documents.</p> <ol style="list-style-type: none"> <li>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.</li> <li>2. Authorization to represent the firm named above, in accordance with ITB 21.2.</li> <li>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.</li> <li>4. Organizational chart and a list of Board of Directors. The successful Bidder shall provide additional information on beneficial ownership, using the Beneficial Ownership Disclosure Form.</li> </ol>			

## 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 member if Bidder is a Joint Venture).

Year	Description	Amount of Nonperformed Portion of Contract (INR equivalent)	Total Contract Amount (INR 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**

**Not Applicable**

## 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 <sup>a</sup> [INR Equivalent]		
	Year 1: 2022-23	Year 2: 2023-24	Year 3: 2024-25
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			
<input type="checkbox"/> Attached are copies of financial statements (balance sheets including all related notes and income statements) for the last 3 years, <sup>b</sup> as indicated above, complying with the following conditions: <ol style="list-style-type: none"> <li>1) Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the financial situation of the legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries or affiliates.<sup>c</sup></li> <li>2) Historical financial statements must be audited by a certified accountant.</li> <li>3) Historical financial statements must be complete, including all notes to the financial statements.</li> <li>4) Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).</li> </ol>			

<sup>a</sup> If the time period indicated under Criterion 1.3.1 of Section 3 (Evaluation and Qualification Criteria) is either four (4) or five (5) years, then the table columns above should be expanded accordingly.

<sup>b</sup> The time period stated here should be the same as the time period indicated under Criterion 1.3.1 of Section 3 (Evaluation and Qualification Criteria).

<sup>c</sup> When financial qualifications of Bidder's parent companies, subsidiaries, or affiliates are permitted in accordance with ITB 29.2 of Section 2, replace the text of condition 1 with "As required by Section 3 of the Bidding Documents, all such documents reflect the financial situation of the legal entity or entities comprising the Bidder, as well as financial situation of such Bidder's parent companies, subsidiaries, or affiliates which are proposed by the Bidder for Criteria 1.3 Financial Situation in Section 3 for consideration of the Employer in determining its qualifications."

## 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 <sup>a</sup> [2022-23, 2023-24, 2024-25] Construction only)			
Year	Amount Currency	Exchange Rate	INR Equivalent
Average Annual Construction Turnover <sup>b</sup>			

<sup>a</sup> The Employer should insert the period described in Criterion 2.3.2 of Section 3 (Evaluation and Qualification Criteria).

<sup>b</sup> To determine the average annual construction turnover, the Employer shall divide the sum of each year's annual turnover by the number of years, for which such information was requested.

### Form FIN – 3: Availability of Financial Resources

Bidders must demonstrate sufficient financial resources, usually comprising of Working Capital supplemented by credit line statements or overdraft facilities and others to meet the Bidder's financial requirements for its contract commitments as defined in FIN-4, and 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 (INR equivalent)
1	Working Capital (to be taken from FIN – 1)	
2	Credit Line <sup>a</sup>	
3	Other Financial Resources <sup>b</sup>	
Total Available Financial Resources		

<sup>a</sup> A credit line is an unconditional and legally binding loan extended to a Bidder by a financial institution. The credit line must be free from any pledge, encumbrance, or commitment to a third party or other transactions. Credit lines should be substantiated by a letter from the bank issuing the line of credit. Bidder to provide the most recent unutilized balance (i.e. the amount currently available to the Bidder) of the credit line, accompanied by a supporting letter from the issuing financial institution

<sup>b</sup> Other financial resources are financial assets not considered in the Working Capital. They are noncurrent assets (i.e., with a maturity beyond a 12-month period) such as a loan and/or trade receivables, bank deposits, debt, or equity instruments (provided they are classified as "available for sale" in the financial statements), and are free from any pledge or commitment to a third party and get their value from contractual rights or ownership.



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

*[Each Bidder must fill out this form to demonstrate financial resources comprising credit line statements or overdraft facilities, as stated in form FIN-3.]*

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 Rs ..... 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:]*

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 ..... 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 Rs..... to M/s ..... to meet their working capital requirements for executing the above contract.

## Form FIN – 4: Financial Requirements for Major Contract Commitments

Bidders (or each Joint Venture partner) should provide information on their commitments on all major contracts<sup>8</sup> that have been awarded<sup>9</sup> after the deadline of the latest financial year for which the financial statements were submitted under Form FIN-1.

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: \_\_\_\_\_

Major Contract Commitments						
No.	Name of Contract	Employer's Contact (Address, Tel, Fax)	Contract Completion Date	Contract Value (X) <sup>a</sup>	Contract Period in months (Y) <sup>b</sup>	Monthly Financial Resources Requirement (X/Y)
1						
2						
3						
4						
<b>Total Monthly Financial Requirements for Current Contract Commitments</b>						INR .....

<sup>a</sup> Values to be calculated from the letter of intent or letter of acceptance or the contract agreement. (INR equivalent based on the foreign exchange rate as of the Base Dates of the respective contracts).

<sup>b</sup> Construction periods (Time for Completion) as defined in the respective contracts.

<sup>8</sup> Major contracts mean contracts with a construction duration that is longer than 12 months.

<sup>9</sup> For the purposes of this criterion, "awarded" shall mean: either letter of intent or letter of acceptance has been received, or contract was signed.

## Form FIN – 5: Self-Assessment Tool for Bidder’s Compliance to Financial Resources (Criterion 1.3.3 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 Contract Commitments  $\geq$  Requirement for the Subject Contract” must be satisfied to qualify.

### Form FIN – 5A: For Single Entities

For Single Entities: (A)	Total Available Financial Resources from FIN – 3 (B)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN – 4 (C)	Available Financial Resources Net of CCC $D = (B - C)$	Requirement for the Subject Contract (E)	Results: Yes or No [D must be greater than or equal to E] (F)
_____ (Name of Bidder)				<b>INR 85.00 Million (INR 8.50 Cr)</b>	

### 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)				<b>INR 34.00 Million (INR 3.40 Cr)</b>	
Each Partner:					
_____ (Name of Partner 1)				<b>INR 21.00 Million (INR 2.10 Cr)</b>	
_____ (Name of Partner 2)				<b>INR 21.00 Million (INR 2.10 Cr)</b>	
_____ (Name of Partner 3)				<b>INR 21.00 Million (INR 2.10 Cr)</b>	
All partners combined	$\Sigma D =$ Sum of available financial resources net of current contract commitments for all partners		$\Sigma D =$ _____	<b>INR 85.00 Million (INR 8.50 Cr)</b>	

<sup>a</sup> The Employer should insert here the total requirement for the Subject Contract (for both, single entity and all partners combined) as defined in Criterion 2.3.3 of Section 3.

<sup>b</sup> The Employer should insert here the required share for one partner as defined in Criterion 2.3.3 of Section 3.

<sup>c</sup> The Employer should insert here the required share for each partner as defined in Criterion 2.3.3 of Section 3.

#### 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

### (A) Similar Size - Must be complied with by the Bidder

Fill out one (1) form per contract. Each contract shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate, Contract Completion Certificate, or Performance Certificate.

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	INR	
If partner in a Joint Venture or Subcontractor, specify participation of total contract amount	Percent of Total	Amount
Employer's name Address Telephone number Fax number E-mail		
Description of the Similarity in Accordance with Criterion 1.4.1 of Section 3 (Evaluation and Qualification Criteria)		
Participation as a contractor, Joint Venture partner, or Subcontractor, in the following contracts that have been satisfactorily completed between <b>1<sup>st</sup> January 2019</b> and bid submission deadline:  <b>One</b> contract of minimum <b>INR 338.00 million (INR 33.80 Cr)</b>		

**(B) Similar Size - Must be complied with by the Bidder**

Fill out one (1) form per contract. Each contract shall be supported by documents such as Signed Contract Agreement, Taking-Over Certificate, Contract Completion Certificate, or Performance Certificate.

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	INR	
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 Email		
Description of the Similarity in Accordance with Criterion 1.4.1 of Section 3 (Evaluation and Qualification Criteria)		
Participation and successful implementation, completed between 1 <sup>st</sup> January 2019 and bid submission deadline, as a contractor, Joint Venture partner, or Subcontractor, in the following technical requirements;		
1 Construction of at least two-lane road for National Highway, State Highways, or Major District Roads, in urban environment (Brownfield Project) having a minimum length of 6.00 km, executed, in a single contract, in similar Himalayan terrain.		

## Form EXP – 2: Construction Experience in Key Activities

Fill out 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 Subcontractors, 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	INR	
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 Key Activities in Accordance with Criterion 1.4.2 of Section 3 (Evaluation and Qualification Criteria)		
1. Construction of RCC drain of at least <b>6.00 Km</b> , executed, in a <b>single</b> contract.		

# Technical Proposal

The technical proposal is expected to include as a minimum information described in the following forms:

- (i) Construction Schedule;
- (ii) Environmental, Health, and Safety Management Plan (EHSMP);
- (iii) Personnel and Organizational Chart;
- (iv) Personnel;
- (v) Equipment;

## **(i) Construction Schedule**

Bidders shall set out a work program for construction of the Works to be undertaken, including the mobilization phase, showing identification of major milestones, and critical path. Detailed timetables may be submitted (as appropriate) for the following aspects:

- (a) Processes and deliverables needed to commence the Works;
- (b) Execution of the Works within the Time for Completion, highlighting activities imposing constraints on the construction sequence;
- (c) Testing, commissioning, and handing over of the completed Works;

Work programs shall be submitted in paper (hard copy) and in a PDF format compatible with known computer programs, such as, for example, PRIMAVERA, TILOS, CAD, or MS Project (GANTT graphics), or similar programs.

Programs must include milestones, when they are applicable, and the specific personnel designation and/or labor outlines, planned for the fulfillment of each program and phase or program activity:

General work program with an outline of designated personnel and tables of theoretical duration of tasks or activities; graphic displays of the work progress in flowcharts to show daily production for each activity and the critical path.



## (ii) Environmental, Health, and Safety Management Plan (EHSMP)

The Bidder shall submit an outline Environmental, Health, and Safety Management Plan (EHSMP) commensurate with the risks and impacts of the proposed works and activities as described in the EMP. These strategies and plans shall describe in detail the actions, materials, equipment, management processes, and others that will be implemented by the Contractor, and its subcontractors to avoid, minimize, and/or mitigate environmental, health, and safety risks associated with implementing the projects activities throughout the project cycle.

In developing these strategies and plans, the Bidder shall have regard to the EHS provisions of the contract and EHS risks, including those as may be more fully described in Section 6 (Works' Requirements).

The table below summarizes the potential impacts along with the corresponding mitigation measures identified in the project Environmental Management Plan (EMP), to guide bidders in the preparation of their Environmental, Health and Safety Management Plan (EHSMP). The project EMP provides a structured framework to mitigate environmental, health, and safety impacts across all phases of the project (refer to Annex X for IEE report and EMP). All mitigation and monitoring measures related to the pre-construction, construction, and operation phases (including the Defects Liability Period) form part of the contractor's contractual obligations, and the associated costs are deemed to be included in the contract price unless specified otherwise.

Note: A full-time Environment, Health and Safety (EHS) supervisor is required to be appointed on-site by contractor, to assist in preparing and implementing site-specific EHSMP.

Field	Anticipated Impact	Mitigation Measures	Monitoring Indicator
Construction work camps, stockpile areas, storage areas, and disposal areas.	Conflicts with local community and sensitive receptors	Selection of camp, measures at sensitives receptor's locations	Site Selection Compliance Environmental Protection Measures
Borrow Areas and Spoil Management	Land degradation, illegal sourcing	Use approved borrow areas, implement spoil management plan, rehabilitate sites	Borrow area permits, spoil disposal records
Legal compliance	Legal non-compliance results to design revisions and/or stoppage of works	Obtain all consents, clearances (CTE/CTO from NPCB), permits NOCs, labour licenses etc. as applicable for construction camp and project site and workforce	Statutory Clearances & Permits Compliance Documentation
Site-Specific Environmental, Health and Safety Management Plan (SEHSMP)	Non-compliance to project EMP	Preparation and implementation of approved SEHSMP	Approval of SEHSMP from PMU/PMSC
Environmental monitoring of baseline conditions of air, noise, water and soil	To establish base line environmental conditions	Environmental monitoring through NABL accredited laboratory	Report for NABL laboratory
Project EMP implementation & training on EMP	Environmental & health risks	Environmental & health risks	Site inspection report, training records, grievances registered
Surface water	Runoff,	Silt traps, sedimentation	Water quality checks,

Field	Anticipated Impact	Mitigation Measures	Monitoring Indicator
quality	contamination	ponds, controlled storage, dry season work	sediment control
Flooding & waterlogging management	Waterlogging, flooding	Avoid monsoon excavation, provide pumps, temporary drainage	No water stagnation, drainage functionality
Noise Level	Increased noise levels	Schedule work, silencers, avoid night work, noise level with prescribed limits	Noise measurements, community feedback/complaints
Waste & Site Restoration	Dredge material, Solid, construction and demolition and hazardous waste	Waste segregation, proper storage, reuse, authorized disposal, no burning	Clean site, waste records
Waste water from Drainage construction work	Accumulated water and sludge from the drains	Planned work in small section of the drain, proper method and management of drainage water and sludge	Clean site, inspection reports
Biodiversity Management	Loss of vegetation and disturbance to wild life	Minimize cutting, obtain relevant permits, plant number of trees per tree removed, as required under local regulation, prohibition on hunting and fishing	Plantation records, site inspections reports
Traffic & accessibility	Traffic disruption	Traffic planning, signage, barricades, public notices	Traffic flow, access maintained
Occupational Health & Safety (OHS)	Worker safety risks	PPE, training, first aid, insurance, safety signage, Emergency response plan	Training records, Incident records, PPE usage
Community Health & Safety	Public safety risks	Barricades, speed control, awareness programs	Safe pedestrian movement
Implementation of project GRM	Community grievances, increased public dissatisfaction, escalation of conflicts	Establish a project GRM, dedicated GRM focal person at site	Status of grievances received
Work Camps (Labour and Material camp)	Sanitation and pollution	Proper camp location, waste management, hygiene, water supply	Camp inspection reports
Night Work	Night hazards	Adequate lighting, trained workers, noise control, emergency readiness	Night inspection reports
Climate Risk	Runoff, erosion	Silt fences, avoid monsoon work, elevated storage	No stagnant water, erosion control
Chance Finds	Archaeological discoveries	Stop work, inform authorities, resume after clearance	Incident reports
Submission of EMP implementation report	Unsatisfactory compliance to EMP	Appointment of Environment, Health and Safety (EHS) Supervisor and timely submission of	Monitoring reports

Field	Anticipated Impact	Mitigation Measures	Monitoring Indicator
		monitoring report	
Post-Construction Restoration	Re-instatement of sites	Remove debris, restore utilities, site cleanup	Final inspection reports

**Note-** For the project EMP refer to Annex-X.

The proposal shall also include details in relation to in-house policies and procedures acceptable to the Employer for EHS management such as:

- Grievance management for both contractor staff and any issues arising between contractor staff and nearby community members
- Performance monitoring system for contractor staff/ subcontractors/ suppliers.
- Existence of a system for monitoring compliance with EHS commitments for the Bidder's Subcontractors and all its partners.
- Evidence of compliance reports to demonstrate implementation of the EMP or other EHS management documents, in past projects, to be self-certified by the bidders

### **(iii) Personnel and Organizational Chart**

The Bidder shall describe the organization of its personnel (an organizational chart shall be provided) specifying the number and specialties of each class of personnel.

For each key personnel, the Bidder shall specify the time periods and number of working days to perform each activity under the works implementation phases.

Likewise, for each specialty, the Bidder shall describe the number of personnel and will show their input over the time periods for the implementation of the Works.

**(iv) Personnel Form PER****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
5.	Title of position
	Name
6.	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: Résumé 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
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

**(v) 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 S Owned      S Rented      S Leased      S 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	

# Schedules

## Schedule of Payment Currencies

For ..... insert name of Section of the Works .....

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

Name of Payment Currency	A Amount of Currency	B Rate of Exchange to Local Currency	C Local Currency Equivalent $C = A \times B$	D Percentage of Net Bid Price (NBP) $\frac{100 \times C}{NBP}$
Local Currency		1.00		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				100.00
Provisional Sums Currency Expressed in Local Currency	4,37,56,759.00	1.00	4,37,56,759.00	
<b>BID PRICE</b>				

### NOTE

The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 18.  
This table [Schedule of Payment Currencies] should be made part of the Contract with the successful Bidder.



## Table(s) of Adjustment Data

**Table A: Local Currency Payment**

Index Code	Index Description	Source of Index	Base Value and Date	Bidder's Local Currency Amount	Fixed Weightings
A.	Nonadjustable				A= 0.15
B.	Labor Component (L):	Source: Labour Bureau of India	Indices applicable on 28 days prior to deadline for bid submission	As per cost of Works done	B=0.20
C.	Cement (C): Portland Pozzolana Cement	<a href="http://www.eaindustry.nic.in/display_data_201112.asp">http://www.eaindustry.nic.in/display_data_201112.asp</a> Ministry of Commerce & Industry, GOI)	Indices applicable on 28 days prior to deadline for bid submission	As per cost of Works	C=0.15
D.	Ferrous Metals (F): Average value of the following (i) Stainless Steel bars & rods, including flats (ii) Steel pipes, tubes & poles	<a href="http://www.eaindustry.nic.in/display_data_201112.asp">http://www.eaindustry.nic.in/display_data_201112.asp</a> Ministry of Commerce & Industry, GOI)	Indices applicable on 28 days prior to deadline for bid submission	As per cost of Works	D= 0.15
E.	Plastic Products (P): Polyethylene	<a href="http://www.eaindustry.nic.in/display_data_201112.asp">http://www.eaindustry.nic.in/display_data_201112.asp</a> Ministry of Commerce & Industry, GOI)	Indices applicable on 28 days prior to deadline for bid submission	As per cost of Works	E: 0.15
F	Bitumen (B)	<a href="http://www.eaindustry.nic.in/display_data_201112.asp">http://www.eaindustry.nic.in/display_data_201112.asp</a> Ministry of Commerce & Industry, GOI)	Indices applicable on 28 days prior to deadline for bid submission	As per cost of work	F= 0.10
G	Other Items	WPI (all commodities)	Indices applicable on 28 days prior to deadline for bid submission	As per cost of Works	G= 0.10
			Total		1.00

**Table B: Foreign Currency Payment: Not Applicable**

# Bill of Quantities

## Preamble to Bill of Quantities

### A. General

1. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Particular Conditions of Contract, Technical Specifications, and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices bid in the priced Bill of Quantities, where applicable; and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.
3. The rates and prices bid in the priced Bill of Quantities shall, except as otherwise provided under the Contract, include all construction equipment, labor, supervision, materials, erection, maintenance, insurance, profit, taxes, and duties; together with all general risks, liabilities, and obligations set out or implied in the Contract.
4. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of items against which the Contractor has failed to enter a rate or price shall be deemed covered by other rates and prices entered in the Bill of Quantities. The units and rates in figures entered the Bill of Quantities should be typewritten; and if written by hand, must be in print form. A Bill of Quantities not presented accordingly may be considered nonresponsive.
5. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
6. General directions and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities.
7. Provisional Sums included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with the Conditions of Contract..
8. The method of measurement of completed work for payment shall be in accordance with relevant BIS Standard and Standard Specification of the published by the Nagaland Public Works Department (NPWD) or Central Public Works Department (CPWD), Government of India as the case may be
9. Arithmetic errors will be corrected by the Employer as follows:
  - (i) 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.
  - (ii) 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.
  - (iii) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Bid will be corrected.
  - (iv) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b), and (c) above.
10. Rock is defined as all materials that, in the opinion of the Engineer, require blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for their removal, and that cannot be extracted by ripping with a tractor of at least 150 brake horsepower with a single, rear-mounted, heavy-duty ripper.

11. A specific Provisional Sum for the work of the Dispute Avoidance and Adjudication Board (DAAB) shall be used to cover the Employer's share (50%) of the DAAB members' fees and expenses, in accordance with Clause 21 *Dispute and Arbitration*. Notwithstanding the foregoing, no prior instruction of the Engineer shall be required for use of this specific Provisional Sum. The Contractor shall submit the DAAB members' invoices and satisfactory evidence of having paid 100% of such invoices as part of supporting documents of those Statements submitted under Sub-Clause 14.3 *Application for Interim Payment*. No overhead and profit shall be paid to the Contractor in respect of this Provisional Sum. Alternately, the Employer may decide to include the DAAB member's fees and expenses under Provisional Sums for contingency.
12. The Bid Price is inclusive of all Environmental, Health and Safety management and compliance costs.
13. Bidders shall price the Bill of Quantities in local currency only, in which rates and prices are entered in local currency only. All provisional sums are to be expended in whole or in part at the direction and discretion of the Engineer in accordance with the Conditions of Contract.
14. The Contractor shall be deemed to have read and examined the Tender Documents before completing the Bill of Quantities and the Schedule of Rates. The Drawings, Specifications, Schedules etc. are to be considered as explanatory of each other and no advantage shall be taken of any omission in tender documents.
15. The Contractor shall be deemed to be fully conversant with and to have made full allowance in his Tender for the site conditions, the nature and complexity of the work to be undertaken, the other extensive development and construction work currently being or which may be executed on and around the Site and all changes in the nature and condition of the Site from that existing at the time of Tender.
16. General directions and descriptions of work and materials given in the Specification or shown on the Drawings are not necessarily repeated in the Bill of Quantities and reference is to be made to the Specification and the Drawings for this information.
17. Quantities given in the annexed Bill of Quantities for the various items are approximate only and are given to provide a common basis for tendering. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Engineer and valued at the rates or prices quoted in the Bills of Quantities where applicable, and otherwise at such rates or prices as may be fixed within the terms of the Contract. Variations in the quantities of work in the Schedule shall be executed as per condition of contract.
18. The rates quoted in the schedule shall be the all inclusive value for the work described and be deemed to include for all the Contractor's liabilities and obligations and all risks set forth or implied in the document and all matters and things necessary for the proper construction, of the Works including surveying, setting out, plant, labour, supervisor, materials, erection, maintenance, insurance, profit, taxes and duties together with all general risks liabilities and obligations set out or implied in the Contract. The Charge for any obligation of the Contractor for which apparently no corresponding item is given in the Bills of Quantities shall be deemed to be included in the Contract Rates and Prices entered against the billed items.
19. Extra items of work shall not vitiate the Contract. The Contractor shall be bound to execute extra items of work as directed by the Engineer.
20. It is to be expressly understood that the measured work is to be taken net (notwithstanding any system or practice to the contrary) according to the actual quantities wherein finished according to the Drawings or as may be ordered from time to time by the Engineer and the cost calculated at the respective prices, without any additional charges for any necessary or contingent works connected therewith. The rates quoted are for works in situ and complete in every respect. Unless the Bill of Quantities specially indicates to the contrary, the constructional plant and temporary works will not be measured.
21. Unless otherwise stated, all items are measured net and no allowance will be made for wastage, working space, bulking or shrinkage, overlaps and the like.
22. The Bills do not generally give a full description of the Construction Documents, Plant and Materials to

be supplied and the services to be performed under each item. The entered rates and prices shall be deemed to include all items necessary for full compliance with all provisions of the Contract.

23. Abbreviations used in Bill of Quantities and Rates have the meanings shown below.

m	Metre / Meter
km	Kilometre
Sq.m	Square metre
m <sup>2</sup>	Square metre
Cu.m	Cubic metre
m <sup>3</sup>	Cubic metre
BOQ	Bill of Quantities
MT	Metric Tonne
RM	Running Metre
No.	Numbers
CI	Cast Iron
CM	Cement Mortar
CC	Cement Concrete
Dia	Diameter
DI	Ductile Iron
IRC	Indian Road Congress
Kg	Kilogram
L.S	Lump sum
RCC	Reinforced Cement Concrete
Wt	Weight
SWG	Standard Wire Gauge
SFRC	Steel Fibre Reinforced Concrete
WBM	Water Bound Macadam road

## B. Civil works

1. The rates of works for excavation etc., shall include for all plant, equipment, materials and labour required for excavation in any material and in any location and shall also include for all temporary diversions, support and protection of any existing services and utilities, temporary support and maintenance of the excavation, any additional excavation necessary to provide working space, refilling trenches with materials as required by the Specification or shown on the Drawings, compaction as per drawings and specifications.
2. The separate item for multiple handling and stack piling excavated materials required for filling anywhere on the Site, where space is constraint in narrow lanes, is provided in BOQ.
3. All work in connection with excavation as specified shall be valued by measurement only of such items as are set forth in the Bills of Quantities for excavation. All such measurements shall be in cubic meters as shown in drawings and specifications. No payment shall be made for excess excavation in respect of or the backfilling thereof.
4. For calculation of quantities of earthwork at different depths, (like 1.5 to 3.0m, 3.0-4.5m etc.) the payment will be made as per approved typical trench section for various depths; payments shall not be made for the excess quantity executed up to that depth.
5. DEWATERING -The dewatering item shall only be executed when water is encountered during excavation work. The rate shall include hire charges of equipment, labour, fuel charges, T&P, disposal of water, etc. complete. The payment will be made on hourly basis.
6. UTILITY SHIFTING AND REINSTATEMENT-The payment for shifting and reinstatement of utilities e.g., electric & telephone cable/poles, drains etc. during excavation and laying of water supply pipeline will be paid from Provisional Sum. Contractor shall take all precautions to avoid damage to underground utilities. Cost for major damages and replacement cost shall be borne by Contractor, if any.
7. BARRICADING DURING CONSTRUCTION -Separate items have been provided for barricading/traffic diversion during construction of water supply and sewerage pipelines.

8. **SITE CLEARANACE AFTER CONSTRUCTION** -After completion of the construction works, the contractor will clear the site of all debris, construction material to ensure smooth operation and maintenance of the site.

9. **Concrete** -The unit of measurement for concrete where measured separately shall be in cubic meters.

Concrete bedding to pipe trenches, bed and surrounds to pipelines shall be measured in cubic meters for all depths as mentioned in bill of quantities and as per drawing.

The quantity of concrete shall be computed on the basis of the dimensions shown on the Drawings or as otherwise instructed as specified in bill of quantities. No deduction in the quantity of concrete shall be made for holes each less than 0.15 cubic meters in volume or chamfers and the like each less than 0.005 square meters in cross sectional area.

The rates for concrete shall include for all plant, materials and labour required to achieve the finished concrete shown on the Drawings or as otherwise instructed in full compliance with the Specification, including testing, concrete of any class, screeds that are not included for elsewhere, formwork, finishes, compaction and all other works necessary for the satisfactory completion of the work.

10. **RCC WORK**- The unit of measurement for RCC work where measured separately shall be in cubic meters.

The quantity of RCC work shall be computed on the basis of the dimensions shown on the Drawings or as otherwise instructed as specified in bill of quantities. No deduction in the quantity of concrete shall be made for holes each less than 0.15 cubic meter in volume or chamfers and the like each less than 0.005 square metres in cross sectional area.

The rates shall include for all plant, materials and labour required to achieve the finished concrete shown on the Drawings or as otherwise instructed in full compliance with the Specification, including reinforcement, formwork, binding wires, testing, concrete of any class, screeds that are not included for elsewhere, formwork, finishes, compaction and all other works necessary for the satisfactory completion of the work.

The Contractor shall be responsible to restore all working services to their original conditions and all cost thereof shall be deemed to be included in the quoted rates.

The item for road cutting is separate and will be measured in cubic meter (road length x top trench width plus 30 cm x thickness).

## C. Road Works

1. Road works has to be carried out as per specifications, contained in the 'Specifications for Road and Bridge Works' (Latest Revision) published by the Indian Road Congress, on behalf of the Government of India, MoRTH. Mode of measurements for bituminous road, CC roads and tiles road shall be as per provisions contained in the relevant clauses of the specifications unless otherwise specified. The rates include all the elements of cost and hire charges of all types of plants, machinery and equipment required to complete the work as mentioned in accordance with bill of quantities, Drawings and Specifications. For purpose of Granular course (Like GSB, WBM, WMM etc), width of road shall be considered as top trench width plus 15cm on both sides of trench. Bituminous & concrete course shall be done on full width of road.
2. The Contractor shall be responsible to restore all working services to their original conditions and all cost thereof shall be deemed to be included in the quoted rates.
3. The item for road cutting is separate and will be measured in cubic meter (road length x top trench width plus 30 cm x thickness).
4. **Roadside Drains**

The unit of measurement for storm water drains shall be as per BOQ items.

5. **Arrangements for Water and Electricity**

The Contractor shall be responsible to make all the necessary arrangements for water and electricity for carrying out the works (during execution of works) and the cost thereof shall be deemed to be included in the quoted rates.

#### D. Schedule of bills

1. The Schedule of bill is organised as follows

Bill No -1	All civil works included in the bid for improvement of roads and roadside drains
------------	--

2. Items left blank are deemed to have been included in other items. The TOTAL for this Bill and the TOTAL of the Grand Summary shall be deemed to be the total price for executing the Works in complete accordance with the Contract, whether or not each individual item has been priced.
3. The Bill do not generally give a full description of the Construction Documents, Plant and Materials to be supplied and the services to be performed under each item. The entered rates and prices shall be deemed to include all items necessary for full compliance with all provisions of the Contract.
4. Items left blank are deemed to have been included in other items.
5. The terms FOB, CIF, etc. shall be governed by the rules prescribed in the current edition of Incoterms, published by the International Chamber of Commerce.
6. The bid price is inclusive of all Environmental, Health and Safety management and compliance cost.
7. The GST shall be governed by State and Central Government rules (as amended up to date).

**[The Bill of Quantities is enclosed separately and the bidder shall submit the same separately as part of Price Bid and shall not be included in the Technical Bid]**

# Section 5: Eligible Countries

Eligible countries are limited to all ADB members listed at [www.adb.org/about/members](http://www.adb.org/about/members), and any restrictions arising from ITB 4.8.

## **Section 6: Employer's Requirements (ERQ)**

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



# Table of Content

<b>1</b>	<b>SCOPE OF WORKS</b>	<b>18</b>
1.1	Introduction and Project Background	18
1.2	Brief Profile of the Project Location	18
1.3	Scope of Works.	19
1.3.1	Scope of services	25
1.3.2	Work to be Carried Out	25
1.3.3	Conformity with Drawings and Allowable Deviations	25
1.3.4	Inspection of Materials Before Incorporation	26
1.3.5	Inspection of Materials at Source	26
1.4	Delivery, Storage and Handling of Materials	27
1.5	Drawings	27
<b>2</b>	<b>STANDARD TECHNICAL SPECIFICATION (CIVIL)</b>	<b>27</b>
2.1	General	27
2.1.1	Preamble	27
2.1.2	Inclusive Documents	27
2.1.3	Order of Precedence, Clarifications, and Interpretation	27
2.1.4	Measurement and Payments	27
2.1.5	Unacceptable Work	28
2.1.6	Maintaining Utility Service and Traffic	28
2.1.6.1	Project Facilitation	28
2.1.6.2	Public Utilities	28
2.1.7	Arrangement for Traffic during Construction	29
2.1.7.1	General	29
2.1.7.2	Passage of Traffic along a Part of the Existing Carriageway	29
2.1.7.3	Passage of Traffic along a Temporary Diversion	29
2.1.7.4	Traffic Safety and Control	29
2.1.7.5	Maintenance of Diversions and Traffic Control Devices	30
2.1.7.6	Measurements for Payment and Rate	30
2.1.8	Setting Out	30
2.1.9	Methodology and Sequence of Work	31
2.1.10	Approval of Materials	31
2.1.11	Access to Abutting Properties& Cross Traffic Flow Arrangement	31
2.1.12	The following conditions regarding use of equipment on work shall be followed:	31
2.1.13	Quality Control and System (QCS)	31
2.1.14	Surveying and Measuring Equipment	32

2.1.15	Drawings	32
2.1.15.1	Construction Drawings	32
2.1.15.2	Completion Drawings (As-built Drawings)	33
2.1.16	Topographical and Level Survey	33
2.1.16.1	General	33
2.1.16.2	Scope of Work	34
2.1.16.2.1	For Road and Storm Water Drains	34
2.1.16.3	Survey Work Programme	35
2.1.16.4	Manpower Responsibilities	35
2.1.16.5	Equipment	35
2.1.16.6	Safety Consideration	35
2.1.16.7	Data Verification and Accuracy	35
2.1.16.8	Survey Procedure	36
2.1.16.8.1	GPS Control Stations	36
2.1.16.8.2	Fixing of Traverse Stations	36
2.1.16.8.3	Location of Benchmarks (BMs)	36
2.1.16.8.4	Fixation of Benchmark Levels	36
2.1.16.8.5	Setting up the Instrument on Station	37
2.1.16.8.6	Taking Traverse Readings	37
2.1.16.8.7	Taking Detail Survey Readings	37
2.1.16.8.8	Topographic Survey	38
2.1.16.8.9	Temporary (TEMP) Stations (CODE TS)	39
2.1.16.8.10	Daily Traverse/ Topographical Checklist	39
2.1.16.9	Measurement and Payment	40
2.1.17	Underground Services	40
2.2	Geotechnical Exploration	40
2.2.1	General	40
2.2.2	Field Investigation	40
2.2.3	Rate and payments	41
2.3	Site clearance	41
2.3.1	Clearing and Grubbing	41
2.3.1.1	Scope	41
2.3.1.2	Preservation of Property/Amenities	42
2.3.1.3	Methods, Tools, and Equipment	42
2.3.1.4	Disposal of Materials	42
2.4	Clearing and Removing Floating Debris	42
2.4.1	Scope	42
2.4.1.1	Methods, Tools, and Equipment	42
2.4.1.2	Disposal of Materials	42
2.4.1.3	Measurement for Payment	42
2.5	Clearing and Removing of Water Hyacinth and Other Form of Floating Vegetation	43

2.5.1	Scope	43
2.5.2	Methods, Tools, and Equipment	43
2.5.3	Disposal of Material	43
2.5.4	Measurement for Payment	43
2.6	Clearing and Removing Floating Debris (Applicable only for Suction Dredging)	43
2.6.1	Scope	43
2.6.2	Methods, Tools and Equipment	43
2.6.3	Disposal of Material	43
2.6.4	Measurement for Payment	44
2.6.5	Rate	44
2.7	Dismantling and Demolition	44
2.7.1	Scope	44
2.8	Carriage of Materials and stacking	44
2.8.1	Scope	44
2.8.2	General	44
2.8.3	Responsibility for Loss or Damage	44
2.8.4	Stacking, Covering and Protection	45
2.9	Earthwork	45
2.9.1	Scope	45
2.9.2	Applicable Codes	45
2.9.3	Drawings	45
2.9.4	General	45
2.10	Methods, Tools and Equipment	46
2.10.1	Setting out	46
2.11	Excavation	46
2.12	Shoring	47
2.12.1	Timber Shoring	47
2.12.2	Steel Shoring/ Sheet Piling	48
2.12.3	Ballah Piling	48
2.13	Dewatering	48
2.14	Backfilling	49
2.15	Testing, Backfilling and Compaction	50
2.16	Public Safety	50
2.17	Clearing	50
2.18	Measurement and Payment	50
2.19	EMBANKMENT CONSTRUCTION	51
2.19.1	Description	51

2.19.2	Materials and General Requirements	51
2.19.2.1	Physical Requirements	51
2.19.2.2	Borrow Materials	51
2.19.3	Construction Operations	52
2.19.3.1	Setting out	52
2.19.3.2	Dewatering	52
2.19.3.3	Stripping and Storing Topsoil	53
2.19.3.4	Compacting Ground Supporting Embankment/ Sub-grade	53
2.19.3.5	Spreading Material in Layers and Bringing to Appropriate Moisture Content	53
2.19.3.6	Compaction	54
2.19.3.7	Drainage	55
2.19.3.8	Repairing of Damages Caused by Rain/ Spillage of Water	55
2.19.3.9	Earthwork for Embankment to be Placed Against Sloping Ground	55
2.19.3.10	Finishing operations	55
2.19.4	Measurement for Payment and Rate	55
2.20	Materials for Structures	56
2.20.1	Scope	56
2.20.2	Sources of Material	56
2.20.3	Bricks	56
2.20.4	Stones	56
2.20.5	Cement	56
2.20.6	Coarse Aggregates	56
2.20.7	Sand/Fine Aggregates	57
2.20.8	Steel	57
2.20.8.1	Reinforcement	57
2.20.9	Water	58
2.20.10	Timber	59
2.20.11	Concrete Admixtures	59
2.20.11.1	General	59
2.20.11.2	Physical and Chemical Requirements	59
2.20.12	Storage of Materials	60
2.20.12.1	General	60
2.20.12.2	Brick	60
2.20.12.3	Aggregates	60
2.20.12.4	Cement	60
2.20.12.5	Reinforcement	61
2.20.12.6	Water	61
2.20.13	Tests and Standards of Acceptance	61
2.20.13.1	Testing and Approval of Material	61
2.20.13.2	Sampling of Materials	62

2.20.13.3	Rejection of Materials Not Conforming to the Specifications	62
2.20.13.4	Testing and Approval of Plant and Equipment	62
2.21	Structural Concrete and Mortar	62
2.21.1	Scope	62
2.21.2	Applicable Codes and Specifications	62
2.21.3	Materials	62
2.21.4	Equipment	63
2.21.5	Codes of Practice	63
2.21.6	Construction Safety	63
2.21.7	Measurement	64
2.22	Reinforcement	64
2.22.1	General	64
2.22.2	Materials	64
2.22.3	Steel Reinforcement	64
2.22.3.1	Laps	64
2.22.3.2	Bending	64
2.22.3.3	Fixing	64
2.22.3.4	Welding of Bars	65
2.22.3.4.1	Cover	65
2.22.3.4.2	Inspection	66
2.22.3.4.3	Payment	66
2.22.3.5	Steel Shapes Encased in Concrete	66
2.22.4	Controlled Concrete	66
2.22.5	Mix Design	67
2.22.5.1	Mix Design for Controlled Concrete	67
2.22.5.2	Preliminary Tests	67
2.22.5.3	Mixing Concrete	68
2.22.5.4	Consistency	68
2.22.5.5	Size of Test Cubes	68
2.22.5.6	Compacting	68
2.22.5.7	Curing	68
2.22.5.8	Testing of Specimens	68
2.22.6	Proportioning, Consistency, Batching and Mixing of Concrete	69
2.22.6.1	Proportioning	69
2.22.6.2	Aggregate	69
2.22.6.3	Cement	69
2.22.6.4	Water	69
2.22.6.5	Definition of Water - Cement Ratio	69
2.22.6.6	Water - Cement Ratio	69
2.22.6.7	Proportioning by Water - Cement Ratio	69
2.22.6.8	Consistency and Slump	69

2.22.6.9	Batching and Mixing of Concrete	70
2.22.6.10	Sampling and Testing Concrete in the Field	70
2.22.6.11	Sampling for strength of concrete	71
2.22.6.12	Consistency	71
2.22.6.13	Admixtures	71
2.22.6.14	Air Entraining Agents	72
2.22.6.15	Water Reducing Admixtures	72
2.22.6.16	Retarding Admixtures	72
2.22.6.17	Water Proofing Agent	72
2.22.6.18	Tests	72
2.22.6.19	Load test on members or any other tests	73
2.22.6.20	Unsatisfactory Tests	73
2.22.6.21	Preparation Prior to Concrete Placement, Final Inspection and Approval	73
2.22.6.22	Rain or Wash Water condition	74
2.22.6.23	Bonding Mortar	74
2.22.6.24	Transportation	74
2.22.6.25	Re-tampered or Contaminated Concrete	74
2.22.6.26	Cleaning of Equipment	74
2.22.7	Procedure for Placing of Concrete	74
2.22.7.1	Engineer's Approval of Equipment & Methods	74
2.22.7.2	Time Interval between Mixing and Placing	74
2.22.7.3	Avoiding Segregation	75
2.22.7.4	Placing by Manual Labor	75
2.22.7.5	Placing by Mechanical Equipment	75
2.22.7.6	Type of Buckets	75
2.22.7.7	Operation of Bucket	75
2.22.7.8	Placement in Restricted Forms	75
2.22.7.9	Chuting	75
2.22.7.10	Placing by Pumping/ Pneumatic Placers	76
2.22.7.11	Concrete in Layers	76
2.22.7.12	Bedding of Layers	76
2.22.7.13	Compaction	76
2.22.7.14	Type of Vibrators	76
2.22.7.15	Use of Vibrators	77
2.22.7.16	Melding Successive Batches	77
2.22.7.17	Penetration of Vibrator	77
2.22.7.18	Vibrating Against Reinforcement	77
2.22.7.19	Use of Form Attached Vibrators	77
2.22.7.20	Use of Surface Vibrators	77
2.22.8	Stone Pockets and Mortar Pondages	77
2.22.9	Placement Interval	77
2.22.9.1	Special Provision in Placing	77
2.22.9.2	Placing Concrete through Reinforcing Steel	78

2.22.9.3	Bleeding	78
2.22.10	Construction Joints and Keys	78
2.22.10.1	Column Joint	78
2.22.10.2	Beam and Slab Joints	78
2.22.10.3	Joints in Liquid Retaining Structures	78
2.22.10.4	Dowels	78
2.22.10.5	Mass Foundations	79
2.22.10.6	Treatment of Construction Joints on Resuming Concreting	79
2.22.11	Curing, Protecting and Repairing	79
2.22.11.1	Curing	79
2.22.11.2	Curing with Water	79
2.22.11.3	Continuous Spraying	79
2.22.11.4	Alternate Curing Methods	79
2.22.11.5	Curing Compounds	80
2.22.11.6	Curing Equipment	80
2.22.11.7	Protecting Fresh Concrete	80
2.22.11.8	Repair and Replacement of Unsatisfactory Concrete	80
2.22.11.9	Use of Polymers	81
2.22.11.10	Method of Repair	81
2.22.11.11	Curing of Patched Work	81
2.22.11.12	Approval by Engineer	81
2.22.12	Finishing	81
2.22.12.1	Finish for Formed Surfaces	81
2.22.12.2	Standard Finish for Exposed Concrete	82
2.22.12.3	Integral Cement Concrete Finish	82
2.22.12.4	Rubbed Finish	82
2.22.12.5	Protection	82
2.22.13	Formwork	83
2.22.13.1	Design of Formwork	83
2.22.13.2	Camber	83
2.22.13.3	Tolerances	83
2.22.13.3.1	Tolerance for RC Buildings	83
2.22.13.3.2	Tolerances in Other Concrete Structures	84
2.22.13.3.3	Tolerances in Fixing Anchor Bolts	85
2.22.14	Type of Formwork	85
2.22.15	Formwork Requirements	85
2.22.15.1	Bracing, Struts and Props	86
2.22.15.2	Mould Oil	86
2.22.15.3	Chamfers and Fillets	86
2.22.15.4	Vertical Construction Joint Chamfers	87
2.22.15.5	Wire Ties	87
2.22.15.6	Reuse of Forms	87
2.22.15.7	Removal of Forms	87

2.22.16	Foundation Bedding, Bonding and Jointing	88
2.22.16.1	Preparation of Rock Strata of Foundations	88
2.22.16.2	Preparation of Earth Strata of Foundations	88
2.22.16.3	Preparation of Concrete Surfaces	89
2.22.16.4	Bonding Treatment (Mortar)	89
2.22.17	Cleaning and Bonding Formed Construction Joints	89
2.22.18	Expansion and Contraction Joints	89
2.22.19	Hot Weather Requirement	89
2.22.20	Concrete Underwater	90
2.22.21	Precast Concrete	90
2.22.21.1	Striking Forms	90
2.22.21.2	Precast Units	90
2.22.21.3	Curing	90
2.22.22	Slots, Openings, etc.	91
2.22.23	Grouting	91
2.22.23.1	Standard Grout	91
2.22.23.2	Sand	91
2.22.23.3	Special Grout	92
2.22.24	Inspection	92
2.22.25	Clean-up	92
2.22.26	Preparation of Mortars and its Grade	92
2.22.26.1	Grade of Masonry Mortar	92
2.22.26.2	Cement Mortar	93
2.22.26.3	Proportioning	93
2.22.26.4	Mixing	93
2.22.26.5	Precautions	93
2.22.27	Measurement and Rate	93
2.23	Brick Masonry	94
2.23.1	Description	94
2.23.2	Applicable Codes	94
2.23.3	Materials	94
2.23.4	Personnel	94
2.23.5	Cement Mortar	94
2.23.6	Soaking of Bricks	95
2.23.7	Joints	95
2.23.8	Laying	95
2.23.9	Jointing Old and New Work	96
2.23.10	Curing	96
2.23.11	Scaffolding	96



2.23.12	Equipment	96
2.23.13	Finishing of Surfaces	96
2.23.13.1	General	96
2.23.13.2	Jointing	97
2.23.13.3	Pointing	97
2.23.13.4	Plastering	97
2.23.13.5	Curing of Finishes	97
2.23.13.6	Scaffolding for Finishes	97
2.23.14	Acceptance of Work	97
2.23.15	Measurements for Payment	98
2.23.16	Rate	98
2.24	Road and Pavement Work	98
2.24.1	Materials	98
2.24.1.1	Supply of Brick Materials	98
2.24.1.2	Collection and Supply of Hard Stone Materials	99
2.24.1.3	Size Requirements for Stone Aggregates	99
2.24.1.4	Sand	100
2.24.1.5	Bitumen	100
2.24.2	Water Bound Macadam Sub-base/ Base Course	100
2.24.2.1	Description	100
2.24.2.2	Materials: Coarse Aggregates General Requirements	100
2.24.2.3	Screenings	102
2.24.2.4	Binding Material	102
2.24.2.5	Construction Operations	102
2.24.2.6	Measurement for Payment	104
2.24.2.7	Rate	104
2.24.3	Tack Coat	104
2.24.3.1	Scope	104
2.24.3.2	Materials	104
2.24.3.3	Construction Operation	104
2.24.3.4	Measurement for Payment	105
2.24.3.5	Rate	105
2.24.4	Bituminous Macadam	105
2.24.4.1	Description	105
2.24.4.2	Binder Materials	105
2.24.4.3	Aggregates	105
2.24.4.4	Construction Operations	106
2.24.4.5	Measurement for Payment	107
2.24.4.6	Rate	107
2.24.5	Premix Carpet	107
2.24.5.1	Description	107

2.24.5.2	Materials	108
2.24.5.3	Construction Operation	108
2.24.5.4	Measurement for Payment	110
2.24.5.5	Rate	110
2.24.6	Mastic Asphalt	110
2.24.6.1	Description	110
2.24.6.2	Materials	110
2.24.6.3	Mix Design	112
2.24.6.4	Construction Operations	112
2.24.7	Temporary Road Restoration	114
2.24.8	Road Kerb and Channel	114
2.24.8.1	Scope	114
2.24.8.2	Materials	115
2.24.8.3	Size of Road Kerb and Channel	115
2.24.8.4	Finish and Colour	115
2.24.8.5	Freedom from Defects	115
2.24.8.6	Moulding	115
2.24.8.7	Tests	115
2.24.8.8	Laying of Road Kerb and Channel	116
2.24.8.9	Measurement	116
2.24.9	Precast Paver Blocks	116
2.24.10	Brick Pavement	117
2.24.10.1	Scope	117
2.24.10.2	Material	117
2.24.10.3	Construction	117
2.24.10.4	Measurement for Payment	117
2.24.10.5	Rate	117
2.25	Finishing Works	117
2.25.1	Scope	117
2.25.2	Cement Plastering	117
2.25.3	Scaffolding	117
2.25.4	Preparation of Surface	118
2.25.5	Mortar	118
2.25.6	Application	118
2.25.7	Thickness	118
2.25.8	Curing	119
2.26	Cement Plaster with a Floating Coat of Neat Cement	119
2.26.1	Cement Plaster (6 mm) on Cement Concrete and Reinforced Cement Concrete Work	119
2.26.1.1	Scaffolding	119
2.26.1.2	Preparation of Surface	119

2.26.1.3	Mortars	119
2.26.1.4	Application	119
2.26.1.5	Finish	120
2.26.1.6	Thickness	120
2.26.1.7	Curing	120
2.26.1.8	Precautions	120
2.26.1.9	Measurements	120
2.26.1.10	Rate	120
2.26.2	Neat Cement Punning	121
2.26.2.1	Curing	121
2.26.2.2	Finish	121
2.26.2.3	Precautions	121
2.26.2.4	Measurements	121
2.26.2.5	Rates	122
2.27	Unplasticized Pvc (UPVC) Pipes	122
2.27.1	Scope	122
2.27.2	Applicable Codes	122
2.27.3	Manufacture	122
2.27.4	Typical UPVC Pipe Properties	122
2.27.5	Stacking	123
2.27.6	Inspection of Pipes	123
2.27.7	Laying and Jointing of uPVC Pipes and Fittings	123
2.27.8	Testing	123
2.27.9	Damage to Pipe Lines	123
2.27.10	Measurement	123
2.28	Gully pits/ catch pits/ inspection pits	123
2.28.1	General	123
2.28.2	Excavation	124
2.28.3	Measurement	124
2.29	Pipe laying using jack pushing technique	124
2.29.1	Pipe Jack Pushing Contractor	124
2.29.2	Pipes	124
2.29.3	Excavation	124
2.29.4	Pipe Jacking Crew	125
2.29.5	Pit Details	125
2.29.6	Jacking Equipment	125
2.29.7	Joint Leakage	125
2.29.8	Measurement & Payment	125

2.30	Outfall structures	125
2.30.1	Scope of Work	125
2.30.2	Overflow Structure	126
2.30.3	Controlling Arrangement	126
2.30.3.1	Sluice Gate	126
2.30.3.2	Weir Gate	127
2.30.3.3	Flap Gate	128
2.30.4	Outlet Conduit	129
2.30.5	Measurements	129
2.31	Miscellaneous	129
2.31.1	Single Brick Flat Soling	129
2.31.1.1	Scope	129
2.31.1.2	Material	130
2.31.1.3	Construction	130
2.31.1.4	Measurement for Payment	130
2.31.1.5	Rate	130
2.31.2	Weep Hole	130
2.31.2.1	Description	130
2.31.2.2	Test and Standards of Acceptance	130
2.31.2.3	Measurements for Payment	130
2.31.2.4	Rate	130
2.31.3	Specification for Construction Joints	130
2.31.3.1	Location	130
2.31.3.2	Preparation of Surface of the Joint	131
2.31.3.3	Concreting of Joints	131
2.31.4	Expansion Joint/ Contraction Joint	131
2.31.4.1	Description	131
2.31.4.2	Measurement of Payment	132
2.31.4.3	Rate	132
<b>3</b>	<b>TECHNICAL SPECIFICATION FOR IMPROVEMENT OF URBAN ROAD AND TRANSPORT INFRASTRUCTURE</b>	<b>133</b>
3.1	Scope of work	133
3.2	Inspection of Materials before Incorporation	133
3.2.1	Inspection of Materials at Source	133
3.3	Site Information	134
3.4	Clearing and grubbing	134
3.4.1	Scope	134
3.4.2	Excavation for roadways and drains	134
3.4.2.1	Scope	134

3.5	Setting out	134
3.6	Methodology and sequence of work	135
3.6.1	Excavation for Roadway and Drains	135
3.6.2	Marsh Excavation	135
3.6.3	Backfilling	136
3.6.4	Excavation for Structures.	136
3.6.5	Preparation of Foundation Base.	136
3.7	Embankment construction	136
3.7.1	Description	136
3.7.2	Material	136
3.7.3	Compaction Requirements.	137
3.7.4	Setting Out.	137
3.7.5	Compacting Ground Supporting Embankment/Sub-Grade	138
3.7.5.1	Compaction.	138
3.7.5.2	Drainage	138
3.7.5.3	Surface Finish and Quality Control of Work	138
3.7.5.4	Sub-grade Strength	138
3.8	Turfing with sods	138
3.8.1	Scope	138
3.9	SURFACE/SUB-SURFACE DRAINS	138
3.9.1	Scope	138
3.9.2	Surface Drains	138
3.9.3	Sub-Surface Drains	139
3.9.3.1	Scope	139
3.9.3.2	Pipe	139
3.10	Granular sub-base	139
3.10.1	Scope	139
3.10.2	Materials	139
3.10.3	Preparation of Sub-grade	140
3.10.4	Spreading and Compacting	140
3.10.5	Rolling	140
3.11	Wet mix macadam sub-base/base	140
3.11.1	Scope	140
3.11.2	Grading Requirements	140
3.11.3	Spreading of Mix	141
3.11.4	Compaction	141
3.11.5	Setting and Drying	141

3.12	SHOULDERS, ISLANDS AND MEDIANS	141
3.12.1	SHOULDERS	141
3.12.1.1	Scope	141
3.12.1.2	Materials	141
3.12.2	Median/Traffic islands	142
3.12.2.1	Scope	142
3.12.2.2	Materials	142
3.12.2.3	Type of Construction	142
3.12.2.4	Equipment	142
3.12.2.5	Construction Operations	142
3.12.2.6	Precast Concrete Blocks and Interlocking Concrete Block Pavements	142
3.13	TRAFFIC SIGNS	143
3.13.1	Scope	143
3.13.2	Materials	143
3.13.3	Concrete	143
3.13.4	Reinforcing Steel	143
3.13.5	Bolts, Nuts, Washers	143
3.13.6	Plates and Supports	144
3.14	Substrate	144
3.15	Plate Thickness	144
3.16	Traffic Signs having Retro-Reflective Sheeting	145
3.16.1	General Requirements	145
3.17	RCC Stom Water Drains.	145
3.17.1	General	145
3.17.2	Materials	145
3.17.2.1	Bricks	145
3.17.2.2	Stones	145
3.17.2.3	Cement	145
3.17.2.4	COARSE AGGREGATES	146
3.17.2.5	FINE AGGREGATES	146
3.17.2.6	MS Steel Reinforcement.	146
3.17.2.7	Water	147
3.17.2.8	TIMBER	147
3.17.2.9	CONCRETE ADMIXTURES	147
3.17.2.9.1	General	147
3.17.2.9.2	Mineral Admixtures	147
3.17.2.10	Form Work	147
3.17.2.10.1	Description	147
3.17.2.10.2	Materials.	147
3.17.2.10.3	Lining of Form Work.	148

3.17.2.10.4	Steel Reinforcement.	148
3.17.2.10.5	Bending of Reinforcement.	148
3.17.2.11	Structural Concrete.	148
3.17.2.11.1	Description.	148
3.17.2.11.2	Grades of Concrete	148
3.17.2.12	Requirements of nominal Mix Concrete	149
3.17.2.13	Batching Mixing, Transporting, Placing and Compaction.	149
3.17.2.13.1	General	150
3.17.2.13.2	Batching of Concrete	150
3.17.2.14	Mixing Concrete	150
3.17.2.14.1	Mixing at site	150
3.17.2.14.2	Placing of Concrete	150
3.17.2.14.3	Compaction of Concrete	150
3.17.2.14.4	Construction Joints.	150
3.17.2.14.5	Protection and Curing.	151
3.17.2.14.6	Test and Standards of Acceptance.	151
3.17.2.15	Sampling and testing	151
3.18	Environmental, Health and Safety Requirements	152
3.18.1	Environmental	152
3.18.2	Health and Safety	152
3.18.3	Health and Safety Procedures	152
3.18.4	Contractor's obligations.	152
3.18.5	Drawings	154
PROJECT SIGNAGE REQUIREMENTS		155
Personnel Requirements		157
Equipment Requirements		158

Table 1 General information of the Town	18
Table 2 List of Roads under Dimapur Town	19
Table 3 Details of Road- wise Carriageway Width	22
Table 4 Details of Proposed Drains	22
Table 5 Details of Pavement Crust Composition	23
Table 6 Details of Footpath Width	24
Table 8 Details of Proposed Culverts Road-Wise	24
Table 9: Building Style	38
Table 10: Size requirements for Stone Aggregates	99
Table 11:Physical Requirements of Coarse Aggregates for Sub-base/ Base Course	100
Table 12: Grading Requirements of Coarse Aggregates	101
Table 13: Grading for Screenings	102
Table 14: Aggregate Grading for 75 mm and 50 mm Compacted Thickness of Bituminous Macadam	105
Table 15: Quantities of Materials for 10 m2 of Road Surface for 2 cm thk Open-Graded Premix Carpet	108
Table 16: Requirements of Physical Properties of Binder	110
Table 17: Physical Requirement for Coarse Aggregates for Mastic Asphalt	110
Table 18: Grade & Thickness of Mastic Asphalt Paving and Grading of Coarse Aggregate	111
Table 19: Grade of Fine Aggregates (Inclusive of Filler)	112
Table 20: Composition of Bitumen Mastic Blocks without Coarse Aggregate	112
Table 21: Grading Requirement for Filler	114
Table 22: Density Requirements of Embankment and Subgrade Materials	137
Table 23: Compaction Requirements	137
Table 24: Physical Requirements for Materials for Granular Sub-base	139
Table 25: Physical Requirements of Coarse Aggregates for Wet Mix Macadam for Sub-base/Base	140
Table 26:Grading Requirements of Aggregates for Wet Mix Macadam	141
Table 27:400-16	142
Table 28:400-17	143
Table 29:Specifications for Aluminum Composite Material (ACM)	144
Table 30:Grades of Reinforcing Bars	146
Table 31:1700-1 Grades of Concrete	148
Table 32:Requirement of Concrete for different exposure Condition using 20 mm aggregate.	149
Table 33:1700-6. Requirements for nominal Mix Concrete	149
Table 34:Key Personnel as determined by the EMP and other safeguard management plans	157



# 1 Scope of Works

## 1.1 Introduction and Project Background

The Northeastern Region is one of the most demographically diverse regions in the country. Nagaland is one of the north-eastern states of India, covers the area of 16,579<sup>1</sup> sq. km, it is rich in every aspect of nature and culture. Nagaland is encircled by Assam in the north and west, Manipur in the south, Arunachal Pradesh in the northeast and its eastern boundary with Myanmar and runs parallel to the left bank of the Brahmaputra. The terrain of the state is predominantly mountainous & steep.

Nagaland is witnessing rapid urbanization driven by its strategic location, growing employment opportunities, and improving infrastructure. The state functions as a key commercial hub supporting regional trade across the Northeast and has implemented major infrastructure initiatives under JNNURM, AMRUT, Smart Cities Mission, Swachh Bharat Mission, and ADB-assisted NERCCDIP. Chumoukedima, located in Dimapur District, is one of the fastest-growing urban centres in Nagaland. Its proximity to Dimapur City and strategic location along major transport corridors have positioned it as a vital administrative and economic hub. The town's rapid growth is driven by increasing migration, urban expansion, and ongoing infrastructure initiatives, making it a key urban node in Nagaland's regional development.

To bridge infrastructure gaps and meet national service benchmarks, the Government of Nagaland (GoN) has received financial assistance under the Project Readiness Financing (PRF) facility of the Asian Development Bank (ADB) through the Department of Economic Affairs, Ministry of Finance, Government of India, for the project "Improving Readiness of Infrastructure Development Projects in Nagaland." The Department of Urban Development aims to enhance urban infrastructure across all sixteen-district headquarters, with this section focusing on **Urban Roads Development** in Dimapur town. The list of the proposed roads was given subsequent sections.

## 1.2 Brief Profile of the Project Location

Dimapur is the 8<sup>th</sup> district of Nagaland, is located at 25°54'45"N latitude and 93°44'30"E longitude. The district is bounded by Assam on its north & west, Kohima on the east and Peren district in the south. Dimapur is connected by two National highways viz., NH - 29 & NH - 36. The town is situated at an average altitude of 260 Mean Sea Level (MSL) and falls under **Seismic Zone V**.

As the district headquarters, Dimapur accommodates major government offices, the Nagaland Police Headquarters, and several educational institutions, establishing it as a growing regional centre. However, rapid urbanization, population growth, and increasing vehicular traffic are placing pressure on existing infrastructure, underscoring the need for planned urban development and improved road connectivity to ensure sustainable growth.

General information about the town is presented in the table 1 below, and the location map is shown in figure 1 below. The proposed works under roads sector in the district headquarter town of Dimapur are to be executed concurrently and complete in accordance with the milestones specified in the bidding documents.

**Table 1 General information of the Town**

City/ Town	District	Area (Sq. Km)	Population (2011 census)	Avg. Annual rainfall (mm)	Temp (°C)
Dimapur	Dimapur	927	379,769	1504.7	36

<sup>1</sup> Source- Nagaland Statistical handbook 2020, Govt. of Nagaland.

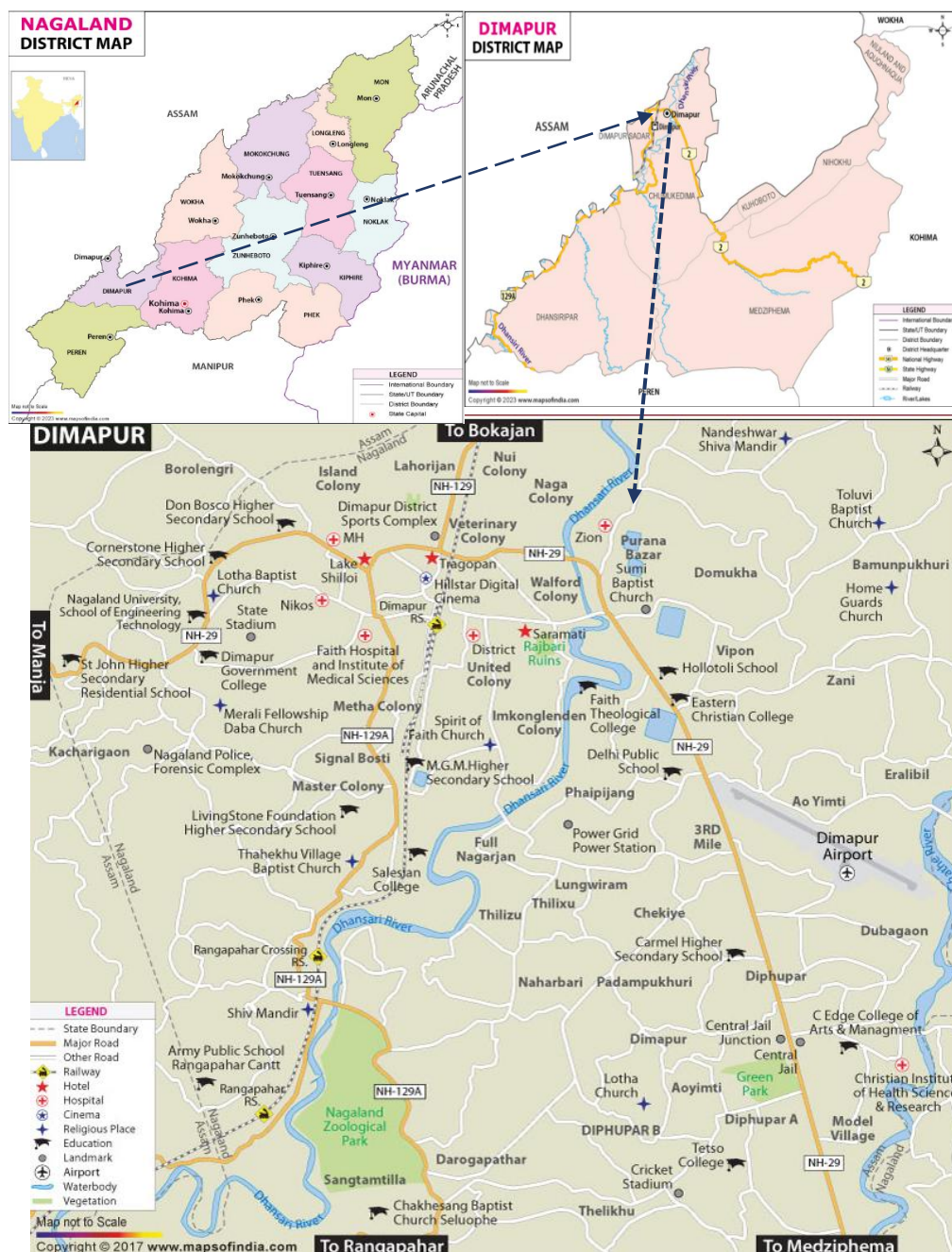


Figure 1 Map of Dimapur Town

### 1.3 Scope of Works.

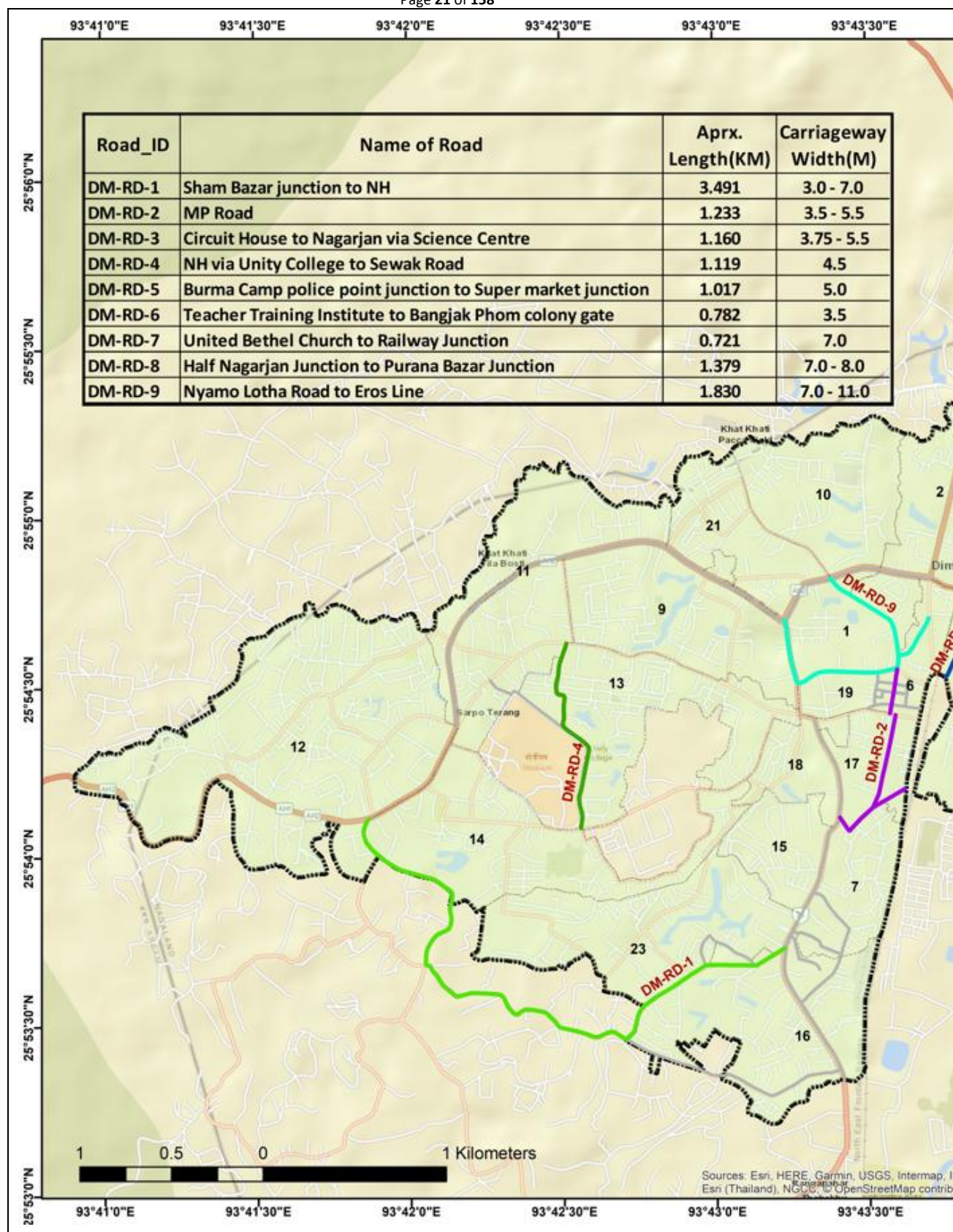
Total nine (09) no. of roads have been selected in Dimapur town of length km. 12.73 and list has given in table 2 below and same shown in figure 2 below.

Table 2 List of Roads under Dimapur Town

Sl. No.	Road_ID	Name of the Road	Length (Km)
1	DM-RD-1	Sham Bazar junction to NH	3.49
2	DM-RD-2	MP Road	1.23
3	DM-RD-3	Circuit House to Nagarjan via Science Centre	1.16

Sl. No.	Road_ID	Name of the Road	Length (Km)
4	DM-RD-4	NH via Unity College to Sewak Road	1.12
5	DM-RD-5	Burma Camp police point junction to Supermarket junction	1.02
6	DM-RD-6	Teacher Training Institute to Bangjak Phom colony gate	0.78
7	DM-RD-7	United Bethel Church to Railway Junction	0.72
8	DM-RD-8	Half Nagarjan Junction to Purana Bazar Junction	1.38
9	DM-RD-9	Nyamo Lotha Road to Eros Line	1.83
		<b>Total Length (km) =</b>	<b>12.73</b>





### A. Carriageway Width

The carriageway width varies from 3.0 m to 10.0 m based on the available land width of each road. The road-wise carriageway width has been given in table 3 below.

**Table 3 Details of Road- wise Carriageway Width**

Sl. No.	Road_ID	Name of the Road	Width of CW (m)
1	DM-RD-1	Sham Bazar junction to NH	3.0 - 7.0
2	DM-RD-2	MP Road	3.5 - 5.5
3	DM-RD-3	Circuit House to Nagarjan via Science Centre	3.75 - 5.5
4	DM-RD-4	NH via Unity College to Sewak Road	4.5
5	DM-RD-5	Burma Camp police point junction to Supermarket junction	5.0
6	DM-RD-6	Teacher Training Institute to Bangjak Phom colony gate	3.5
7	DM-RD-7	United Bethel Church to Railway Junction	7.0
8	DM-RD-8	Half Nagarjan Junction to Purana Bazar Junction	7.0 - 7.5
9	DM-RD-9	Nyamo Lotha Road to Eros Line	7.0 - 11.0*
<b>Note: *Dual CW</b>			

### B. Roadside Drains

Based on discharge calculations, the width and depth of the drains have been determined. RCC covered drains should be proposed and the road-wise drain sizes are listed below.

**Table 4 Details of Proposed Drains**

Road_ID	Name of the Road	Chainage (Km)		Side	Width (m)	Depth (m)
		From	To			
DM-RD-1	Sham Bazar junction to NH	0+00	0+700	LHS	0.3	0.5
		0+700	1+051	BS	0.3	0.5
		1+051	2+321	LHS	0.3	0.5
		2+351	3+490	LHS	0.3	0.5
DM-RD-2	MP Road	0+00	0+469	LHS	0.4	0.6
		0+469	1+233	LHS	0.4	0.6
		0+469	1+233	RHS	0.4	0.6
DM-RD-3	Circuit House to Nagarjan via Science Centre	0+00	0+320	LHS	0.3	0.5
		0+320	1+161	BS	0.3	0.5
DM-RD-4	NH via Unity College to Sewak Road	0+00	0+120	RHS	0.4	0.6
		0+120	0+300	<b>Existing Drain Retained</b>		
		0+300	0+470	RHS	0.4	0.6
		0+470	1+119	<b>Existing Drain Retained</b>		

Road_ID	Name of the Road	Chainage (Km)		Side	Width (m)	Depth (m)
		From	To			
DM-RD-5	Burma Camp police point junction to Supermarket junction.	0+00	1+017	BS	0.3	0.5
DM-RD-6	Teacher Training Institute to Bangjak Phom Colony Gate	0+00	0+350	LHS	0.4	0.6
		0+350	0+620	BS	0.3	0.5
		0+620	0+680	LHS	0.4	0.6
DM-RD-7	United Bethel Church to Railway Junction	0+00	0+721	BS	0.3	0.5
DM-RD-8	Half Nagarjan Junction to Purana Bazar	0+00	0+995	BS	1.0	0.5
		0+995	1+151	LHS	0.5	0.6
		1+251	1+379	Existing Drain Retained		
DM-RD-9	Nyamo Lotha Road to Eros Line	0+00	1+830	Existing Drain Retained		

### C. Crust Composition

The crust composition of the pavement for reconstruction/resurfacing & widening has been determined based on traffic load and subgrade conditions. Road-wise details are provided in the table below.

**Table 5 Details of Pavement Crust Composition**

Sl. No.	Road_ID	Name of the Road	GSB (mm)	WMM (mm)	DBM (mm)	BC (mm)	Total Thickness (mm)
1	DM-RD-1	Sham Bazar junction to NH	200	230	50	30	510
2	DM-RD-2	MP Road	200	230	50	35	515
3	DM-RD-3	Circuit House to Nagarjan via Science Centre	150	170	40	30	390
4	DM-RD-4	NH via Unity College to Sewak Road	200	215	50	30	495
5	DM-RD-5	Burma Camp police point junction to Supermarket junction	200	230	50	35	515
6	DM-RD-6	Teacher Training Institute to Bangjak Phom colony gate	200	230	50	35	515
7	DM-RD-7	United Bethel Church to Railway Junction	-	-	70	45	115
8	DM-RD-8	Half Nagarjan Junction to Purana Bazar Junction	200	250	80	40	570
9	DM-RD-9	Nyamo Lotha Road to Eros Line	200	250	80	40	570
<b><u>Note: The Contractor shall adopt the highest pavement crust composition if the traffic survey conducted indicates a requirement exceeding the composition mentioned above.</u></b>							

### D. Footpath

The width of the footpath has been determined based on the available right-of-way, pedestrian movement patterns, and adjoining land use characteristics. It varies from road to road to ensure optimal space utilization and pedestrian safety. The proposed footpath widths have been summarized road-wise in table below.

**Table 6 Details of Footpath Width**

Road ID	Name of Road	Chainage (Km)		Side	Width of Footpath (m)
		From	To		
DM-RD-1	Sham Bazar Junction to NH	0+00	0+700	LHS	1.2
		0+700	1+051	BS	1.2
		2+351	3+491	RHS	1.2
DM-RD-2	MP Road	0+00	0+271	LHS	1.2
		0+469	1+233	BS	1.2
DM-RD-3	Circuit House to Nagarjan via Science Centre	0+00	0+320	LHS	1.2
DM-RD-5	Burma Camp police point junction to Supermarket junction	0+00	1+017	BS	1.2
DM-RD-7	United Bethel Church to Railway Junction	0+00	0+721	BS	1.2
DM-RD-8	Half Nagarjan Junction to Purana Bazar Junction	0+00	0+801	LHS	1.6
		0+801	0+995	LHS	1.2
		0+00	0+995	RHS	1.0
DM-RD-9	Nyamo Lotha Road to Eros Line	0+00	1+830	BS	1.2

### E. Culverts

In view of the deteriorated condition of existing cross drainage structures, new culverts have been proposed, to ensure proper drainage and enhance the longevity of the road infrastructure, replacement/reconstruction of these culverts is essential. Total eighteen (18) no. of culverts has been proposed and the list of culverts on each road chainage wise details were given in Table below.

**Table 7 Details of Proposed Culverts Road-Wise**

Road_ID	Name of the Road	Chainage (Km)	Type of Culvert	Size (m)
DM-RD-1	Sham Bazar junction to NH	1+255	Box	1 x 1.5 x 1.5
		2+660	Box	1 x 1.5 x 1.5
DM-RD-2	MP Road	0+130	HPC	1 x 1.0
		0+715	HPC	1 x 0.9
DM-RD-3	Circuit House to Nagarjan via Science Centre	0+255	HPC	1 x 1.0
		0+320	HPC	1 x 1.0

Road_ID	Name of the Road	Chainage (Km)	Type of Culvert	Size (m)
		0+580	HPC	1 x 0.6
		1+010	Box	1 x 1.0 x 1.0
DM-RD-4	NH via Unity College to Sewak Road	0+150	HPC	1 x 0.6
		0+300	HPC	1 x 0.6
		0+900	HPC	1 x 0.9
DM-RD-5	Burma Camp police point junction to Supermarket junction.	0+020	HPC	1 x 0.9
		0+060	HPC	1 x 1.0
		0+300	Box	3 x 2.0 x 3.0
DM-RD-6	Teacher Training Institute to Bangjak Phom Colony Gate	0+240	HPC	1 x 0.9
DM-RD-7	United Bethel Church to Railway Junction	0+210	HPC	1 x 0.9
		0+720	HPC	1 x 0.9
DM-RD-8	Half Nagarjan Junction to Purana Bazar	0+995	Box	1 x 2.0 x 2.0

### 1.3.1 Scope of services

The Scope of Services shall include all technical, managerial, administrative, commercial, environmental, and social interventions as required in accordance with acceptable, prudent construction and management practices road infrastructure and storm water drainage system in four project towns, ensuring improvement in connectivity and road safety and improvement storm water drainage system in the Service Areas. The Scope of Services mentioned below is indicative only and the contractor is required to undertake his own detailed investigation of the Project Facilities to determine the complete Scope of Services mentioned below are indicative and need to be confirmed by Contractor through work plan, and all components covered under the contract for implementation of work plan are to be planned in detail including testing, trial run and commissioning component wise.

### 1.3.2 Work to be Carried Out

The work to be carried out under the Contract shall consist of the various items as generally described in the Contract Documents as well as in the Bill of Quantities furnished in the Contract Documents'

### 1.3.3 Conformity with Drawings and Allowable Deviations

All works performed and all materials furnished shall be in conformity with the lines, grades, typical sections, dimensions, material requirements, and tolerances shown in the drawings or as indicated in the Specifications.

The works to be performed shall also include all general works preparatory to the construction of roads, bridges, structures, canal crossings, drainage and all other related works. The works shall include work of any kind necessary for the due and satisfactory construction, completion and maintenance of works to the intent and meaning of the drawings and these Specifications and further drawings and orders that may be issued by the Engineer from time to time.



The scope of work shall include compliance by the Contractor with all Conditions of Contract, whether specifically mentioned or not in the various Sections of these Specifications, all materials, apparatus, plant, equipment, tools, fuel, water, strutting, timbering, transport, offices, stores, workshop, staff, labour and the provision of proper and sufficient protective works, diversions, temporary fencing and lighting.

It shall also include safety of workers at construction site, first- aid equipment, suitable accommodation for the staff and workmen with adequate sanitary arrangements, the effecting and maintenance of all insurances, the payment of all wages, salaries, fees, royalties, duties or other charges arising out of the erection of works and the regular clearance of rubbish, reinstatement and clearing-up of the site as may be required on completion of works, safety of the public and protection of the works and adjoining land/ structures.

The Contractor shall ensure that all actions are taken to build in quality assurance (QA) in the planning, management, and execution of works. The quality assurance shall cover all stages of work such as setting out, selection of materials, selection of construction methods, selection of equipment and plant, deployment of personnel and supervisory staff, quality control testing, etc. The QA programme shall cover the details as per IRC:SP:47 and IRC:SP:57. These shall broadly cover quality assurance aspects of all services rendered, all items to be supplied and all activities to be performed under the contract including temporary structures and equipment which will influence the quality of the completed works or the progress of the contract.

As a minimum, it shall cover the following:

- i) Organisation and management responsibility,
- ii) Document and data control,
- iii) Construction programme,
- iv) Working, inspection, testing and documentary procedures,
- v) Arrangement for smooth and safe traffic flow during construction and maintenance,
- vi) Control and documentation of purchasing and handling of materials,
- vii) Maintenance of records for non-conformity and timely corrective actions,

The Contractor shall furnish, at least 7 days in advance, unless otherwise stipulated in the contract, his programme of commencement of each item of work, including the method statement including deployment of plant and equipment for the works included in the contract and any other work for which the Engineer may demand the method statement. He shall provide all information to the satisfaction of the Engineer to ensure its adequacy.

#### **1.3.4 Inspection of Materials Before Incorporation**

All materials shall be inspected, tested, and accepted by the Engineer as per these specifications before incorporation in the work. The frequencies and methods of sampling and testing materials, including those required for definite purpose and not covered by these specifications shall be in accordance to the relevant IRC or BIS or AASHTO/ASTM/ BS Standards in order of priority.

#### **1.3.5 Inspection of Materials at Source**

The Engineer may choose to inspect material at source. In the event, the following conditions shall be met.

- a. The Contractor and the manufacturer of material shall assist and co-operate with the Engineer in carrying out the inspection.
- b. The Engineer shall have right to enter areas of plant where the manufacture or production of material is carried out.

## **1.4 Delivery, Storage and Handling of Materials**

All materials shall be handled and stored in appropriate manner to preserve their quality and fitness for the work. During the handling of all aggregates or other construction materials, special care shall be taken to prevent contamination. Furthermore, aggregate shall be handled in such a manner as to prevent segregation.

## **1.5 Drawings**

The drawings provided in the Tender Documents shall be used as reference only. The Contractor shall study the nature and type of work and ensure that the rates and prices quoted by him in the Bill of Quantities have due consideration of the site and complexities of work involved during actual execution/construction.

# **2 Standard Technical Specification (CIVIL)**

## **2.1 General**

### **2.1.1 Preamble**

These specifications apply to the structural and non-structural elements of the works falling under the purview of this document. All work shall be carried out in conformity with these specifications. In general, the provisions of standard specifications published by the Bureau of Indian Standards (BIS) and other equivalent national or international standards have been adopted. These specifications are not intended to cover minute details. The works shall be executed in accordance with the best modern practices. All codes and standards referred to in these specifications shall be the latest revisions available at least thirty days prior to the date of bid submission. In the event of any discrepancy with the BIS codes, the provisions contained in these specifications shall prevail.

### **2.1.2 Inclusive Documents**

The provisions of Conditions of Particular Application & General Conditions of Contract, those specified in the tender as well as drawings and notes issued in writing by the Engineer as well as Quality Action Plan (QAP) shall form part of these specifications.

### **2.1.3 Order of Precedence, Clarifications, and Interpretation**

In the event of any discrepancies between these specifications and the various referenced specifications or codes, or among the referenced documents themselves, the order of precedence shall be as specified under Part B: Specific Provisions, Sub-Clause 1.5: Priority of Documents of the Particular Conditions of Contract.

The Contractor's attention is drawn to certain clauses within the BIS codes that may require clarification from the Engineer or mutual agreement between the Employer and the Contractor. In such instances, it shall be the Contractor's responsibility to seek clarification on any ambiguity and to obtain the Engineer's prior approval before proceeding with any related supply or construction work

### **2.1.4 Measurement and Payments**

The methods of measurement and payment shall be as described under various items and in the bill of quantities. Where specific definitions are not given, the methods described in BIS Codes shall be followed. Should there be any detail of construction or materials which have not been referred to in these specifications or in the bill of quantities and drawings but the necessity for which may be implied or inferred wherefrom, or which are usual or essential to the completion of the work in the trades, the

same shall be executed and if such work becomes an extra item of work, in the opinion of the Engineer, then it shall be analysed by the Engineer and get approved by the Employer for payment to the Contractor.

### **2.1.5 Unacceptable Work**

All defective works shall be demolished, rebuilt and defective materials replaced by the Contractor at his own cost. In the event of such work being accepted at the sole discretion of the Engineer after carrying out necessary repairs etc. as specified by the Engineer, the cost of repairs shall be borne by the Contractor.

### **2.1.6 Maintaining Utility Service and Traffic**

#### **2.1.6.1 Project Facilitation**

The Employer shall arrange meetings and coordinate with all concerned agencies viz. Urban Development Department (UDD), Government of Nagaland, and Directorate of Urban Development (DUD), Directorate of Municipal Affairs (DMA), Public Health Engineering Department (PHED), Forest Department, Public Works Department (Roads and Bridges)–PWD (R&B), Department of Power, ULB's, Labour and Employment, Nagaland Pollution Control Board, BSNL and other mobile and communication companies, Nagaland Police, etc. to obtain necessary permission and clearances for execution of the work. The Contractor shall follow-up all matter with such agencies for speedy execution of the work. In the event of any hindrance, the Contractor shall bring the same to the notice of the Employer/ Engineer forthwith.

#### **2.1.6.2 Public Utilities**

Almost all the roads where road & roadside drainage works are to be carried out are known to have underground utilities/ services. Drawings of underground services like water pipes, sewers, electric/ telephone cables, gas lines and the like owned by various agencies including Public Undertakings and Local Authorities which are likely to be affected by the S&D works are not accurately available and therefore have not been included in the tender documents. An indication of major water supply pipes and CESC HT cables has been given in the enclosed drawings. The successful bidder shall excavate trial trenches/ pits as directed by the Engineer, to verify exact locations of different utility services. Necessary modifications to the at ground & underground utilities, if required, shall be issued by the Engineer after the verification.

The proposed work programme shall include the period of notice to be given to the authorities seeking permission for diversion/ alterations of utilities (at ground & underground) and for actual diversion work and the effects thereof in the works.

No removal or alterations to the utility shall be carried out unless specifically asked by the Engineer.

Any service affected by the works shall be temporarily supported by the Contractor who must also take all measures reasonably required by the various bodies to protect their services and property during the progress of the works.

The Contractor may be required to carry out certain works for and on behalf of the various bodies and he shall also provide, with the prior approval of the Engineer, such assistance to the various bodies as may be authorized by the Engineer.

The work of temporarily supporting and protecting the public utility services during execution of the works shall not be paid extra.

The Contractor may be required to carry out the removal or shifting of certain services/ utilities on specific orders from the Engineer. Such works shall be taken up by the Contractor only after obtaining clearance from the Engineer and ensuring adequate safety measures.

## **2.1.7 Arrangement for Traffic during Construction**

### **2.1.7.1 General**

The Contractor shall always carry out work on the roads in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all works, the Contractor shall, in accordance with the directives of the Engineer, provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement, or along a temporary diversion constructed close to the road.

The Contractor shall be responsible for removal of excavated spoils/ silt and other debris without dumping/ stacking the same in huge heaps adjacent to the trench/ site to enable traffic of any form to ply in the area and to enable people to walk on the sides of the trench outside the barricade. The Contractor shall also barricade the trench/ area of activity as directed by Engineer. Deck slabs/ walkways shall be placed at suitable locations across the trench for easy accessibility to adjoining premises as directed by the Engineer.

### **2.1.7.2 Passage of Traffic along a Part of the Existing Carriageway**

Where part width of the existing carriageway is proposed to be used for passage of traffic, treated shoulders shall be provided on the side on which work is not in progress. The treatment to the shoulder shall be as per the instruction of the Engineer. The continuous length, in which such work shall be carried out, would be limited to available space at site and instructions of the Engineer. After completion of pipe laying work, the carriageway shall be temporarily restored and made pliable to traffic. Excavated surplus and debris shall be removed from site. All barricades shall be removed.

### **2.1.7.3 Passage of Traffic along a Temporary Diversion**

In stretches where it is not possible to pass the traffic on part width of the carriageway, a temporary diversion may be constructed (if practicable) of adequate width and in accordance with instruction of the Engineer. Such diversion shall be intimated by the Contractor to the Engineer with drawings for approval before commencement of work.

### **2.1.7.4 Traffic Safety and Control**

The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights, flagmen and temporary gates as may be instructed by the Engineer for the information and protection of traffic approaching or passing through the section of the road under which the pipe shall be laid. Before taking up any construction, an agreed phased programme for the diversion of traffic shall be drawn up in consultation with the Engineer.

The barricades erected on either side of the trench/ excavation closed to traffic, shall be as shown in drawing. Under special cases, the Engineer, as per site condition may ask for alternative design for trench barricading from the Contractor for approval without any extra cost. Red lanterns or warning lights of similar types shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise. Fluorescent paint boards or reflective glass boards in red color shall also be used. Toe guards shall be provided.

At the points where traffic is to deviate from its normal path, the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device as per directions of the Engineer. At night, the passage shall be delineated with lanterns or other suitable light source.

One-way traffic operation shall be established whenever the traffic is to pass over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/ lights.

On both sides, suitable regulatory/ warning signs with gates (if required) as approved by the Engineer shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of the carriageway begins and the other at a suitable distance away. The signs shall be approved design and of reflector type, if so directed by the Engineer.

#### **2.1.7.5 Maintenance of Diversions and Traffic Control Devices**

Signs, lights, barriers, and other traffic control devices, as well as the riding surface of diversions shall be maintained in a satisfactory condition till such time they are required as directed by Engineer.

The Contractor shall supply MS boards of requisite number as instructed by the Engineer for traffic diversions, within 30 days from the date of commencement of the project for which no additional payment will be made. Same are to be retained at site till the project is substantially completed and the Engineer gives permission to remove those from site. Damages caused to the sign boards for any reason whatsoever shall be either repaired or replaced immediately for which no separate payment will be made.

The Contractor shall supply flexes indicating traffic signs as well as project details indicating project name, name of Owner/ Engineer/ Contractor, brief description of work, start date, tentative date of completion etc. and shall be fixed to the MS boards for display at strategic locations as directed by the Engineer and shall be retained in position till such time the work is completed. Any damage caused to the flexes shall be replaced immediately. No additional cost on account of provision of flexes will be paid.

#### **2.1.7.6 Measurements for Payment and Rate**

- a. The construction of temporary road diversion shall be payable as per item rates in the BOQ.
- b. Temporary restoration of road and barricading shall be payable as per item of BOQ.

#### **2.1.8 Setting Out**

The Contractor shall establish working benchmarks tied with the Reference Benchmark spread over the entire work area, as applicable relevant to this document, soon after taking possession of the site. The reference benchmark for the area shall be obtained by the Contractor from the Engineer. The working benchmarks shall be at the rate of two per km (minimum) and at bends & corners and one per hectare of land area or/and as directed by the Engineer and one each at the reservoir and/or pump house locations. The working benchmarks/ levels shall be got approved by the Engineer. Checks must be made on these benchmarks once in every month and adjustments, if any, agreed with the Engineer and recorded. An up-to-date record of all working benchmarks including approved adjustments, if any, shall be maintained by the Contractor and a copy supplied to the Engineer for his record. These benchmarks shall be on a permanent structure.

On construction reaching the formation level stage, the centre line shall again be set out by the Contractor and when approved by the Engineer, shall be accurately referenced in a manner satisfactory to the Engineer by marker pegs set at the outer limits of the formation.

No reference peg or marker shall be removed or withdrawn without the approval of the Engineer and no earthwork work shall be commenced until the centre line has been referenced.

The Contractor shall be responsible for safeguarding all survey monuments, benchmarks, beacons, etc. The Engineer shall provide the Contractor with the data necessary for setting out of the centre line. Setting out of the centre line on allied structures shall be done by the Contractor based on the approved working drawings and get approved by the Engineer. All dimensions and levels shown in the drawings or mentioned in documents forming part of or issued under the Contract shall be verified by the Contractor on the site and he shall immediately inform the Engineer of any apparent errors or discrepancies in such dimensions or levels. The Contractor shall, in connection with the setting out of

the centre line, survey route with road top and cross check the same with those given in drawings/ documents and have it checked by the Engineer.

The work of setting out shall be deemed to be a part of general works preparatory to the execution of work and no separate payment shall be made for the same.

Precision automatic levels, having a standard deviation of  $\pm 2$  mm per km (and per hectare), and fitted with micrometre attachment shall be used for all levelling work. Setting out of the alignment and measurement of angles shall be done by using total station with traversing target, having an accuracy of one second. Measurement of distances shall be done using precision instruments like Diatomite or equivalent. Modern survey equipment's shall be used for all surveying and levelling works.

### **2.1.9 Methodology and Sequence of Work**

Prior to start of the construction activities at site, the Contractor shall, within 28 days after the date of the Letter of Acceptance, submit to the Engineer for approval for work components relevant to the scope of the project, the detailed construction methodology including mechanical equipment proposed to be used, sequence of various activities and schedule from start to end of the project. The Contractor shall prepare detail construction program using MS Project software. The methodology and the sequence shall be so planned as to provide proper safety, drainage, and free flow of traffic.

### **2.1.10 Approval of Materials**

Approval of all sources of material for works shall be obtained in writing from the Engineer before their use in the project.

Raw and processed samples of all materials shall be submitted by the Contractor at no extra cost.

### **2.1.11 Access to Abutting Properties& Cross Traffic Flow Arrangement**

For the entire duration of the works the Contractor shall at all times provide convenient access to paths, steps or drives for all entrances to property abutting the site and maintain them clear, tidy, and free from mud and objectionable matter.

In addition to the above, to ensure uninterrupted traffic flow in the crossroads, the Contractor shall have to provide and maintain suitable crossing under construction/improvement during the entire period of construction or till such time that alternative arrangement for the traffic is made.

For the items above no additional payment shall be made to the Contractor.

### **2.1.12 The following conditions regarding use of equipment on work shall be followed:**

1. The Contractor shall be required to give a trial run of the equipment, as may be asked for by the Engineer for establishing their capability to achieve the required specifications and tolerance to the satisfaction of the Engineer before commencement of the work.
2. All equipment provided shall be of proven efficiency and shall be operated and maintained at all times in a manner acceptable to the Engineer.
3. No equipment shall be removed from site without permission of the Engineer.

### **2.1.13 Quality Control and System (QCS)**

The Contractor shall be responsible for the quality of the work in the entire construction work within the contract. He shall, therefore, have his own independent and adequate set-up for ensuring the same.

An approved Quality Action Plan (QAP) document is enclosed. Contractor shall follow the same as applicable.

Dimension of all equipment's or materials shall be as per the relevant IS or ISO standards, if not mentioned otherwise, and these should be followed by the contractor in his QAP which is to be approved before procurement and installation.

The Engineer shall inspect the work from time to time during and after construction and ascertain the quality of the work tested (by himself, by his Testing and Quality Control Units or by any other agency deemed fit by him) generally as per the requirements of QAP. Additional tests may also be conducted where, in the opinion of the Engineer, need for such tests exist. In the absence of clear indications and frequency of tests for any item in the above-mentioned publication, procedures and tests as directed by the Engineer shall be binding.

The Contractor shall provide necessary cooperation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer from time to time. This may include provision of labour, attendance, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests.

Similar permission from the Engineer shall be obtained in respect to other items of work prior to proceeding with the next stage of construction. The Contractor shall offer the Engineer any sequential work Ready for Inspection (RFI) after the said work has been certified by his Engineer as ready to proceed with.

The Contractor shall carry out modification in procedure of work, if any, as directed by the Engineer during inspection.

Works falling short of quality as per tests shall be rectified by the Contractor at his own cost as directed by the Engineer.

For testing of samples of soil, soil mix, granular material and mix, bituminous mix, aggregates, core pipes, manhole & pit covers/ gratings etc. samples as required by Quality Control & System (QAP) shall be furnished by the Contractor. The cost incurred in testing of all materials shall be incorporated in the quoted rates.

For cement, bitumen, similar other materials, and pumps motors where essential tests are to be carried out at the manufacturer's plants or at laboratories other than the site laboratory, the cost of samples, sampling, testing and furnishing of test certificates shall be borne by the Contractor. He shall also furnish the test certificates to the Engineer. All materials shall be tested to relevant BIS codes. In general, the Quality Control & System (QAP) shall be followed. The decision of the Engineer shall be final & binding.

Where the Engineer considers that in the interest of the control of the quality on materials or workmanship, modifications, if any, are necessary, such modifications shall be carried out by the Contractor.

#### **2.1.14                      Surveying and Measuring Equipment**

Equipment for surveying and measurement on the work shall be procured by the Contractor for his use. The same shall also be made available to the Engineer at site for any work connected with the Contract without any additional charge.

#### **2.1.15                      Drawings**

##### **2.1.15.1                   Construction Drawings**

The Engineer will issue to the Contractor a set of design drawings in soft and hard copy showing every accessory. Together with these drawings the Engineer will provide data sheets containing the tentative

levels of all the chambers. Based on the design drawings and data sheet issued by the Engineer, topographical survey drawings shall be prepared and submitted by the Contractor showing the total road network within the area of activity. Thereafter the Contractor shall prepare the construction drawings for the areas where proposed drain lines will be laid under the project based on topographical survey, the design drawings, the data sheet, and trial pit/ trenches (if applicable) details and get these drawings approved by the Engineer. Contractor shall provide the construction drawings and get approval of the engineer. The specification of these submitted drawings will be prepared matching with the existing site condition & necessity as may vary and it is the prerogative of the Engineer In-Charge/ Employer. The construction drawings provided by the Contractor shall be complete in all respects. Construction drawings of a part of a command area/ zone/ sub-zone will not be accepted for approval to commence the field work from the downstream end of the area. The command area/ zone/ sub-zone delineations will be provided in the working drawings.

The submission of drawings shall be in the following sequence:

- First the draft survey drawings to be submitted by the Contractor.
- These will be checked and commented on by the Engineer.
- The corrected survey drawings to be resubmitted by the Contractor and approved by the Engineer.
- The draft construction drawing, showing the pipeline alignment (including canal crossing etc.), and accessories, etc. to be submitted by the Contractor.
- These will be checked and commented on by the Engineer.
- The corrected construction drawing to be re-submitted by the Contractor and approved by the Engineer.

Without approved construction drawing, the Contractor shall not proceed with the actual execution work.

### **2.1.15.2 Completion Drawings (As-built Drawings)**

The construction drawings shall be updated along with the progress of construction work and all modification and changes are to be incorporated in these drawings. The modified drawings shall be termed “As-Built drawings”, which are to be submitted by the Contractor to the Engineer. These “as-built drawings” shall among other details, include layout plan, long section, including cross-section of the along major junction’s canal crossings etc. and “as-built drawings” of the appurtenant structures.

The Contractor shall submit ‘Completion Drawings’ to the Engineer progressively within one month of actual completion of each section /segment as laid, tested and after trial run. These drawings and reports shall be accurate and correct in all respects and shall be checked and approved by the Engineer. The completion drawings shall be provided by the Contractor section / segment-wise for the drainage network, as laid starting to target point. The drawings are to be submitted soft as well as hard copies in A1 size sheets or as directed by the Engineer.

The drawings are to be submitted duly signed by the Contractor. Taking over certificate of the works shall not be issued by the Engineer in the event of Contractor’s failure to submit the aforesaid “As-built drawings” for the entire works. No separate payment shall be made for preparation and submission of “As-built drawings” by the Contractor.

## **2.1.16 Topographical and Level Survey**

### **2.1.16.1 General**

The Contractor will be provided with working drawings and data sheets for the proposed, road and drains layout for verification of ground reality prior to execution of work. Alignment of the proposed road and drains and location of appurtenances shall be finalized by the Contractor in consultation with the Engineer. The Contractor shall prepare the construction drawings for the areas where proposed



road and drains will be laid under this project. Reference benchmark will be shown at site and RLs of the same will be provided to the Contractor by the Engineer for carrying out topographical survey. The Contractor shall furnish updated map and other related information to the Engineer for approval as described in relevant clause elsewhere in the document.

The Contractor shall also conduct block contour survey and cross-sectional survey along the main route. Reference benchmark will be shown at site and level value of the same will be provided to the Contractor by the Engineer for carrying out topographical survey. The Contractor shall furnish updated map and level information to the Engineer as a verification of data given in the drawings by the Engineer. Any variation found in the details provided in the drawings originally provided to the Contractor shall be corrected by the Engineer and issued to the Contractor. The revised drawings issued to the Contractor shall be used for implementation of works.

## **2.1.16.2 Scope of Work**

### **2.1.16.2.1 For Road and Storm Water Drains**

The Contractor shall transfer benchmark (BM) value from identified place to proposed work site and establish the same at nearby location for regular use for construction purpose. The Contractor shall construct at least 5 nos. permanent BM within the project area including 1 each or as directed by the Engineer. BM level value shall be inscribed in 15 mm thick 300 mm square granite plaque etched suitably to show level with its centre point and the same shall be anchored on a 300 mm square concrete pillar of height 500 mm from ground with suitable foundation in a safe place and as per direction of the Engineer.

Topographical survey shall be carried out by the Contractor with total station or any other suitable modern survey instrument for assessing the most appropriate alignment of the road and Stormwater drain. Type & width of road and offset distance of important structures within or adjacent to road, from a fixed point shall be shown in the map, along with existing valves chambers, manholes, drains, poles etc. up to a minimum width of 3m on both sides of the road (black bituminous top or concrete or brick) edges including road portion.

Spot level survey of road, drain, culvert, existing manhole, existing valve chambers and other water/sewer appurtenances shall be carried out by the Contractor as per direction of the Engineer. Level survey on roads where water line will be executed, shall be carried out along the alignment of proposed sewer, generally at 30m interval and at strategic locations as per direction of the Engineer. Level information shall be collected at regular interval as stated earlier as well as at road intersections, road curves and drain crossing, culvert, manhole, valve chambers, pits, inspection chamber, etc. Any other level essentially required for construction purposes shall be recorded as per direction of the Engineer. Spot levels at right angles to manhole/chamber point shall also be taken at 2m intervals on both sides of road centre to find out GLs along the cross-section.

Alignment and spot level survey for stretches of existing water lines/sewers shall be carried out by the Contractor on road at every manhole location including invert level of existing manholes/valve chambers and incoming & outgoing pipes including size of the pipes and depth. This survey shall be carried out as per direction of the Engineer and includes opening of manhole/valve chamber covers, dewatering (if required), cleaning as far as required for measuring invert levels and diameters of the pipes and manholes/chambers and putting back the manhole/chamber covers. Pumping of wastewater from the manholes/chambers (if required) including cleaning, to determine invert levels and dia. of pipes shall be included in the cost of this survey work.

The Contractor shall submit to the Engineer all survey information and drawings in two hard copies and one soft copy initially. After receiving comments from the Engineer, the same shall be incorporated and resubmitted by the Contractor in 3 hard copies and one soft copy.

Based on this survey drawing, construction drawing shall be prepared by Contractor and submitted along with updated manhole/valve chamber data sheet incorporating the ground levels at manhole/chamber locations and information of existing water/sewer lines (IL, dia. Etc.) as obtained

from topographical survey including L-section as a draft for 1st submission in 2 hard copies and soft copy of updated manhole data sheet. Comments on this drawing from the Engineer shall be incorporated by the Contractor and submit it in 4 hard copies and 1 soft copy. Based on the information as submitted by the Contractor, the Engineer will issue a corrected manhole data sheet. Soft copy of finally corrected manhole data sheet shall also be submitted along with the final construction drawings.

All drawings at pre & post execution stage shall be submitted in scale as specified Specifications (Part A2) for construction drawing. Road alignment drawing shall be to a scale of 1:200

The Contractor shall complete carrying out total field survey work progressively within three months from the date of issue of notice to proceed and submit the 'Draft' to the Engineer for approval. Since time is the essence of the contract, the draft drawings should be prepared in the most professional manner to invite minimum comments from the Engineer. Same mistakes or discrepancies pointed out in the draft version should not reappear in the final version drawing. The final version of Construction Drawings will be further checked by the Engineer and will be approved within 10 days from the date of receipt if found acceptable. Based on such approved drawings only the Contractor shall start setting out operation followed by excavation at site. Under no circumstances the Contractor shall start excavation at site without approved drawings.

#### **2.1.16.3 Survey Work Programme**

The Contractor shall complete carrying out total field survey work progressively within 90 days from the date of issue of notice to proceed and submit the draft survey drawings progressively within 10 days of completion of survey to the Engineer. The survey drawings shall be complete with grid markings and coordinates. Such coordinates shall be taken from available GIS or other maps to be arranged by the Contractor. The total survey programme shall be submitted within 10 days of receipt of notice to proceed or Letter of Intent wherever is earlier to the Engineer for approval.

#### **2.1.16.4 Manpower Responsibilities**

The topographic survey shall be executed through a specialized team and a Survey Engineer shall be deployed for checking adequacy, coverage and correctness of the surveys.

#### **2.1.16.5 Equipment**

The following equipment in required numbers as deemed fit by the Contractor to complete the survey activity in time shall be deployed.

- Differential GPS equipment
- Electronic total stations with angular accuracy of  $\pm 1$  sec.
- Auto level having accuracy of  $\pm 2.5$  mm/km
- Other items like measuring tapes, ranging rods, leveling staff etc., as required

#### **2.1.16.6 Safety Consideration**

The survey personnel shall take all possible measures to ensure safety of them as well machines. The instrument stations shall be established outside travelled way to avoid conflict with moving traffic.

#### **2.1.16.7 Data Verification and Accuracy**

After sufficient work, the collected data will be downloaded into the computer, and the Survey Engineer shall verify the correctness and completeness of the survey data.

The level of accuracy to be ensured shall be as follows:

- Better than 1:20000 for all distance measurements

- The closing error for level measurements shall be within  $\pm 2\sqrt{K}$  mm where K is the distance in km.

## **2.1.16.8 Survey Procedure**

### **2.1.16.8.1 GPS Control Stations**

A pair of intervisible GPS control stations shall be fixed at a frequency of 4-5 km, almost flush with ground surface. These pillars will be in such a way that no obstructions shall be encountered during operation. Distance between the pillar pair shall be in the range of 250-300m. All Total Station traverse shall be closed against the GPS Control points with a linear accuracy of 1:20,000.

### **2.1.16.8.2 Fixing of Traverse Stations**

Location of traverse stations shall be selected on the following basis:

- It should be located on the edge of the road/ canal bank so that traffic is not disturbed while the survey is in progress.
- It should be triangulated properly with respect to existing permanent features (as far as possible).
- It should as far as possible be near to a permanent structure so that it can be identified easily on field.
- Traverse stations should be located such that last station signal bottom and next station signal bottom are clearly visible from the occupied station. This distance can be increased when there is no obstruction to vision up to maximum 300m. This distance can be decreased in case of horizontal and vertical curves.

Traverse will be done by Total Station having angular measurement accuracy of  $\pm 1$  sec. The instrument shall be calibrated at the start of the work.

### **2.1.16.8.3 Location of Benchmarks (BMs)**

These should be located generally at permanent structures at 250m intervals.

- It should be as per the specification provided.
- It should remain for future reference during construction.
- The RL and BM No. shall be marked on the pillar with red paint.

### **2.1.16.8.4 Fixation of Benchmark Levels**

All levelling for establishing benchmark is to be carried out as per method adopted by Survey of India DT levelling and specified as under. All levelling is to be carried out from GTS benchmark with Auto Level having accuracy  $\pm 2.5$  mm/km and closed.

For fixing up bench marks the following actions need to be taken:

- Before starting the work, the machine should be calibrated.
- Intermittently during levelling, collimation is to be checked and adjusted whenever collimation error exceeds 1 mm.
- Two levelling staff are to be used and fixed with circular bubble during levelling i.e., fore staff and back staff.
- Staff is to be held exactly vertically as per as possible on pillars or any other permanent structures and the fore and back staffs are to be placed exactly at the middle to nullify the collimation error.
- All readings are to be taken with 3 hair and mean of the three are to be averaged for calculation of

rise and fall. All rise and fall are to be observed twice.

#### **2.1.16.8.5 Setting up the Instrument on Station**

The Survey Engineer shall inspect all instruments to verify that no damage has occurred in transit. The instrument shall be then set up as follows:

- Set up total station instrument over station and measure height of instrument.
- Fill in top of Detail Survey Booking Sheet
- File name e.g.3123PC.FC7
- Station number
- Height of instrument
- Date
- Observer (Surveyor)
- Page number (start each day on page 1)
- Start string number (add 1 to previous station or start at 01 for each new day)

The vertical collimation shall be checked on the first station for each day in the following manner:

- In face left, sight to a distant well-defined object and record the vertical circle reading on the booking sheet.
- in face right, re-sight the same object and again record the vertical circle.
- Add the two readings and subtract 3600.
- This difference is twice the vertical collimation error.
- This error should be less than 20" to maintain the required vertical accuracy.
- Check that the prism constant is correct for the prisms being used for the traverse/ detail survey.
- Place a mark about 10 metres from the station and measure the distance with the 30-metre steel tape.
- Take a reading to the prism at this point and ensure the horizontal distance is within 5 mm of the taped distance.

#### **2.1.16.8.6 Taking Traverse Readings**

In face left, set **0°00'00"** to backsight station.

If using a prism pole, the chainman shall make sure that he uses an extra pole to brace the prism pole whilst taking the readings. The extra pole should be held away from the line with the Total Station to allow the surveyor to be able to see the bottom of the prism pole to set his bearing. Two sets of horizontal angles shall be measured in face left and face right.

All horizontal angles of offset points are to be measured in face left only.

#### **2.1.16.8.7 Taking Detail Survey Readings**

After traverse readings, read and record an angle to a reference object other than a station. This angle can be used to check the orientation if the instrument is disturbed.

This object should be checked back every 50 readings.

- Marks shall be made on the road/ canal edge every 30 metres on straights or very gentle curves,

or 5 to 10 metres on sharp curves to align the string readings. The survey should extend to within 2 metres of the previous survey or halfway to the next station.

- The entire topographical survey from a station should proceed in one direction from left to right or right to left.
- The various aspects of survey are detailed below.

#### **2.1.16.8.8 Topographic Survey**

##### **2.1.16.8.8.1 Survey**

Topographic survey should be carried out with reference to traverse stations. The X, Y, Z coordinates for each station surveyed should be recorded with respect to the values of traverse stations. All features should be accurately picked up and properly coded as explained below. A sketch for surveyed points with respect to traverse station should be prepared.

The sketch shall include:

- Station positions (including setup, backsight, foresight, and temporary stations)
- All features with string numbers
- Any additional information as felt necessary and as directed by the Engineer.
- Keep a record of the string numbers on the right of the sketch.

Any error found in the field should be recorded on the booking sheet for correction.

The following shall be recorded:

- Point number of errors
- The actual error
- The correct entry

Hard sketches of relevant details shall be prepared at site during survey.

##### **2.1.16.8.8.2 Coding**

Coding for feature is to be done as per the code used in the field booking sheet. Coding pattern shall be pre-approved by the Engineer. All survey procedure explained hereafter refers to this coding pattern. However, depending on the equipment used, the coding may change. However, it shall remain uniform for the entire survey work.

The code used in the booking sheet is the descriptive part of the string, but to identify the particular detail a numeric value is also to be added along with it. The alphanumeric code is given for those items which are to be joined to draw the detail. For example, “buildings” shall be joined as per following style:

**Table 8: Building Style**

<b>PRIVATE BL01</b>		<b>BL01</b>	<b>BL02</b>		<b>BL02</b>
BL01		BL01	BL02		BL02

All the surveyed points having the string no. BL01 shall be joined together to draw the first building and all points having string no. BL02 shall be joined together to draw the second building, i.e., numeric part will indicate how to join the points to form the detail and descriptive part indicate what is the feature.

Coding string pattern may change from software-to-software requirement e.g. some software may require only numeric string i.e. the descriptive part as well as for joining the details also require numeric value. Before proceeding to site, surveyor should finalize with Engineer the string pattern and do the pattern as required for the software.

Normally all heights observed are contourable. If for some unavoidable reasons any height cannot be observed correctly then this is to be coded differently so that the Engineer can understand that these points are not to be considered for contouring.

#### **2.1.16.8.8.3 Guidelines for Typical Feature Surveys**

The Contractor shall obtain a detail guideline prior to commencement of survey for typical features of surveys.

#### **2.1.16.8.9 Temporary (TEMP) Stations (CODE TS)**

Placing Stations

- Temporary stations are placed between traverse stations to locate additional survey not visible from the traverse stations.
- Before reading to the temporary station check the angle to the reference object. This angle must be correct before placing any new stations.
- A final check reading should be taken to the backsight station after reading to the temporary station.
- Use of temporary station:
  - ✓ if only a few additional readings are being taken from the temporary station the previous booking sheet can be used, otherwise use a new sheet.
  - ✓ Take readings to additional detail.

#### **2.1.16.8.10 Daily Traverse/ Topographical Checklist**

At the end of daily survey, the data shall be checked.

##### **2.1.16.8.10.1 Survey Controls**

The entire topographic survey shall be carried out by Total Station having facility of transferring data to computer.

All traverse stations shall be recorded with X, Y and Z coordinates and shall be checked to eliminate any error. However, the Z values obtained from this should not be used for any survey work.

The BMs shall be connected for X and Y coordinates by Total Stations with closing at intervals. In case of closing error being outside the permissible limit, survey to be repeated for proper closing.

Levels of all temporary and permanent BMs shall be obtained by Auto levels only. Levels shall be closed to eliminate any error.

#### **2.1.16.8.10.2 Submission Pattern**

All data should be submitted in hard and soft copy in compact discs as per Engineer's requirement.

The survey drawings prepared from the data shall also be submitted in hard and soft copies in compact discs for design purpose.

All hard copies shall be submitted in A1 sheets properly numbered and indexed with reference to index map included at the corner of each sheet.

The drawings shall preferably be coloured.

All drawings shall be prepared in AutoCAD only. A list of layer details shall be submitted separately.

#### **2.1.16.9 Measurement and Payment**

Topographical survey and level survey along existing / proposed pipe alignment shall be measured in running metres. Length shall be measured along the centre line of road/ canal. In case of open area length shall be measured along the alignment of pipeline.

Area mapping and level survey for pumping stations shall be paid by area measurement.

The contract unit rate shall be for the payment in full for carrying out the work as per this specification and BOQ provision.

#### **2.1.17 Underground Services**

Trial trench/ pit excavations shall be conducted at least upto 2m below existing GL/ road top as per direction of the Engineer to ascertain the presence of all existing buried services/ utilities along the route of the proposed sewer line/ route of the pumping main/ within the pump house area. The buried services data shall be recorded and incorporated in the survey drawings to enable the Engineer to finalize the location of structures and alignment of sewer/ pumping mains. All safety precautions shall be ensured by the Contractor while carrying out trial trench/ pit excavations.

Measurement for such trial trenches/ pits shall be made separately and paid for as per items in BOQ.

### **2.2 Geotechnical Exploration**

#### **2.2.1 General**

The objective of geotechnical exploration is to determine the suitability of the soil for construction of structures in the area of construction of pumping stations and for the design of shoring in trenches. The sub-surface exploration shall be planned in such a way that different types of soil up to the desired depth can be recorded and other information such as mechanical and physical properties like grain-size distribution, sensitivity, any existence of deleterious material in soil or ground water, etc., are determined along with soil parameters and rock characteristics. The exploration shall also throw light on ground water level, artesian condition, if any, likely sinking and driving effort, likely constructional difficulties, etc.

#### **2.2.2 Field Investigation**

- 1) Reconnaissance
- 2) Preliminary Investigation

Reconnaissance includes a review of available topographic and geological information.

The Contractor shall do confirmatory bore log exploration work at locations indicated by the Engineer up to a depth of 12m below GL along the route of gravity sewers/ pumping mains and 30m below GL at pumping station locations or as specified in BOQ for each bore or as advised by Engineer. Payment shall be made as per BOQ. The available information after bore logging shall be submitted to the Engineer in triplicate.

Preliminary investigation shall include the study of existing geological information, previous site reports, geological maps, air photos, etc. and surface geological examination. In some cases where no previous sub-strata data are available, exploratory geophysical investigation may need to be supplemented by resorting to a few bore holes. These shall be done in consultation with the Engineer. Payment for carrying out such investigations will be paid separately as per contract provisions.

For all borings, necessary information as detailed below shall be given. A site plan showing the location of the bore holes shall also be attached. The number and location of bore holes is to be finalized in consultation with and to the approval of the Engineer.

- 1) Agency
- 2) Location with reference map
- 3) Pit/ borehole number
- 4) Reduced level (RL) of ground surface or other reference point (the RL shall be with respect to GTS datum)
- 5) Dates of starting and completion
- 6) Name of supervisor
- 7) Scales of plans and sections
- 8) General description of strata met with and RLs at which they are met
- 9) The level at which the sub-soil water is met
- 10) Visual description of strata and soil classification
- 11) Any other information and remarks

Upon removal of sampling tube, the length of the sample in the tube and the length between the top of the tube and the top of the sample in the tube shall be measured and recorded.

The Contractor shall submit a geotechnical exploration report incorporating the investigation results.

### **2.2.3 Rate and payments**

The soil investigation shall be done by the Contractor when directed by the Engineer and shall be paid separately under the provisions of the Contract.

## **2.3 Site clearance**

### **2.3.1 Clearing and Grubbing**

#### **2.3.1.1 Scope**

This work shall consist of cutting, removing, and disposing off all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, electric/ telephone poles, posts, other structures etc., from the area of works which to the opinion of the Engineer are unsuitable for incorporation in the works, and such other areas as may be specified on the drawings or by the Engineer.

If trees must be removed, effort must be given for transplantation through specialized agency. If for any reason the trees cannot be transplanted, then arrangements must be made for planting 5 tree saplings with guard for every tree to be felled. Payment for transplantation or sapling plantation shall be paid for as per Provisional Sum items.



### **2.3.1.2 Preservation of Property/Amenities**

Trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers, and all facilities within or adjacent to the site which are not to be disturbed shall be protected from injury or damage.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional works to that effect. Before start of operations, the Contractor shall submit to the Engineer for approval his work plan including the procedure to be followed for disposal of materials, etc., and the schedules for carrying out temporary and permanent works.

### **2.3.1.3 Methods, Tools, and Equipment**

Only such methods, tools and equipment as are approved by the Engineer which will not affect the property to be preserved shall be adopted for the work.

### **2.3.1.4 Disposal of Materials**

All materials arising from clearing and grubbing operations shall be disposed of by the Contractor to any suitable site to be arranged by the Contractor. Payment for disposal shall be made as per items in BOQ.

## **2.4 Clearing and Removing Floating Debris**

### **2.4.1 Scope**

This work shall consist of pushing of floating debris stretch-wise to pre-identified location of a canal, lifting the same from water, removing all forms of materials such as plastics, floating municipal debris but not the water hyacinth and other form of floating vegetation etc. and disposing to pre-approved location at any distance arranged by the Contractor. Clearing and removing of floating debris shall be performed in advance of all the activities. This work item also includes removal of all materials such as all form of municipal garbage, carcasses, farmyard dung, top organic soil etc. and disposing the same to pre-approved location at any distance arranged by the Contractor. Both the above activities shall be in accordance with the requirement of this specification.

### **2.4.1.1 Methods, Tools, and Equipment**

Only such methods, tools and equipment as are approved by the Engineer, and which are capable to remove the debris in totality are to be used. If necessary, boat may be deployed to push the floating debris to a predetermined location.

### **2.4.1.2 Disposal of Materials**

All materials arising from clearing of debris (including floating debris) operation shall be disposed of to the pre-approved location at any distance arranged by the Contractor.

### **2.4.1.3 Measurement for Payment**

Clearing and removing of debris (including floating debris) shall be measured per km length of the canal. Such measurement will qualify for payment only after disposal to pre-approved location at any distance arranged by the Contractor. Clearing and removing of floating debris shall be incidental to the clearing and removing of debris operation. Payment will be made as per BOQ provision.

## **2.5 Clearing and Removing of Water Hyacinth and Other Form of Floating Vegetation**

### **2.5.1 Scope**

This work shall consist of pushing of water hyacinth and other form of floating vegetation etc. stretch-wise to pre-identified location, lifting the same from the water, removing the same to a pre-approved location, allows the same to get dry and burnt to ash. Clearing and removing of water hyacinth and other form of floating vegetation shall be performed in advance of all the activities and in accordance with the requirement of this specification.

### **2.5.2 Methods, Tools, and Equipment**

Only such methods, tools and equipment as are approved by the Engineer, and which are capable to remove any form of floating vegetation in totality are to be used. If necessary, boat may be deployed to push the floating vegetation to a pre-determined location.

### **2.5.3 Disposal of Material**

All materials arising from clearing of water hyacinth and other form of floating vegetation shall be disposed of to pre-identified location for drying and burning to ash only in a manner as directed by the Engineer.

### **2.5.4 Measurement for Payment**

Clearing and removing of water hyacinth and other form of floating vegetation shall be measured in sqm. Such measurement will be performed only after the pushing to a pre-identified location to the satisfaction of Engineer. Such measurement shall qualify for payment only after disposal to pre-identified location and burnt them to ash in a manner as directed by the Engineer. Payment will be made as per BOQ provision.

## **2.6 Clearing and Removing Floating Debris (Applicable only for Suction Dredging)**

### **2.6.1 Scope**

This work shall consist of pushing of floating debris stretch-wise to pre-identified location of a canal, lifting the same from the water, removing of all materials such as all form of plastics, floating municipal debris but not the water hyacinth and other form of floating vegetation etc. and disposing to pre-approved location at any distance arranged by the Contractor. Clearing and removing of floating debris shall be performed in advance of all the activities.

### **2.6.2 Methods, Tools and Equipment**

Only such methods, tools and equipment as are approved by the Engineer, and which are capable to remove the debris in totality are to be used. If necessary, boat may be deployed to push the floating debris to a predetermined location.

### **2.6.3 Disposal of Material**

All materials arising from clearing of debris (including floating debris) operation shall be disposed of to pre-approved location at any distance arranged by the Contractor.

## **2.6.4 Measurement for Payment**

Clearing and removing of floating debris shall be measured per km length of the canal. Such measurement will qualify for payment only after disposal to pre-approved location at any distance arranged by the Contractor.

## **2.6.5 Rate**

The contract unit rates for clearing and removing of floating debris shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidental necessary to complete the work including handling, salvaging and disposing of the cleared materials to pre-approved location at any distance arranged by the Contractor with all lifts and lead.

## **2.7 Dismantling and Demolition**

### **2.7.1 Scope**

This work shall consist of removing, as here-in-after set forth, existing structures below or above GL consisting of concrete, RCC, brickwork, steel work, partitions, wood work, pipes and sewer lines, posts or struts, fencing, culverts, pavements, kerbs and other structures like guard rails, utility services, bamboo & wooden bridges etc., which are in place but interfere with the new construction or are not suitable to remain in place, and disposing off the resulting materials and back filling the resulting trenches and pits.

Dismantling and removal operations shall be carried out with such equipment and in such a manner as to leave undisturbed adjacent pavement, structures and any other work to be left in place.

All operations necessary for the removal of any existing structure which might endanger new construction shall be completed prior to the start of new work.

Payment shall be made for dismantling as per relevant items in BOQ.

All unusable materials arising from dismantling and demolition shall be disposed of by the Contractor to any suitable site to be arranged by the Contractor. Payment for transporting unusable materials shall be included in the quoted rates. No extra payment shall be made for such disposal. All serviceable materials arising from dismantling and demolition shall be stacked and sent to other stores as identified by the Engineer. Payment for transportation of usable materials only shall be made as per relevant items in BOQ.

## **2.8 Carriage of Materials and stacking**

### **2.8.1 Scope**

This Specification covers the general requirements for carriage of materials.

### **2.8.2 General**

The carriage and stacking of materials shall be done as directed by the Engineer. Any tools and plants required for the work shall be arranged by the Contractor. The carriage of materials including loading/unloading shall be included in Contractors rates.

### **2.8.3 Responsibility for Loss or Damage**

Loading, carriage, unloading and stacking shall be done carefully by the Contractor to avoid loss or damage to the materials. The Contractor shall be responsible for any loss or damage arising out of these.

## **2.8.4 Stacking, Covering and Protection**

Material shall be stacked in such a manner as to ensure the preservation of their quality and fineness for the work. Different types of materials shall be stacked separately and in such a way that counting and measurements can be done without disturbing the stacks. Any material that is liable to be affected by rain or other adverse weather conditions shall be covered and protected properly against the same. Cost of such protection shall be considered by Contractor in his quoted rates. Special care shall be taken by the Contractor for temporary storage of fragile and delicate materials.

Cement bags, steel bars, structural steel sections, bricks, timber and other similar materials shall be stacked in regular tiers. Cement bags shall be stored in covered enclosures/ godowns to prevent ingress of water. The bags shall not be allowed to come in contact with the ground/ floor and as per manufacturer's recommendation. Steel bars/ sections with fusion bonded epoxy coating shall be stacked properly so as not to damage the coating.

Pipes of RCC, MS, DI, HDPE, GI and uPVC etc. shall be stacked in rows.

Lime, stone metal, sand and such similar materials shall be stacked as directed by the Engineer.

The item rates shall be inclusive of carriage of all construction materials to site of works including loading and unloading. No extra payment will be made on this account.

## **2.9 Earthwork**

### **2.9.1 Scope**

This Specification covers the general requirements of earthwork in excavation in trenches and trial trenches/ pits, well sinking or otherwise and in different varieties of soil for the construction of pipe laying & allied works and pumping stations and in accordance with requirements of the specifications and as shown in the drawings or as directed by the Engineer. This specification also includes site grading, filling in trenches, filling back around foundations, conveyance and disposal of surplus spoils or stacking them properly and all operations covered within the intent and purpose of this specification. Excavation shall also include the trenching with shoring of any kind and sheet piling, which shall be paid as per relevant item of work.

### **2.9.2 Applicable Codes**

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

- 1) IS 783 : Code of practice for laying of concrete pipes
- 2) IS 1200 : Method of measurement of building & Civil Engineering works
- 3) IS 3764 : Code of safety for excavation work

### **2.9.3 Drawings**

The Engineer will furnish additional drawings wherever, in his opinion, such drawings are required to show areas to be excavated/ filled, sequence of priorities etc. Contractor shall strictly follow such drawings.

### **2.9.4 General**

The Contractor shall furnish all tools, plants, instruments, qualified supervisory personnel, labour, materials, any temporary work, consumable, any and everything necessary, whether or not such items are specifically stated herein for completion of the job in accordance with specification requirements.

The Contractor shall carry out excavation according to construction drawings approved by the Engineer and properly mark all lines and establish levels for various works such as earthwork in excavation for pipe laying & ancillary works, different units of pumping stations and other excavation works.

The excavation shall be done to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night for ensuring safety.

## **2.10 Methods, Tools and Equipment**

Only such methods, tools and equipment as approved by the Engineer shall be adopted/ used in the work. If so desired by the Engineer, the Contractor shall demonstrate the efficacy of the type of equipment to be used before commencement of the work.

Bidders must assess the site conditions because in most cases the excavation will have to be manual and mechanical excavation may not be possible because of narrow and congested roads.

### **2.10.1 Setting out**

Setting out shall be in accordance with Section 2.1.8 specified earlier.

## **2.11 Excavation**

Excavation shall be taken out to such widths, lengths, depths, and profiles as are shown on the drawings or such other lines and grades as may be specified by the Engineer.

The Contractor may, for facility of his work or similar other reasons, excavate, and also backfill later, if so approved by the Engineer, at his own cost, outside the lines shown on the drawings or directed by the Engineer. Should any excavation be taken below the specified levels, the Contractor shall fill it up with PCC (1:3:6) or granular material in accordance with the type of bedding upto the required level. No extra payment shall be claimed by the Contractor on this account.

All excavations shall be done to the minimum dimension as required for safety and working facility. Prior approval of the Engineer shall be obtained by the Contractor in each individual case, for the method he proposes to adopt for the excavation, including setting out, dimensions, side slopes, dewatering, disposal, etc. This approval, however, shall not in any way relieve the Contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as directed by the Engineer and precaution shall be taken to prevent slips. Should slips occur, the slipped material shall be removed and the slope dressed to a modified stable slope. Removal of the slipped earth shall not be paid for. Excavation dimensions shall be as indicated in the drawings.

For purposes of measurement, the volume of excavation shall be calculated by actual dimension as directed by the Engineer at site or as per approved drawing dimensions. For purposes of measurement in trenches the volume of excavation shall be calculated by measuring width from the outside edges of polling boards x length of trench x mean depth below GL between the outside faces of manholes/ catch pits/ gully pits. For measurement of excavation of manholes/ catch pits/ gulley pits the volume of excavation shall be computed from the outside dimension of the foundation slab.

While working in narrow roads, it may not be possible to store the excavated material beside the trench/ working area to allow traffic/ pedestrian movement. In such cases the Contractor shall be required to haul the excavated materials to a nearby storage space and subsequently bring back the selected excavated material during backfilling. The Contractor only under exclusive approval of the Engineer shall take up such work. The payment for such item will be made as per provisions of the Contract. The payment for such item will be made as per provisions of the Contract.

Surplus excavated spoils shall be disposed off by the Contractor to any place to be arranged by him but in keeping with the laws of the land. No extra lead will be payable.

When there is a continuous considerable inflow of water along with sand boiling 'Cement - Sand Grouting' at a pressure of about 1.5 kg/cm<sup>2</sup> may be adopted for required depth for soil conditioning as directed by the Engineer. The Contractor shall submit to the Engineer his scheme of cement - sand grouting along with sufficient details for approval. The work shall be carried out through specialized agency, to be arranged by the Contractor with prior approval from the Engineer. It is recommended that grouting shall be taken up only after driving timber shoring/ sheet pile. Otherwise, it will be difficult to drive the shoring planks/ sheet pile in cement grouted hard soil. Payment for such work shall be made as per provisions of the Contract.

When there is a continuous considerable inflow of water along with sand boiling 'Well Point System' - single stage or multistage may also be adopted as directed by the Engineer. The Contractor shall submit to the Engineer his scheme of well point system including the stages, the spacing, number and diameter of well points, headers, discharge point etc. and the number, capacity and location of pumps for approval. Payment for approved well point system shall be made as per provisions of the Contract.

## **2.12 Shoring**

### **2.12.1 Timber Shoring**

Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called 'Polling Boards'. The Contractor shall have to design the shoring keeping into consideration the soil characteristics and for varied depths and get it approved by the Engineer. These shall be of minimum 50 mm thick sections or as directed by the Engineer. The boards shall generally be placed in position, vertically, side by side without any gap, on each side of the excavation and shall be secured by horizontal walling of strong hard wood at maximum 1.2m spacing, struted with 'Ballies' or as directed by the Engineer. The length of the 'Bally' struts shall depend on the width of the trench or pit. The boards may be placed horizontally against each side of the excavation and supported by vertical walling according to site conditions and as per direction of Engineer.

Timber shoring shall be 'close' type. The type of timbering shall be as approved by the Engineer. It shall be the responsibility of the Contractor to take all necessary steps to prevent the sides of excavation, trenches, pits, etc. from collapsing.

Timber shoring may be required to keep the sides of excavations vertical to ensure safety of adjoining structures or to limit the slope of excavations, or due to space restrictions or for other reasons. Such shoring shall be carried out as per site requirement and in consultation with the Engineer. Generally timber shoring may not be required up to 1.5m depth of excavation, however the Engineer will decide if any shoring is required or not.

The withdrawal of the timber shall be done very carefully, to prevent collapse, systematically from one end to the other end. Concrete or masonry shall not be damaged during the removal of the timber. In case of trenches, the shoring should be withdrawn in stages, simultaneously on both sides of the trench to prevent any disturbance of the bedding.

In case of large pits and open excavations, where shoring is required for securing safety of adjoining structures or for any other reasons and where the planking across sides of excavations/ pits cannot be struted against, suitable inclined struts supported on the excavated bed shall be provided. Load from such struts shall be suitably distributed on the bed to ensure no yielding of the strut. If, however, Engineer directs any timbering to be left in, keeping in mind the type of construction or any other factor, the Contractor shall follow the instructions of the Engineer. Cost of left in timber below GL only shall

be paid to the Contractor as per provisions of the Contract. The projected portion of the shoring shall be cut at 30 cm below the road level or as directed by the Engineer without any extra cost.

### **2.12.2 Steel Shoring/ Sheet Piling**

Where the subsoil conditions are expected to be of soft and unstable character in any type of excavation the normal method of timbering may prove insufficient to avoid subsidence of the adjoining road surfaces and other services. In such circumstances Contractor will be required to use steel shoring or sheet piling adequately supported by timber struts, walling, etc. The Contractor shall have to design the shoring keeping into consideration the soil characteristics and for required depth of excavation and get it approved by the Engineer. The Contractor shall also submit the methodology of work under such circumstances and get it approved by the Engineer.

Sheet piles shall be of standard sections with interlocking joints. Sheet piles shall be hammered with manual hammer/ mechanical hammer/ vibratory hammer as may be required taking care that the surrounding structures are not damaged. The piles shall have to be driven very carefully true to plumb along the alignment up to the required depth. The driving of sheet piles shall also include driving of junction, corner, taper piles, clutch bars etc. where necessary. The rate shall be inclusive of cutting to sizes, making necessary arrangements for hoisting in position, drilling holes, hire charges of mechanical equipment, carriage of materials etc. Proper sheet pile caps shall have to be used in order to prevent damage to the head of the piles. The piles not driven to design depth or to plumb or to alignment shall be taken out by the Contractor and re-driven at no extra cost. Extracting these piles shall be by means of jacks or any other safe method the Contractor thinks fit. Proper timber or steel struts are to be placed across the trench to prevent the sheet piles from caving in. If sheet piles are required to be 'left-in' below GL for safety reasons at the direction of the Engineer, the cost of such 'left-in' steel shoring/ sheet piles shall be paid to the Contractor as per provision of Contract. The protruding portion of steel shoring/ sheet pile above GL shall be cut away without any extra cost.

If required, the sheet piles maybe fabricated with an internal jet pipe. These piles maybe jetted into position and then set with a hammer. Jetting may be used in special instances and only with permission of the Engineer. The Contractor shall determine the number of jets, and the volume and pressure of water at the jet nozzles necessary to freely erode the material adjacent to the pile. The Contractor shall control and dispose of all jet water in a manner satisfactory to the Engineer.

### **2.12.3 Ballah Piling**

Closed eucalyptus ballah piling is proposed for the areas where, to the discretion of the Engineer, the soil quality is poor and unstable for deep excavation with timber shoring, proximity of underground utilities which cannot be disturbed or to safeguard the adjacent properties. The ballah piles shall be of diameter 150 mm (measured at a distance of 1.5m from the thicker end). The ballah piles shall be driven unto a depth of about 50% more than the depth of excavation, unless otherwise directed by the Engineer. The ballah piles shall be driven by monkey. The pile head shall be provided with an iron band of size 75 mm x 12 mm to protect it from splintering under the blows of hammer. On completion of pipe laying work including backfilling, the ballah piles shall be carefully taken out. The rate quoted shall be inclusive of supply of ballah piles, all labour charges as may be required, hire and labour charges for necessary driving appliances and tackles, carriage of ballah piles etc. Contractor shall procure the ballah piles of length matching with the depth of driving required so that the protruding portion above GL is kept to the minimum. Measurement will be based on the length of ballah piles driven from the GL. Protruding portion of ballah piles above GL will not be paid.

### **2.13 Dewatering**

All excavations shall be kept free of water. Grading in the vicinity of excavations shall be controlled to prevent surface water running into excavated areas.

If water is met within the excavations due to seepage, subsoil water level & rain, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry whenever so required or directed by the Engineer. Such type of bailing out/ pumping will be considered as normal dewatering. Care shall be taken to discharge the drained water into suitable outlet as not to cause damage to the works or any other property. Dewatering shall not cause chokage to other drain/sewers. If it does, then the chokage shall be removed/ cleaned by Contractor at no extra cost. Sumps made for dewatering must be kept clear of the excavations/ trenches required for further work. Method of pumping shall be approved by the Engineer; but in any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction.

Normal dewatering as explained above is deemed to have been included in the unit rates quoted for excavation and pipe laying. If well pointing is required, it shall be paid separately within the provision of Contract. If there is surface flooding owing to excessive rain or water supply pipe/ waste water pipe damage or surface drains (nikashis)/ canal overflow and if such water fills up the excavated trench, then dewatering shall be done at the direction of the Engineer. Such dewatering (except that caused due to negligence/ damage done by the Contractor to the water supply or wastewater pipe systems or blockage to nikashis/ canals caused due to Contractor's work) shall be paid for as per item in BOQ. If the trench is filled up with rain water and no surface flooding is observed then this trench water shall be dewatered and the costs of such dewatering shall be included in excavation and pipe laying items. No extra payment shall be made for such dewatering. If, the trench is filled up with unprecedented rain water and surface flooding takes place then this trench water shall be dewatered and the costs of such dewatering shall be paid separately as per items in the BOQ. However, any payment for dewatering shall have to be approved by the Engineer prior to operation of the item.

If a trench is excavated adjacent to a water body and in spite of taking necessary measures for safeguard as advised by the Engineer, if it is observed that there is substantial infiltration into the trench from the water body, dewatering the trench shall be payable as per items in BOQ.

Over pumping for repairs and replacement of existing sewers shall be considered and payment shall be made as per item in BOQ.

## **2.14 Backfilling**

Backfilling of box drain/pipe trenches and excavations shall be done as directed by the Engineer with selected available excavated material as far as possible. Silver sand and borrowed earth may be used as filling material as directed by Engineer. The backfilling shall be carried out in such a way as not to cause undue thrust on any part of the construction. The compaction shall be done with the help of suitable equipment such as mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve at least 95% proctor density with respect to field density before excavation. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All clods of earth shall be broken or removed.

Wherever silver sand is used for filling in foundation and trenches, same shall be done in layers not exceeding 150 mm or as directed by the Engineer. Consolidation shall be done by thorough saturation with water and ramming complete. The rate shall be inclusive of the cost of supply of sand.

In pipe laying work, filling of the trenches shall be carried out simultaneously on both sides of the pipe to avoid unequal pressure on the pipe. The backfilling shall be done very carefully up to 300 mm above the crown of the pipe so as not to damage the pipe or disturb the level. Above this the filling and consolidation may be done at a faster pace as per instructions of Engineer. While consolidating the filled material above the crown of the pipe, care shall be taken not to damage the pipe in any manner.



## **2.15 Testing, Backfilling and Compaction**

In general, requirement of routine testing for backfilling is not being anticipated in this project. However, Engineer may ask for Standard Proctor Density Test for any compacted earth at site without any extra cost. Extent of such testing is expected to be kept limited to one number per new pump house construction or one number every 500m for pipe laying works. However, actual requirement for such tests shall be at the sole direction of the Engineer.

The compaction shall comply with the specified (Proctor/ Modified Proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. The Contractor shall demonstrate adequately at his cost, by field and laboratory tests that the specified density has been obtained.

To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by the Contractor at his cost.

## **2.16 Public Safety**

Trenches and pits etc. shall be securely barricaded as per drawing, provided with proper caution signs and marked with red lights at night to avoid accidents. The Contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures. For safety precautions, guidance may be taken from IS:3764 and Safety Plan included with this document.

## **2.17 Clearing**

The excavated area shall be cleared and cleaned after completion of work to the satisfaction of the Engineer.

## **2.18 Measurement and Payment**

All earthwork in excavation shall be measured net. Dimensions for purpose of payment shall be reckoned on the mean of the excavation multiplied by the mean depth from the surface below the road hard crust (whenever applicable) as given in BOQ.

Excavation for road crust shall be measured according to mean width of crust multiplied by mean depth of crust.

The actual effective area of shored faces as approved by the Engineer shall be measured in sqm. The area of planking/ sheeting embedded in the bed not to be considered, nor the area supporting inclined struts in case of large pits/ open excavation. All planks, boards, walling, verticals, struts, props and all other materials required for shoring and subsequent safe dismantling and removal shall be included in the quoted unit rates.

Payment for fill inside excavated areas and trenches, with selected excavated material will be made only for compaction as specified/ directed. Cost of all other operations shall deem to have been covered in the rate quoted for excavation. Payment for this work will be made based on net fill dimensions i.e. excavated dimension minus the volume occupied by structures, pipes, beddings, manholes, ancillaries etc.

Actual quantity of consolidated silver sand filling or with carried earth supplied by the Contractor shall be measured and paid in cubic meters as per BOQ Earth filling and EMBANKMENT CONSTRUCTION

## **2.19 EMBANKMENT CONSTRUCTION**

### **2.19.1 Description**

This specification shall apply to the construction of the embankment with approved material obtained from borrow pits or other sources arranged by the Contractor. All embankments shall be constructed in accordance with the requirements of these specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by Engineer.

### **2.19.2 Materials and General Requirements**

#### **2.19.2.1 Physical Requirements**

The materials used in embankments, shall be soil or any other material approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish, or any other ingredient likely to deteriorate or affect the stability of the embankment.

The following types of material shall be considered unsuitable for embankment:

- i) Materials from swamps, marshes, and bogs
- ii) Peat, log, stump and perishable material, any soil that classifies as OL, OI, OH or Pt in accordance with IS:1498
- iii) Materials susceptible to spontaneous combustion
- iv) Materials in a frozen condition
- v) Clay having liquid limit exceeding 70 and plasticity index exceeding 45.
- vi) Materials with salts resulting in leaching in the embankment.

Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 per cent when tested as per IS:2720 - Part 40) shall not be used as a fill material.

Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as  $\text{SO}_3$ ) per litre when tested in accordance with BS:1377 - Test 10 but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract, of concrete, cement bound materials or other cementitious materials forming part of the permanent works.

Materials with a total sulphate content (expressed as  $\text{SO}_3$ ) exceeding 0.5 per cent by mass, when tested in accordance with BS:1377 - Test 9 shall not be deposited within 500 mm or other distances described in the Contract, of metallic items forming part of the permanent works.

Material shall be free from any large size particles. Material shall be such that it can be compacted at optimum moisture, content by suitable compacting equipment to the maximum dry density. The dry bulk density of the soil fraction after compaction shall not be less than 95 percent of the maximum dry bulk density at optimum moisture content obtained in accordance with IS:2720 (Part 7). The co-efficient of permeability of the compacted material shall not be greater than 30 cm per year.

#### **2.19.2.2 Borrow Materials**

Arrangement for locating the source of supply of material for embankment as well as compliance to environmental requirements in respect of excavation and borrow areas as stipulated from time to time by the Ministry of Environment and Forests, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.

Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Should the Contractor be permitted to remove acceptable material from the site to suit his operational procedure, he shall make good any consequent deficit of material arising there from.

Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or sitting of temporary buildings or structures.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the laboratory following a testing programme approved by the Engineer. It shall be ensured that the material, when compacted not less than 95%, shall satisfy the requirement in accordance with IS:2720 (Part 7).

The Contractor shall, at least 7 working days before commencement of compaction, submit the following to the Engineer for approval:

- i) The values of maximum dry density and optimum moisture content obtained in accordance with IS:2720 (Parts 7 or 8) as the case may be, appropriate for each of the fill materials he intends to use.
- ii) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
- iii) The dry density moisture content - CBR relationships for light, intermediate and heavy compactive efforts [light corresponding to IS:2720 (Part 7), heavy corresponding to IS:2720 (Part 8) and intermediate in between the two] for each of the fill materials he intends to use in the sub-grade.

Once the above information has been approved by the Engineer, it shall form the basis for compaction.

## **2.19.3 Construction Operations**

### **2.19.3.1 Setting out**

After the site has been cleared, embankment shall be lock-spitted (Dog-Belled) and marked by fixing batter pegs on both sides at intervals of 20m as guides before commencing the earthwork. Profiles made by bamboos, earth or other convenient materials and strings shall be set up for the guidance of the workmen at about 50m apart over straight reaches and 25m apart in curved reaches.

### **2.19.3.2 Dewatering**

If the foundation of the embankment is in an area with stagnant water and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer and the area of the embankment foundation shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore it to original condition or compensate the damage at his own cost.

### **2.19.3.3 Stripping and Storing Topsoil**

The topsoil from all areas to be covered by embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged, or otherwise loaded and multiple handling shall be kept to a minimum.

The ground surface of the canal embankment shall be scarified making open furrows not less than 20 cm deep below natural ground surface at intervals of not more than 1m.

### **2.19.3.4 Compacting Ground Supporting Embankment/ Sub-grade**

Where necessary, the original ground shall be levelled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling so as to achieve minimum dry density of 95%.

Where so directed by the Engineer, any unsuitable material occurring in the embankment foundation shall be removed and replaced by approved materials laid in layers to the required degree of compaction.

Embankment work shall not proceed until the foundations for embankment have been inspected by the Engineer for satisfactory condition and approved.

Where the ground on which an embankment is to be built has any of the material considered unsuitable for embankment construction as mentioned above, at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

### **2.19.3.5 Spreading Material in Layers and Bringing to Appropriate Moisture Content**

The embankment material shall be spread in layers of uniform thickness not exceeding 200 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted as per specification given below. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be beyond agreed limits, the same shall be made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by blading, discing, or harrowing until uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the roadbed is too wet, it shall be dried by aeration and exposure to the sun till the moisture content is acceptable for compaction. Should circumstances arise, where, owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS:2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses that at the time of compaction it is in the range of 1 per cent above to 2 per cent below the optimum moisture content determined in accordance with IS:2720 (Part 7) or IS:2720 (Part 8) as the case may be. Expansive clays shall, however, be compacted at moisture content corresponding to the specified dry density, but on the wet side of the optimum moisture content obtained from the laboratory compaction curve.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a maximum size of 75 mm when being placed in the embankment and a maximum size of 50 mm when being placed in the sub-grade.

Embankment and other areas of fill, shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength of the original material.

Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations steeper than 1 vertical on 4 horizontals, such faces shall be benched immediately before placing the subsequent fill as per specification given below.

All permanent faces of side slopes of embankments and other areas of fill formed shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

### **2.19.3.6            Compaction**

Only the compaction equipment approved by the Engineer shall be deployed to compact the different material types encountered during construction.

The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted. Subsequent layers shall be placed only after the satisfactory compliance of the following test of the finished layer:

- Density moisture relationship in soil
- Density of the soil in finished layer
- Moisture content as accepted by the Engineer.

The Engineer may permit measurement of field dry density by a nuclear moisture/ density gauge used in accordance with agreed procedure and the gauge is calibrated to provide results identical to that obtained from tests in accordance with IS:2720 (Part 28). A record of the same shall be maintained by the Contractor.

When density measurements reveal any soft areas in the embankment, further compaction shall be carried out as directed by the Engineer. If in spite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

### **2.19.3.7 Drainage**

The surface of the embankment at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

### **2.19.3.8 Repairing of Damages Caused by Rain/ Spillage of Water**

The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the compaction stated above. If the cut is not sufficiently wide for use of required mechanical means for compaction, the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including arranging of machinery/equipment for the purpose.

### **2.19.3.9 Earthwork for Embankment to be Placed Against Sloping Ground**

Where an embankment/sub-grade is to be placed against sloping ground, the latter shall be appropriately benched or ploughed/scarified as below before placing the embankment material. When an existing embankment is to be widened and its slopes are steeper than 1 vertical on 4 horizontal, continuous horizontal benches, each at least 300 mm wide, shall be cut into the old slope for ensuring adequate bond with the fresh embankment material to be added. The material obtained from cutting of benches could be utilized in the widening of the embankment. However, when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontals, the slope surface may be only ploughed or scarified instead of resorting to benching. Extra earthwork involved in benching or due to ploughing/scarifying etc. shall be considered incidental to the work.

For wet conditions, benches with slightly inward fall and subsoil drains at the lowest point shall be provided as per the drawings before the fill is placed against sloping ground.

### **2.19.3.10 Finishing operations**

Finishing operations shall include the work of shaping and dressing the embankment and side slopes to conform to the alignment, levels, cross-sections, and dimensions shown on the drawings or as directed by the Engineer subject to the surface tolerance of  $\pm 25$  mm.

Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain.

The topsoil removed and conserved earlier shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moistened slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm.

When earthwork operations have been substantially completed, the canal area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

### **2.19.4 Measurement for Payment and Rate**

Earth embankment construction shall be measured separately by taking cross-sections at intervals in the original position before the work starts and after its completion and computing the volumes of earthwork in cubic metres by the method of average end areas.

The contract unit rates for the items of embankment construction shall be paid as per contract provisions.

## **2.20 Materials for Structures**

### **2.20.1 Scope**

Materials to be used in the work shall conform to the specifications mentioned on the drawings, the requirements laid down in this section and specifications for relevant items of work covered under these specifications.

If any material, not covered in these specifications, is required to be used in the work, it shall conform to relevant Indian Standards or International Standards (in the absence of Indian standards) or to the requirements specified by the Engineer.

### **2.20.2 Sources of Material**

The Contractor shall notify the Engineer of his proposed sources of materials prior to delivery. If it is found after trial that sources of supply previously approved do not produce uniform and satisfactory products, or if the product from any other source proves unacceptable at any time, the Contractor shall furnish acceptable material from other sources at his own expense.

### **2.20.3 Bricks**

Burnt clay bricks shall conform to the requirement of IS:1077, except that the minimum compressive strength when tested flat shall not be less than 8.4 MPa for individual bricks and 10.5 MPa for average of 5 specimens. They shall be free from cracks and flaws and nodules of free lime. The brick shall have smooth rectangular faces with sharp corners and emit a clear ringing sound when struck. The size may be according to local practice with a tolerance of  $\pm 5$  per cent.

### **2.20.4 Stones**

Stones shall be specified of the type. It shall be hard, sound, free from cracks, decay and weather and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used.

The stones, when immersed in water for 24 hours, shall not absorb water by more than 5 per cent of their dry weight when tested in accordance with IS: 1124.

The length of stones shall not exceed 3 times its height nor shall they be less than twice its height plus one joint. No stone shall be less in width than the height and width on the base shall not be greater than three-fourths of the thickness of the wall nor less than 150 mm

### **2.20.5 Cement**

**Usage of Green Cement conforming to IS: 1489 (I)- 2015 Portland Pozzolana Cement (PPC) is mandatory, for all item of civil works to be carried out under the subject contract.**

### **2.20.6 Coarse Aggregates**

For plain and reinforced cement concrete (PCC and RCC) or pre-stressed concrete (PSC) works, coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or granite, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material. They shall not contain pieces of disintegrated stones, soft, flaky, elongated particles, salt, alkali, vegetable matter or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the steel reinforcement. Coarse aggregate having positive alkali silica reaction shall not be used. All coarse aggregates shall conform to IS:383 and tests for conformity shall be carried out as per IS:2386 (Parts 1 to 8).

The Contractor shall submit for the approval of the Engineer; the entire information indicated in Appendix A of IS:383.

Nominal size of coarse aggregate for various components in PCC & RCC is mentioned in BOQ. In case of discrepancy the decision of the Engineer is final.

The maximum value for flakiness index for coarse aggregate shall not exceed 35 percent. The coarse aggregate shall satisfy the following requirements of grading:

IS Sieve Size	Percent by Weight Passing the Sieve		
	40 mm	20 mm	12.5 mm
63 mm	100	–	–
40 mm	95-100	100	–
20 mm	30-70	95-100	100
12.5 mm	–	–	90-100
10 mm	10-35	25-55	40-85
4.75 mm	0-5	0-10	0-10

## 2.20.7 Sand/Fine Aggregates

For masonry work, sand shall conform to the requirements of IS:2116.

For plain and reinforced cement concrete (PCC and RCC) works, fine aggregate shall consist of a suitable combination of natural sand. They shall not contain dust, lumps, soft or flaky, materials, mica or other deleterious materials in such quantities as to reduce the strength and durability of the concrete, or to attack the embedded steel. Sand washing machines shall be used to remove impurities from sand. Fine aggregate having positive alkali-silica reaction shall not be used. All fine aggregate shall conform to IS: 383 and test for conformity shall be carried out as per IS:2386 (Parts 1 to 8). The Contractor shall submit to the Engineer the entire information indicated in Appendix A of IS:383. The fineness modulus of fine aggregate shall neither be less than 2.0 nor greater than 3.5.

Sand/ fine aggregate for structural concrete shall conform to the following grading requirements.

IS Sieve Size	Percent by Weight Passing the Sieve		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 micron	15-34	35-59	60-79
300 micron	5-20	8-10	12-40
150 micron	0-10	0-10	0-10

## 2.20.8 Steel

### 2.20.8.1 Reinforcement

For reinforced cement concrete (RCC) works, the reinforcement/ intentioned steel as the case shall consist of the following grades of reinforcing bars:



Grade designation	Bar type conforming to governing IS specification	Characteristic strength ( $f_y$ ) (MPa)	Elastic modulus (GPa)
S 240	IS:432 Part I – Mild steel bar	240	200
S 415	IS:1786 – High yield strength deformed bars	415	200
S 500		500	200

Other grades of bars conforming to IS:432 and IS:1786 shall not be permitted.

All steel shall be procured from original producers, or their authorized re-rollers.

Only new steel shall be delivered to the site. Every bar shall be inspected before assembling on the work and defective, brittle or burnt bar shall be discarded. Cracked ends of bars shall also be discarded.

Whenever specified, either in drawings or BOQ, reinforcement steel i.e. high yield strength deformed bars shall be coated with fusion bonded epoxy coating conforming to IS:13620. The coating shall be applied to the abrasive blast cleaned heated rod as an electrostatically charged dry powder sprayed on to the grounded steel bar. The coating thickness shall be varying between 0.1 to 0.3 mm after curing. Damaged areas shall be patched up with epoxy patching material as per IS:13620. Mandrel bending machines shall be used for bending end. Utmost care should be taken for not damaging the coated surface during fabrication and placement of bars. Utmost care shall be taken so that bars are not damaged during handling and transportation.

## 2.20.9 Water

Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete. Mixing and curing with sea water shall not be permitted. As a guide, the following concentrations represent the maximum permissible values:

- 1) To neutralise 200 ml sample of water, using phenolphthalein as an indicator, it should not require more than 2 ml of 0.1 normal NaOH.
- 2) To neutralise 200 ml sample of water, using methyl orange as an indicator, it should not require more than 10 ml of 0.1 normal HCl.
- 3) The permissible limits for solids shall be as follows when tested in accordance with IS:3025

i)	Organic	200 mg/lit
ii)	Inorganic	3000 mg/lit
iii)	Sulphates ( $\text{SO}_4$ )	500 mg/lit
iv)	Chlorides (Cl)	500 mg/lit *
v)	Suspended matter	2000 mg/lit

\* In case of structures of lengths 30m and below, the permissible limit of chlorides may be increased upto 1000 mg/lit.

All samples of water (including potable water) shall be tested, and suitable measures may be necessary to ensure conformity of the water to the requirements stated herein.

- 4) The pH value shall not be less than 6.5.

### **2.20.10 Timber**

The timber used for structural purposes shall conform to IS:883.

### **2.20.11 Concrete Admixtures**

#### **2.20.11.1 General**

Admixtures are materials added to the concrete before or during mixing with a view to modify one or more of the properties of concrete in the plastic or hardened state.

Concrete admixtures are proprietary items of manufacture and shall be obtained only from established manufacturers with proven track record, quality assurance and full-fledged laboratory facilities for the manufacture and testing of concrete. The manufacturer should be ISO:9000/ 14000 certified.

The Contractor shall provide the following information concerning each admixture after obtaining the same from the manufacturer:

- 1) Normal dosage and detrimental effects, if any, of under dosage and over dosage
- 2) The chemical names of the main ingredients in the admixtures
- 3) The chloride content, if any, expressed as a percentage by weight of the admixture
- 4) Values of dry material content, ash content and relative density of the admixture which can be used for uniformity tests.
- 5) Whether or not the admixture leads to the entrainment of air when used as per the manufacturer's recommended dosage and if so to what extent
- 6) Where two or more admixtures are proposed to be used in any one mix, confirmation as to their compatibility.
- 7) There should be no increase in risk of corrosion of the reinforcement or other embedment as a result of using the admixture.

#### **2.20.11.2 Physical and Chemical Requirements**

Admixtures shall conform to the requirements of IS:9103. In addition, the following conditions shall be satisfied:

- 1) Plasticisers' and 'Super-plasticisers' shall meet the requirements indicated for 'water reducing admixture'.
- 2) Except where resistance to freezing and thawing and to disruptive action of deicing salts is necessary, the air content of freshly mixed concrete in accordance with the pressure method given in IS:1199 shall not be more than 2 per cent higher than that of the corresponding control mix and in any case not more than 3 per cent of the test mix.
- 3) The chloride content of the admixture shall not exceed 0.2 per cent when tested in accordance with IS:6925.
- 4) Uniformity tests on the admixtures are essential to compare qualitatively the composition of different samples taken from batch to batch or from the same batch at different times.

The tests that shall be performed along with permissible variations in the same are indicated below.

- Dry material content: to be within 3 per cent and 5 per cent of liquid and solid admixtures respectively of the value stated by the manufacturer.
- Ash content: to be within 1 per cent of the value stated by the manufacturer.

- Relative density (for liquid admixtures) : to be within 2 percent of the value stated by the manufacturer.
- 5) All tests relating to the concrete admixtures shall be conducted periodically at an independent laboratory and compared with the data given by the manufacturer.

## **2.20.12 Storage of Materials**

### **2.20.12.1 General**

All materials shall be stored at proper places to prevent their deterioration or intrusion by foreign matter and to ensure their satisfactory quality and fitness for the work. The storage space must also permit easy inspection, removal, and re-storage of the materials. All such materials even though stored in approved godowns/ places, must be subjected to acceptance test prior to their immediate use.

### **2.20.12.2 Brick**

Bricks shall not be dumped at site. They shall be stacked in regular tiers as they are unloaded, to minimize breakage and defacement. The supply of bricks shall be available at site at any time. Bricks selected for use in different situations shall be stacked separately.

### **2.20.12.3 Aggregates**

Aggregate stockpiles may be made on ground that is denuded of vegetation, is hard and well drained. If necessary, the ground shall be covered with 50 mm plank or brick flat soling.

Coarse aggregates shall be delivered to the site in separate sizes agreed by the Engineer in writing.

In case of fine aggregates, these shall be deposited at the mixing site not less than 8 hours before use and shall have been tested and approved by the Engineer.

Broken brick (burnt clay) fine aggregate (surkhi) shall be stacked on a hard surface or platform so as to prevent the admixture of clay, dust, vegetation and other foreign matter. It shall be also protected from rain and dampness and kept under adequate covering.

### **2.20.12.4 Cement**

Cement shall be transported, handled, and stored on the site in such a manner to avoid deterioration or contamination. Cement shall be stored above ground level in perfectly dry and water-tight sheds and shall be stacked not more than eight bags high. Wherever bulk storage containers are used their capacity shall be sufficient to cater to the requirement at site and shall be cleaned at least once every 3 to 4 months.

Each consignment shall be stored separately so that, it may be readily identified and inspected, and cement shall be used in the sequence in which it is delivered at site. Any consignment or part of a consignment of cement which had deteriorated in any way, during storage, shall not be used in the works and shall be removed from the site by the Contractor without charge to the Employer.

The Contractor shall prepare and maintain proper records on site in respect of delivery, handling, storage and use of cement and these records shall always be available for inspection by the Engineer.

The Contractor shall make a monthly return to the Engineer on the date corresponding to the interim certificate date, showing the quantities of cement received and issued during the month and in stock at the end of the month.

### **2.20.12.5 Reinforcement**

The reinforcement bars, when delivered on the job, shall be stored above the surface of the ground upon platforms, skids, or other supports, and shall be protected from mechanical injury and from deterioration by exposure.

### **2.20.12.6 Water**

Water shall be stored in containers/ tanks covered at top and cleaned at regular intervals in order to prevent intrusion by foreign matter or growth of organic matter. Water from shallow, muddy or marshy surface shall not be permitted. The intake pipe shall be enclosed to exclude silt, mud, grass and other solid materials and there shall be a minimum depth of 0.60m of water below the intake always.

### **2.20.13 Tests and Standards of Acceptance**

All materials, even though stored in an approved manner shall be subjected to an acceptance test prior to their immediate use. Independent testing of cement for every consignment shall be done by the Contractor at site or in a laboratory approved by the Engineer before use. Any cement with lower quality than those shown in manufacturer's certificate shall be debarred from use. In case of imported cement, the same series of tests shall be carried out before acceptance.

#### **2.20.13.1 Testing and Approval of Material**

The Contractor shall furnish test certificates from the manufacturer/supplier of materials along with each batch of material(s) delivered to site. Tests shall be as specified in QAP.

The Contractor shall set up a field laboratory (as given below) with necessary equipment for testing materials, finished products used in the construction as per requirements of conditions of contract and the relevant specifications. The testing of all the materials shall be carried out in presence of the Engineer or his representative for which the Contractor shall make all the necessary arrangements and shall bear the entire cost.

Tests which cannot be carried out in this field laboratory have to be got done at the Contractor's cost at any recognized reputed laboratory/ testing establishments approved by the Engineer.

Field laboratory equipment shall be (minimum) :

- Compressive strength testing machine with jack – 1 no.
- Standard stainless-steel sieves – 2 sets
- Sump cone and rod – 3 sets
- Equipment and apparatus for measuring proctor density
- Measuring cylinders 1000 ml capacity – 6 nos.
- Assorted beakers
- Weighing scale (analog dial) 0 - 500 kg
- Weighing scale electronic 0 - 5 kg
- Electric heater
- Filter paper No. 40
- Assorted laboratory glassware
- Assorted reagents
- Any other equipment that may be required according to the Engineer as per relevant tests given in QAP.

This laboratory should be housed properly with a competent laboratory technician.

### **2.20.13.2 Sampling of Materials**

Samples provided to the Engineer or his representative for their retention is to be in labelled boxes suitable for storage.

Samples required for approval and testing must be supplied well in advance, by at least 48 hours or minimum period required for carrying out relevant tests to allow for testing and approval. Delay to works arising from the late submission of samples shall not be acceptable as a reason for delay in the completion of the works.

If materials are brought from abroad, the cost of sampling/ testing whether in India or abroad shall be borne by the Contractor.

### **2.20.13.3 Rejection of Materials Not Conforming to the Specifications**

Any stack or batch of material(s) of which sample(s) does not conform to the prescribed tests and quality shall be rejected by the Engineer or his representative and such materials shall be removed from site by the Contractor at his own cost. Such rejected materials shall not be made acceptable by any modifications.

### **2.20.13.4 Testing and Approval of Plant and Equipment**

All plants and equipment used for preparing, testing and production of materials for incorporation into the permanent works shall be in accordance with manufacturer's specifications and shall be got approved by the Engineer before use.

## **2.21 Structural Concrete and Mortar**

### **2.21.1 Scope**

This specification covers the general requirements for concrete to be used on jobs using on-site production facilities including requirements about the quality, handling, storage of ingredients, proportioning, batching, mixing and testing of concrete and also requirements in regard to the quality, storage, bending and fixing of reinforcement. This also covers the transportation of concrete from the mixer to the place of final deposit and the placing, curing, protecting, repairing and finishing of concrete.

### **2.21.2 Applicable Codes and Specifications**

The following specifications, standards and codes are made a part of this specification. All standards, specifications, codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. Other IS codes not specifically mentioned here, but pertaining to woodwork and joinery form part of these specifications. In case of discrepancy between this specification and those referred to herein, this specification shall govern.

### **2.21.3 Materials**

IS:383	Specification for coarse and fine aggregates from natural sources for concrete
IS:432	Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement
IS:455	Specification for Portland slag cement
IS:516	Method of test for strength of concrete
IS:1199	Method of sampling and analysis of concrete

IS:1489	Specification for Portland pozzolona cement
IS:1566	Specification for hard drawn steel wire fabric for concrete reinforcement
IS:1786	High strength deformed steel bars and wires for concrete reinforcement – Specification
IS:2386	Methods of test for aggregates for concrete
IS:2645	Integral water proofing compounds for cement mortar and concrete – Specification
IS:3025	Method of sampling and test (physical and chemical) for water and wastewater
IS:4031	Methods of physical tests for hydraulic cement
IS:4990	Specification for plywood for concrete shuttering work
IS:8041	Specification for rapid hardening Portland cement
IS:12269	Specification for 53 grade ordinary Portland cement
BS:4461	Cold worked steel bars for the reinforcement of concrete

#### 2.21.4 Equipment

IS:1791	General requirements for batch type concrete mixers
IS:2438	Specification for roller pan mixer
IS:2505	Concrete vibrators : Immersion type – General requirements
IS:2506	General requirements for screed board concrete vibrators
IS:2514	Specification for concrete vibrating tables
IS:2722	Specification for portable swing weigh batchers for concrete (single and double bucket Type)
IS:2750	Specification for steel scaffoldings

#### 2.21.5 Codes of Practice

IS:456	Plain and reinforced concrete - Code of practice
IS:2250	Code of practice for preparation and use of masonry mortars
IS:2502	Code of practice for bending and fixing bars for concrete reinforcement
IS:2571	Code of practice for laying in-situ cement concrete flooring
IS:2751	Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction
IS:3370	Code of practice for concrete structures for the storage of liquids
IS:3414	Code of practice for design and installation of joints in buildings
IS:3558	Code of practice for use of immersion vibrators for consolidating concrete
IS:4014	Code of practice for steel tubular scaffolding

#### 2.21.6 Construction Safety

IS:3696	Safety code for scaffolds and ladders
---------	---------------------------------------

### 2.21.7 Measurement

IS:1200	Method of measurement of building and Civil Engineering works
---------	---

## 2.22 Reinforcement

### 2.22.1 General

The quality of materials and method and control of manufacture and transportation of all concrete work irrespective of mix, whether reinforced or otherwise, shall conform to the applicable portions of this specification.

The Engineer shall have the right to inspect the source(s) of material(s), the layout and operation of procurement and storage of materials, the concrete batching and mixing equipment and the quality control system. Such an inspection shall be arranged and the Engineer's approval obtained, prior to starting of concrete work.

### 2.22.2 Materials

All materials shall conform to the requirements given elsewhere.

### 2.22.3 Steel Reinforcement

#### 2.22.3.1 Laps

Laps and splices for reinforcement shall be as shown on the drawings. Splices in adjacent bars shall be staggered and the locations of all splices, except those specified on the drawings, shall be approved by the Engineer. The bars shall not be lapped unless the length required exceeds the maximum available length of bars at site.

#### 2.22.3.2 Bending

- 1) Reinforcing bars supplied bent or in coils, shall be straightened before they are cut to size. Straightening of bars shall be done in cold and without damaging the bars. This is considered as a part of reinforcement bending fabrication work.
- 2) All bars shall be accurately bent according to the sizes and shapes shown on the detailed working drawings and bar bending schedules prepared by the Contractor as per the construction drawings and approved by the Engineer. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and rebent in a manner that will injure the material and bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25 mm in diameter which may be bent hot if specifically approved by the Engineer. Bars which depend for their strength on cold working shall not be bent hot. Bars bent hot shall not be heated beyond cherry red colour (not exceeding 845 °C) and after bending, shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only if the means used for straightening and rebending is such as shall not, in the opinion of the Engineer, injure the material. No reinforcement shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having kinks or bends other than those required by design shall not be used. All reinforcement bars shall be bent with mandrel bending machines especially if they are fusion epoxy bonded.

#### 2.22.3.3 Fixing

Reinforcement shall be accurately fixed by any approved means and maintained in the correct position as shown in the drawings by the use of MS galvanized PVC spacers and chairs as per IS:2502 to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing points shall be securely bound together at all such points with number 16 gauge annealed soft iron wire. The vertical distances required between successive layers of bar in beams or similar

members shall be maintained by the provision of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between spacer bars.

#### **2.22.3.4 Welding of Bars**

When permitted or specified on the drawings, joints of reinforcement bars shall be butt welded so as to transmit their full strength. Welded joints shall preferably be located at points where the reinforcement steel will not be subject to more than 75% of the maximum permissible stresses and the welded joints shall be staggered such that, at any one section, not more than 33% of bars are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in two or three stages, the previous surfaces shall be cleaned properly. Ends of bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed for the work. The MS electrodes used for welding shall conform to IS:814. Welded pieces of reinforcement shall be tested. Specimens shall be taken from the actual site and their number and frequency of test shall be as directed by the Engineer. If welding is permitted on fusion bonded bars then the welded points are to be touched up with epoxy patching compound.

##### **2.22.3.4.1 Cover**

Unless indicated otherwise on the drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish) shall be as follows:

- 1) At each end of reinforcing bar, not less than 25 mm, nor less than twice the diameter of the bar.
- 2) For a longitudinal reinforcing bar in a column, not less than 40 mm, nor less than the diameter of the bar. In case of columns of minimum dimension of 20 cm or under, with reinforcing bars of 12 mm and less in diameter, a cover of 25 mm may be used.
- 3) For longitudinal reinforcing bars in a beam, not less than 25 mm, nor less than the diameter of the bar.
- 4) For tensile, compressive, shear, or other reinforcement in a slab or wall, not less than 13 mm, nor less than the diameter of such reinforcement.
- 5) For any other reinforcement, not less than 13 mm, nor less than the diameter of such reinforcement.
- 6) For footings and other principal structural members in which the concrete is deposited directly against the ground, cover to the bottom reinforcement shall be 75 mm. If concrete is poured on a layer of lean concrete the bottom cover may be reduced to 50 mm.
- 7) For concrete surfaces exposed to the weather or the ground after removal of forms, such as retaining walls, grade beams, footing sides and top, etc., not less than 50 mm for bars larger than 16 mm diameter and not less than 40 mm for bars 16 mm diameter or smaller.
- 8) Increased cover thickness shall be provided, as indicated on the drawings, for surfaces exposed to the action of harmful chemicals (or exposed to earth contaminated by such chemical), acid, alkali, saline atmosphere, sulphurous smoke, etc.
- 9) For reinforced concrete members, totally or periodically immersed in sea water or subject to sea water spray, the cover of concrete shall be 50 mm more than those specified in (1) to (5) above.
- 10) For liquid retaining structures, the minimum cover to all steel shall be 40 mm or the diameter of the main bar, whichever is greater. In the presence of sea water and soils and waters of a corrosive character the cover shall be increased by 10 mm.
- 11) Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing a dense impermeable concrete with approved protective coatings, as specified



in the drawings. In such a case the extra cover mentioned in (8) and (9) above, may be reduced by the Engineer to those shown on the drawings.

- 12) The correct cover shall be maintained by cement mortar cubes or other approved means. Reinforcement for footings, grade beams and slabs on sub-grade shall be supported on precast concrete blocks as approved by the Engineer. The use of pebbles or stones shall not be permitted.
- 13) The 28 day crushing strength of cement mortar cubes/ precast concrete cover blocks shall be at least equal to the specified strength of concrete in which these cubes/ blocks are embedded.
- 14) The minimum clear distance between reinforcing bars shall be in accordance with IS:456 or as shown in drawings.

#### **2.22.3.4.2 Inspection**

Erected and secured reinforcement shall be inspected and approved by the Engineer prior to placement of concrete.

#### **2.22.3.4.3 Payment**

For payment of work done under this item, the actual quantity of steel embedded in concrete as calculated and approved by the Engineer, irrespective of the level or the height at which the work is done, shall be taken. The unit rate for reinforcement shall include all wastage, binding wire, etc. for which no separate payment shall be made. Laps as shown in drawings or as approved by the Engineer and minimum number of chairs and spacer bars shall be measured and paid for.

#### **2.22.3.5 Steel Shapes Encased in Concrete**

Structural steel columns, beams, girders and bracings to be encased in concrete shall be unpainted, if so indicated on the drawings. The encasing shall be done in concrete with 10 mm maximum size aggregate and cube strength not less than 150 kg/cm<sup>2</sup> at 28 days unless otherwise specified in drawings. The steel member shall be wrapped with galvanized wire mesh of the size indicated on the drawings. The galvanized wire mesh shall be kept 20 mm from the edge or surface of the steel member and shall be held in position securely. The steel member shall have a minimum cover of 50 mm unless otherwise indicated on the drawings. Where the clear cover to steel is more than 75 mm, mild steel bar and concrete with 20 mm coarse aggregate can be used.

#### **2.22.4 Controlled Concrete**

All concrete in the works shall be 'Controlled Concrete' as defined in IS:456, unless it is a nominal mix concrete such as 1:3:6, 1:4:8 or 1:5:10. Whether reinforced or otherwise, all controlled concrete works to be carried out under this specification shall be divided into the following classification. If for any reason, according to the Engineer, controlled concrete is not possible then volumetric mix may be allowed. The mixes will be as under:

M15 (1:2:4) ; M20 (1:1½: 3) ; M25 (1:1:2); M30 (1:0.75:1.5)

However, if volumetric mixes are allowed, then the cube strengths shall have to be higher than M15, M20, M25, M30 as specified in IS codes. M30 concrete should be used for all water retaining structures.

Minimum compressive strength of 15 cm cubes at 7 and 28 days after mixing, conducted in accordance with IS:516 shall be as follows:

Class	Work Test kg/cm <sup>2</sup>		Max. size of Aggregate (mm)
	At 7 days	At 28 days	
M40	270	400	20
M35	235	350	20
M30	200	300	20
M25	170	250	20
M20	135	200	20
M15	100	150	20

Note : It shall be very clearly understood that whenever the class of concrete such as M20 is specified it shall be the Contractor's responsibility to ensure that minimum crushing strength stipulated for the respective class of concrete is obtained at works. The maximum total quantity of aggregate by weight per 50 kg of cement shall not exceed 450 kg, except when otherwise specifically permitted by Engineer.

## 2.22.5 Mix Design

Mix design shall be provided by the Contractor. This is to investigate the grading of aggregates, water-cement ratio, workability and the quantity of cement required to give preliminary and works cubes of the minimum strength specified. The proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be based on the principles given in IS:456 and SP:23 'Handbook for Design Mix Concrete'. The mix design shall be approved by the Engineer after checking the cube strengths. However, the Contractor shall be fully responsible for failure of the concrete structures even if the mix design is approved by the Engineer.

Whenever there is a change either in required strength of concrete, or water-cement ratio or workability or the source of aggregates and/ or cement, preliminary tests shall be repeated to determine the revised proportions of the mix to suit the altered conditions. While designing mix proportions, over-wet mixes shall always be avoided.

While fixing the value for water - cement ratio for preliminary mixes, assistance may be derived from the graph (Appendix A, IS:456) showing the relationship between the 28 day compressive strengths of concrete mixes with different water - cement ratios and the 7 day compressive strength of cement tested in accordance with IS:269.

### 2.22.5.1 Mix Design for Controlled Concrete

The mix designs shall be submitted by the Contractor within 45 days from the date of award of work.

### 2.22.5.2 Preliminary Tests

Tests specimens shall be prepared with at least two different water - cement ratios for each class of concrete, consistent with workability required for the nature of the work. The materials and proportions used in making preliminary tests shall be similar in all respects to those, to be actually employed in the works as the object of these tests is to determine the proportions of cement, aggregates and water necessary to produce concrete of required consistency and to give the specified strength. It shall be the Contractor's sole responsibility to carry out statement of proportions proposed to be used for the various concrete mixes.

Materials shall be brought to the room temperature, and all materials shall be in a dry condition. The quantities of water, cement and aggregates for each batch shall be determined by weight to an accuracy of 1 part in 1000 parts.

### **2.22.5.3 Mixing Concrete**

For all works, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction period. Mixing shall be continued till materials are uniformly distributed and a uniform colour of entire mass is obtained, and each individual particle of the coarse aggregate shows a complete coating of mortar containing its proportionate amount of cement. In no case, the mixing shall be done for a period of not less than two minutes after all ingredients have been put into the mixer. In case of hand mixing, quantity of cement shall be increased by 10% above that specified, the cost of increased cement quantity being borne by the Contractor. Hand mixing shall be permitted only under exceptional conditions, and the Contractor must take the permission of the Engineer in advance. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting a new batch. Unless otherwise agreed by the Engineer, the first batch of concrete from the mixer shall contain only two thirds of the normal quantity of coarse aggregate. The mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

### **2.22.5.4 Consistency**

The consistency of each batch of concrete shall be measured immediately after mixing, by the slump test, care shall be taken to ensure that no water or other material is lost. The material used for the slump test may be remixed with the remainder of the concrete for making the specimen test cubes. The period of re-mixing shall be as short as possible, yet sufficient to produce a homogeneous mass.

### **2.22.5.5 Size of Test Cubes**

Compression tests of concrete cubes shall be made as per IS:516 on 15 cm cubes. Each mould shall be provided with a metal base plate having no leakage. The base plate shall be preferably attached to the mould when assembled and shall be positively and rigidly held together. Before placing concrete, the mould and base plate shall be cleaned and oiled. The dimensions and internal faces of the mould shall be accurate within the following limits:

- 1) Height and distance between the opposite faces of the mould shall be of specified size  $\pm 0.2$  mm. The angle between the adjacent internal faces and between internal faces and top and bottom planes of mould shall be  $90^\circ \pm 0.5^\circ$ . The interior faces of the mould shall be plane surfaces with a permissible variation of 0.03 mm.

### **2.22.5.6 Compacting**

Concrete test cubes shall be moulded by placing fresh concrete in the mould and compacted as specified in IS:516.

### **2.22.5.7 Curing**

Curing shall be as specified in IS:516. The cubes shall be kept in moist air of at least 90% relative humidity at a temperature of  $27^\circ\text{C} \pm 2^\circ\text{C}$  for 2 hours  $\pm 1/2$  hr. from the time of adding water to the dry ingredients, thereafter in clean, fresh water and kept at  $27^\circ\text{C} \pm 2^\circ\text{C}$  temperature until seven days. A record of maximum and minimum temperatures at the places of storage of the cubes shall be maintained during the period they remain in storage.

### **2.22.5.8 Testing of Specimens**

The strength shall be determined based on not less than five cube test specimens for each age and each water - cement ratio. All these laboratory test results shall be tabulated and furnished to the Engineer. The test results will be accepted by the Engineer if the average compressive strengths of the specimens tested are not less than the compressive strength specified for the age at which specimens are tested, subject to the condition that only one out of the five consecutive tests may give a value less than the specified strength for that age. The Engineer may direct the Contractor to repeat the tests if the results are not satisfactory and also to make such changes as he considers necessary

to meet the requirements specified. All these preliminary tests shall be conducted by the Contractor at his own cost in an approved laboratory.

## **2.22.6 Proportioning, Consistency, Batching and Mixing of Concrete**

### **2.22.6.1 Proportioning**

#### **2.22.6.2 Aggregate**

The proportions which shall be decided for conducting preliminary tests shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weigh batchers conforming to IS:2722 capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Engineer that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stocked in separate stockpiles. The grading of coarse and fine aggregate shall be checked as frequently as possible, as determined by the Engineer, to ensure maintaining of grading in accordance with the sample used in preliminary mix design. The material shall be stockpiled well in advance of use.

#### **2.22.6.3 Cement**

The cement shall be measured by weight.

#### **2.22.6.4 Water**

Only such quantity of water shall be added to the cement and aggregates in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with the strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of material or the collection of excessive free water on the surface of the concrete.

#### **2.22.6.5 Definition of Water - Cement Ratio**

The water - cement (W/C) ratio is defined as the weight of water in the mix (including the surface moisture of the aggregates) divided by the weight of cement in the mix.

#### **2.22.6.6 Water - Cement Ratio**

The actual water cement ratio to be adopted shall be determined in each instance by the Contractor and approved by the Engineer.

#### **2.22.6.7 Proportioning by Water - Cement Ratio**

The water - cement ratio specified for use by the Engineer shall be maintained. The Contractor shall determine the water content of the aggregates as frequently as directed by the Engineer as the work progresses and as specified in IS:2386 (Part 3) and the amount of mixing water added at the mixer shall be adjusted as directed by the Engineer to maintain the specified by water - cement ratio. To allow for the variation in weight of aggregates due to variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

#### **2.22.6.8 Consistency and Slump**

Concrete shall be of a consistency and workability suitable for the condition of the job. After the amount of water required is determined, the consistency of the mix shall be maintained throughout the progress of the corresponding parts. Compacting factor tests, in accordance with IS:1199 shall be conducted from time to time to ensure the maintenance of such consistency.

The following table gives a range of slumps which shall generally be used for various types of construction unless otherwise instructed by the Engineer.

Types of Construction (Private)	Slump in mm	
	Maximum	Minimum
Reinforced foundation walls and footings	75	25
Plain footings, caissons, and sub-structure walls	75	25
TG and Massive compressor foundations	50	25
Slabs, beams and reinforced walls	100	25
Pumps & miscellaneous equipment foundations	75	25
Building columns	100	25
Pavements	50	25
Heavy mass construction	50	25

### 2.22.6.9 Batching and Mixing of Concrete

The materials and proportions of concrete materials as established by the preliminary tests for the mix design shall be rigidly followed for all concrete on the project and shall not be changed except when specifically permitted by the Engineer.

Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batchers shall be maintained in clean, serviceable condition. The accuracy of weigh batchers shall be periodically checked. They shall be set up level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately. Volume batching will not be permitted. However, the Engineer may permit volume batching by subsequent conversion of the weights of important pours involving concrete of not more than 0.25 cubic metres, on days when other pours involving weigh batching are not likely to be taken up. Concrete shall be of strength stipulated in the respective items. All concrete shall be mixed in mechanically operated batch mixers complying with IS:1791 and of approved make with suitable provision for correctly controlling the water delivered to the drum.

The quantity of water actually entering the drum shall be checked with the reading of the gauge or valve setting, when starting a job. The test shall be made while the mixer is running. The volume of the mixed material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregates. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour, for a minimum period of two minutes after all the materials and water are in the drum. The entire contents of the drum shall be discharged in one operation before the raw materials for the succeeding batches are fed into the drum.

Each time the work stops, the mixer shall be cleaned out and when next commencing the mixing, the first batch shall have 10% additional cement to allow for sticking in the drum.

### 2.22.6.10 Sampling and Testing Concrete in the Field

Facilities required for sampling materials and concrete in the field, if the Engineer so desires, shall be provided by the Contractor at no extra cost. The following equipment with operator shall be made available at the Engineer's request (all must be in serviceable condition) :

	Equipment	Quantity
1	Concrete cube testing machine suitable for 15 cm cubes of 100 tonnes capacity with proving calibration ring	1 no.
2	Cast iron cube moulds 15 cm size	50 nos. (min.)
3	Slump cone complete with tamping rod	5 sets
4	Laboratory balance to weigh upto 5 kg with sensitivity of 10 gm	1 no.
5	IS Sieves for coarse and fine aggregates	3 sets
6	Electric oven with thermostat upto 120°C	1 no.
7	Flakiness gauge	1 no.
8	Elongation index gauge	1 no.
9	Sedimentation pipette	1 no.
10	Pycnometer	1 no.
11	Calibrated glass jar 1 litre capacity	3 nos.
12	Glass flasks & metal containers	As required
13	Chemical reagents like sodium hydroxide, tannic acid, litmus papers etc.	As required
14	Laboratory balance of 2 kg capacity and of sensitivity of 1 gm	1 no.

Note: Arrangement can be made by the Contractor to have the cubes tested in an approved laboratory in lieu of a testing machine at site at his expense, with the prior consent of the Engineer.

#### **2.22.6.11 Sampling for strength of concrete**

At least 6 test cubes of each class of concrete shall be taken for every 150 cum concrete or part thereof. Such samples shall be drawn on each day for each type of concrete. Of each set of 6 cubes, three shall be tested at 7 days age and three at 28 days age. The laboratory test results shall be tabulated and furnished to the Engineer. The Engineer shall pass the concrete if average strength of the specimens tested is not less than the strength specified, subject to the condition that only one out of three consecutive tests may give a value less than the specified strength, but this shall not be less than 90% of the specified strength.

#### **2.22.6.12 Consistency**

Slump tests shall be carried out as often as demanded by the Engineer and invariably from the same of concrete from which the test cubes are made. Slump tests shall be done immediately after sampling.

#### **2.22.6.13 Admixtures**

Admixtures may be used in structural concrete only with the approval of the Engineer based upon evidence that, with the passage of time, neither the compressive strength nor its durability will reduce. Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement, or embedded steel parts. When calcium chloride is permitted to be used such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1½ percent of the weight of the cement in each batch of concrete. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by the Engineer.

#### **2.22.6.14 Air Entraining Agents**

Where specified and approved by the Engineer, neutralized vinsol resin or any other approved air entraining agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6-260 : Air Entraining Admixtures for Concrete. The recommended total air content of the concrete is  $4\% \pm 1\%$ . The method of measuring air content shall be as per IS:1199.

#### **2.22.6.15 Water Reducing Admixtures**

Where specified and approved by the Engineer water reducing lignosulfonate mixture shall be added in quantities specified by the Engineer. The admixtures shall be added in the form of a solution.

#### **2.22.6.16 Retarding Admixtures**

Where specified and approval by the Engineer, retarding agents shall be added to the concrete mix in quantities specified by the Engineer.

#### **2.22.6.17 Water Proofing Agent**

Where specified and approved by the Engineer, water proofing agent conforming to IS:2645, shall be added in quantities specified by the Engineer.

#### **2.22.6.18 Tests**

The Engineer, if he so desires, may order tests to be carried out on cement, sand, coarse aggregate, water in accordance with the relevant Indian Standards.

##### **Tests on cement shall include:**

- 1) Fineness test
- 2) Test for normal consistency
- 3) Test for setting time
- 4) Test for soundness
- 5) Test for tensile strength
- 6) Test for compressive strength

##### **Tests on sand shall include:**

- 1) Sieve test
- 2) Test for organic impurities
- 3) Test for sieve analysis and fineness modulus

##### **Tests on coarse aggregate shall include:**

- 1) Sieve analysis
- 2) Specific gravity and unit weight of dry, loose and rodded aggregate
- 3) Soundness and alkali aggregate reactivity
- 4) Petrographic examination
- 5) Deleterious materials and organic impurities
- 6) Test for aggregate crushing value

Any or all these tests would normally be ordered to be carried out only if the Engineer feels that the materials are not in accordance with the specifications or if the specified concrete strengths are not

obtained and shall be performed by the Contractor at an approved test laboratory. If the tests are successful, owner shall pay for all such optional tests otherwise the Contractor shall have to pay for them.

If the works cubes do not give the stipulated strengths, the Engineer reserves the right to ask the Contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standard stipulated, at the Contractor's cost. The unit rate for concrete shall be inclusive of making preliminary mix design and test cubes, works, cubes, testing them as per specification, slump tests, optional tests, etc. complete.

#### **2.22.6.19 Load test on members or any other tests**

In the event of any work being suspected of faulty material or workmanship or both, the Engineer requiring its removal and reconstruction may order, or the Contractor may request that it should be load tested in accordance with the following provisions:

- 1) The test load shall be 125 percent of the maximum superimposed load for which the structure has been designed. Such test load shall not be applied before 56 days after the effective hardening of concrete. During the test, struts strong enough to take the whole load shall be placed in position leaving a gap under the members. The test load shall be maintained for 2 hours before removal.
- 2) If within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 percent of the maximum deflection shown during the 24 hours under load, the test loading shall be repeated after a lapse of at least 72 hours. The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 75 percent of the maximum deflection shown during the second test. If the structure is certified as failed by the Engineer, the cost of the load test shall be borne by the Contractor.
- 3) Any other tests, e.g. taking out in an approved manner concrete cores, examination and tests on such cores removed from such parts of the structure as directed by the Engineer, sonic testing etc. shall be carried out by the Contractor if so directed.

#### **2.22.6.20 Unsatisfactory Tests**

- 1) Should the results of any test prove unsatisfactory, or the structure shows signs of weakness, undue deflection or faulty construction, the Contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by the Engineer/ Owner. The Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfill the test conditions is proved to be solely due to faulty design. The cost of load and other tests shall be borne by the Contractor if the tests show unsatisfactory results; otherwise such costs will be borne by the Owner.

#### **2.22.6.21 Preparation Prior to Concrete Placement, Final Inspection and Approval**

Before the concrete is actually placed in position, the insides of the formwork shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection, especially at bottom of columns and wall forms, to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Openings shall be placed or holes drilled so that these materials and water can be removed easily. Such openings/ holes shall be later suitably plugged.

All embedded parts, inserts etc. shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

All anchor bolts shall be positioned and kept in place with the help of properly manufactured templates unless specifically waived in writing by the Engineer. The use of all such templates, fixtures etc. shall be deemed to be included in the rates. Slots, openings, holes, pockets etc. shall be provided in the concrete work in the positions indicated in the drawings or as directed by the Engineer.

Reinforcement and other items to be cast in concrete shall have clean surfaces that will not impair bond.



Prior to concrete placement, all work shall be inspected and approved by the Engineer and if found unsatisfactory, concrete shall not be poured until after all defects have been corrected at the Contractor's cost.

Approval by the Engineer of any and all materials and work as required herein shall not relieve the Contractor from his obligation to produce finished concrete in accordance with the drawings and specifications.

#### **2.22.6.22 Rain or Wash Water condition**

No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rains shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixture. To guard against damage which may be caused by rains, the works shall be covered with tarpaulins, immediately after the concrete has been placed and compacted before leaving the work unattended. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid flow of water over/ around freshly placed concrete, suitable drains & sumps shall be provided.

#### **2.22.6.23 Bonding Mortar**

Immediately before concrete placement begins, prepared surfaces except formwork, which will come in contact with the concrete to be placed, shall be covered with a bonding mortar.

#### **2.22.6.24 Transportation**

All buckets, containers or conveyers used for transporting concrete shall be mortar-tight. Irrespective of the method of transportation adopted, concrete shall be delivered with the required consistency and plasticity without segregation or loss of slump. However, chutes shall not be used for transport of concrete without the written permission of the Engineer and concrete shall not be re-handled before placing.

#### **2.22.6.25 Re-tampered or Contaminated Concrete**

Concrete must be placed in its final position before it becomes too stiff to work. On no account, water shall be added after the initial mixing. Concrete which has become stiff or has been contaminated with foreign materials shall be rejected and disposed off as directed by the Engineer.

#### **2.22.6.26 Cleaning of Equipment**

All equipment used for mixing, transporting and placing of concrete shall be maintained in clean condition. All pans, buckets, hoppers, chutes, pipelines and other equipment shall be thoroughly cleaned after each period of placement.

### **2.22.7 Procedure for Placing of Concrete**

#### **2.22.7.1 Engineer's Approval of Equipment & Methods**

Before any concrete is placed, the entire placing programme consisting of equipment, layout, proposed procedures and methods shall be submitted to the Engineer for approval if so demanded by the Engineer and no concrete shall be placed until the Engineer's approval has been received. Equipment for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing, without segregation of materials, considering the size of the job and placement location.

#### **2.22.7.2 Time Interval between Mixing and Placing**

Concrete shall be placed in its final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer, and once compacted, it shall not be disturbed.

#### **2.22.7.3 Avoiding Segregation**

Concrete shall, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be re-handled or caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible, and in narrow forms, the Contractor shall provide suitable drop and 'Elephant Trunks' to confine the movement of concrete.

Special care shall be taken when concrete is dropped from a height, especially if reinforcement is in the way, particularly in columns and thin walls.

#### **2.22.7.4 Placing by Manual Labor**

Except when otherwise approved by the Engineer, concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height more than 1.0m or handled in a manner which will cause segregation.

#### **2.22.7.5 Placing by Mechanical Equipment**

The following specification shall apply when placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of work involved.

The control of placing shall begin at the mixer discharge by a vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in its final position.

#### **2.22.7.6 Type of Buckets**

Central-bottom-dump buckets of a type that provides for positive regulation of the amount and rate of deposition of concrete in all dumping position shall be employed.

#### **2.22.7.7 Operation of Bucket**

For placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowering for dumping. The open bucket shall clear the concrete already in place and the height of drop shall not exceed 1m. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients or disturbance of previously placed concrete will not be permitted.

#### **2.22.7.8 Placement in Restricted Forms**

Concrete placed in restricted forms by barrows, buggies, short chutes, hand shovelling shall be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly as practicable in its final position.

#### **2.22.7.9 Chuting**

Where it is necessary to use transfer chutes, specific approval of the Engineer must be obtained to type, length, slopes, baffles, vertical terminals and timing of operations. These shall be so arranged that an almost continuous flow of concrete is obtained at the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mixes shall have less coarse aggregate. During cleaning of chutes, the waste water shall be kept clear of the forms. Concrete shall not be permitted to fall from the end of the chutes by more than 1m. Chutes, when approved for use, shall have slopes not flatter than 1 vertical : 3 horizontal and not steeper than 1 vertical : 2 horizontal. Chutes shall be of metal or metal lined and of rounded cross section. The slopes of all chute sections

shall be approximately the same. The discharge end of the chutes shall be maintained above the surface of the concrete in the forms.

#### **2.22.7.10 Placing by Pumping/ Pneumatic Placers**

Concrete may be conveyed and placed by mechanically operated equipment e.g. pumps or pneumatic placers, only with the written permission from the Engineer necessary for conveying concrete by this method.

When pumping is adopted, before pumping of concrete is started, the pipeline shall be lubricated with one or two batches of mortar composed of one part cement and two parts sand. The concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

When pneumatic placer is used, the manufacturer's advice on layout of pipeline shall be followed to avoid blockages and excessive wear. Restraint shall be provided at the discharge box to take care for the reaction at this end.

Manufacturer's advice shall be followed regarding concrete quality and all other related matters when pumping/ pneumatic placing equipment are used.

#### **2.22.7.11 Concrete in Layers**

Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15 to 90 cm or as directed by the Engineer. These shall be placed as rapidly as practicable to prevent the formation of cold joints or planes of weakness between each succeeding layer within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit shall be spotted progressively along the face of the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shoveling. Any tendency to segregation shall be corrected by shoveling stones. Such a condition shall be corrected by redesign of mix or other means, as directed by the Engineer.

#### **2.22.7.12 Bedding of Layers**

The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed by the Engineer.

#### **2.22.7.13 Compaction**

Concrete shall be compacted during placing with approved vibrating equipment until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate, fits tightly against all form surfaces, reinforcement and embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of vibrators shall be consistent with the concrete mix and caution exercised not to over vibrate the concrete to the point that segregation results.

#### **2.22.7.14 Type of Vibrators**

Vibrators shall conform to IS specifications. Type of vibrator to be used shall depend on the structure where concrete is to be placed. Shutter vibrators to be effective, shall be firmly secured to the formwork which must be sufficiently rigid to transmit the vibration and strong enough not to be damaged by it. Immersion vibrators shall have 'no load' frequency, on the size of the vibrator.

Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators shall not be permitted.

### **2.22.7.15 Use of Vibrators**

The exact manner of application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of lift e.g., in a column or wall.

### **2.22.7.16 Melding Successive Batches**

When placing concrete in layers, which are advancing horizontally as the work progresses, great care shall be exercised to ensure adequate vibration, blending, and melding of the concrete between the succeeding layers.

### **2.22.7.17 Penetration of Vibrator**

The immersion vibrator shall penetrate the layer being placed and penetrate the layer below while the under layer is still plastic to ensure good bond and homogeneity between the two layers and prevent the formation of cold joints.

### **2.22.7.18 Vibrating Against Reinforcement**

Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. They shall also not be allowed to come in contact with forms or finished surfaces.

### **2.22.7.19 Use of Form Attached Vibrators**

Form attached vibrators shall be used only with specific authorization of the Engineer.

### **2.22.7.20 Use of Surface Vibrators**

The use of surface vibrators shall not be permitted under normal conditions. However, for thin slabs, such as highways, runways and similar constructions, surface vibration by specially designed vibrators may be permitted, upon approval of the Engineer.

## **2.22.8 Stone Pockets and Mortar Pondages**

The formation of stone pockets or mortar pondages in corners and against faces of forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for thorough bonding, as directed by the Engineer.

## **2.22.9 Placement Interval**

Except when placing with slip forms, each placement of concrete in multiple lift work shall be allowed to set for at least 24 hours after the final set of concrete and before the start of a subsequent placement.

### **2.22.9.1 Special Provision in Placing**

When placing concrete in walls with openings, in floors of integral slabs and beam construction and other similar conditions, the placing shall stop when the concrete reaches the top of the opening in walls or bottom horizontal surface of the slab, as the case may be. Placing shall be resumed before the concrete in place takes initial set, but not until it has had time to settle as determined by the Engineer.

### **2.22.9.2 Placing Concrete through Reinforcing Steel**

When placing concrete through reinforcing steel, care shall be taken to prevent segregation of the coarse aggregate. Where the congestion of steel makes placing difficult, it may be necessary to temporarily move the top aside to get proper placement and restore reinforcing steel to design position.

### **2.22.9.3 Bleeding**

Bleeding or free water on top of concrete being deposited into the forms shall be a cause to stop the concrete pour and the conditions causing this defect corrected before any further concreting is resumed.

### **2.22.10 Construction Joints and Keys**

Concrete shall be placed without interruption until completion of the part of the work between predetermined construction joints, as specified here-in-after. Time lapse between the pouring of adjoining units shall be as specified on the drawings or as directed by the Engineer.

If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made where the work is stopped. Joints shall be either vertical or horizontal, unless shown otherwise on drawings. In case of an inclined or curved member, the joint shall be at right angles to the axis of the member. Vertical joints shall be formed against a stop board; horizontal joints shall be level and wherever possible, arranged so that the joint lines coincide with the architectural features of the finished work. Battens shall be nailed to the formwork to ensure a horizontal line and if directed, shall also be used to form a grooved joint. For tank walls and similar works joints shall be formed as per IS:3370. Concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering. Horizontal and vertical construction joints and shear keys shall be located and shall conform to the requirements of the plans unless otherwise directed by the Engineer. Where not described, the joint shall be in accordance with the following:

#### **2.22.10.1 Column Joint**

In a column, the joint shall be formed 75 mm below the lowest soffit of the beams including haunches if any. In flat slab construction, the joint shall be 75 mm below the soffit of column capital. At least 2 hours shall elapse after depositing concrete in columns, piers or walls, before depositing in beams, girders or slabs supported thereon.

#### **2.22.10.2 Beam and Slab Joints**

Concrete in a beam shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and at the centre or within the middle third of the span unless otherwise shown in drawings. Where a beam intersects a girder, the joints in the girder shall be offset by a distance equal to twice the width of the beam and additional reinforcement provided for shear. The joints shall be vertical throughout the full thickness of the concrete member. A joint in a slab shall be vertical and parallel to the principal reinforcement. Where it is unavoidable at the right angles to the principal reinforcement, the joint shall be vertical and at the middle of the span.

#### **2.22.10.3 Joints in Liquid Retaining Structures**

Vertical construction joints in watertight construction shall not be permitted unless indicated on the drawings. Where a horizontal construction joint is required to resist water pressure, special care shall be taken in all phases of its construction to ensure maximum water tightness.

#### **2.22.10.4 Dowels**

Dowels for concrete work, not likely to be taken up in the near future shall be wrapped in tar paper and burlap.

### **2.22.10.5 Mass Foundations**

Mass foundations shall be poured in lifts not exceeding 1.5m in height unless otherwise indicated on the drawings or approved by the Engineer.

### **2.22.10.6 Treatment of Construction Joints on Resuming Concreting**

A drier mix shall be used for the top lift of horizontal pours to avoid laitance. All laitance and loose stones shall be thoroughly and carefully removed by wire brushing/ hacking and surface washed.

Just before concreting is resumed, the roughened joint surface shall be thoroughly cleaned, and loose matter removed and then treated with a thin layer of cement grout of proportion specified by the Engineer and worked well into the surface. The new concrete shall be well worked against the prepared face before the grout mortar sets. Special care shall be taken to obtain thorough compaction and to avoid segregation of the concrete along the joint plane.

### **2.22.11 Curing, Protecting and Repairing**

#### **2.22.11.1 Curing**

All concrete shall be cured by keeping it continuously damp for the period required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays, ponded water, continuously saturated covering of sacking, canvas, hessian or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even-textured coat. Extra precautions shall be exercised in curing concrete during cold and hot weather as outlined here-in-after. The quality of curing water shall be same as the one used for mixing concrete.

Certain types of finish or preparation for overlaying concrete must be done at certain stages of the curing process and special treatment may be required for specific concrete surface finish.

Curing of concrete made of high alumina cement and super sulphated cement shall be carried out as directed by the Engineer.

#### **2.22.11.2 Curing with Water**

Fresh concrete shall be kept continuously wet for a minimum period of 10 days from the date of placing of concrete, following a lapse of 12 to 14 hours after laying concrete. The curing of horizontal surfaces exposed to the drying winds shall, however, begin immediately after the concrete has hardened. Water shall be applied to unformed concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled to prevent erosion of freshly placed concrete.

#### **2.22.11.3 Continuous Spraying**

Curing shall be assured by use of an ample water supply under pressure in pipes with all necessary appliances of hose, sprinklers, and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by the Engineer.

#### **2.22.11.4 Alternate Curing Methods**

Whenever, to the judgment of the Engineer, it may be necessary to omit the continuous spray method, a covering of clean sand or other approved means such as wet gunny bags which will prevent loss of moisture from the concrete, may be used. No type of covering will be approved which will stain or damage the concrete during or after the curing period. Covering shall be kept continuously wet during the curing period.

For curing of concrete in pavements, sidewalks, floors, flat roofs or other level surfaces, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by the Engineer. Special attention shall be given to edges and corners of the slabs to ensure proper protection to these areas. The ponded areas shall be kept continuously filled with water during the curing period.

#### **2.22.11.5 Curing Compounds**

Surface coating type curing compounds shall be used only by special permission of the Engineer. Curing compounds shall be liquid type, white pigmented, conforming to US Bureau of Reclamation Specification. No curing compound shall be used on surfaces where future blending with concrete, water or acid proof membrane, or painting is specified.

#### **2.22.11.6 Curing Equipment**

All equipment and materials required for curing shall be on hand and ready for use before concrete is placed.

#### **2.22.11.7 Protecting Fresh Concrete**

Fresh concrete shall be protected from the elements, from defacements and damage due to construction operations by leaving forms in place for an ample period as specified later in this specification. Newly placed concrete shall be protected by approved means such as tarpaulins from rain, sun, and winds. Steps as approved by the Engineer shall also be taken to protect immature concrete from damage by debris, excessive loading, vibration, abrasion or contact with other materials etc. that may impair the strength and/ or durability of the concrete. Workmen shall be warned against and prevented from disturbing green concrete during its setting period. If it is necessary that workmen enter the area of freshly placed concrete, the Engineer may require that bridges be placed over the area.

#### **2.22.11.8 Repair and Replacement of Unsatisfactory Concrete**

Immediately after the shuttering is removed, the surface of concrete shall be very carefully gone over, and all defective areas called to the attention of the Engineer who may permit patching of the defective areas or also reject the concrete unit either partially or entirely. Rejected concrete shall be removed and replaced by the Contractor at no additional expense to the Owner.

Holes left by form bolts etc. shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing 2.36 mm IS sieve after removing any loose stones adhering to the concrete. Mortar filling shall be struck off flush at the face of the concrete. Concrete surfaces shall be finished as described under the items of work.

Superficially honey-combed surfaces and rough patches shall be similarly made good immediately after removal of shuttering, in presence of the Engineer and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with a wooden float. Excess water shall be avoided. Unless instructed otherwise by the Engineer, the surface of the exposed concrete placed against shuttering to remove fine or other irregularities, care being taken to avoid damaging the surface. Surface irregularities shall be removed by grinding.

If reinforcement is exposed or the honey combing occurs at vulnerable positions e.g., ends of beams or columns it may be necessary to cut out the member completely or in part and reconstructed. The decision of the Engineer shall be final in this regard.

If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25 mm) the edges being cut perpendicular to the affected surface or with a small under cut, if possible. Anchors, tees, or dovetail slots shall be provided whenever necessary to attach the new concrete securely in place.

An area extending several centimetres beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

#### **2.22.11.9 Use of Polymers**

The use of polymers for bonding fresh concrete used for repairs will be permitted upon written approval of the Engineer. Polymers shall be applied in strict accordance with the instruction of the manufacturer.

#### **2.22.11.10 Method of Repair**

Small size holes having surface dimensions of about equal to the depth of the hole left after removal of form bolts, grout insert holes and slots cut for repair of cracks shall be repaired as follows:

- 1) The hole to be patched shall be roughened and thoroughly soaked with clean water until absorption stops. A 5 mm thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched, followed immediately by the patching with concrete which shall be well consolidated with a wooden float and left slightly proud of the surrounding surface. The concrete patch shall be built up in 10 mm thick layers. After an hour or more, depending upon weather conditions, it shall be worked off flush with a wooden float and a smooth finish obtained by wiping with hessian, a steel trowel shall be used for this purpose. The mix for patching shall be of the same materials and in the same proportions as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible.
- 2) Mortar filling by air pressure (guniting) shall be used for repair of areas too large and/ or too shallow for patching with mortar. Patched surfaces shall be given a final treatment to match the colour and texture of the surrounding concrete. White cement shall be substituted for ordinary cement, if so, directed by the Engineer, to match the shade of the patch with the original concrete.

#### **2.22.11.11 Curing of Patched Work**

The patched area shall be covered immediately with an approved non staining, water saturated material such as gunny bags which shall be kept continuously wet and protected against sun and wind for a period of 24 hours. Thereafter, the patched area shall be kept wet continuously by a fine spray or sprinkling for not less than 10 days.

#### **2.22.11.12 Approval by Engineer**

All materials, procedures and operations used in the repair of concrete and also the finished repair work shall be subject to the approval of the Engineer. All fillings shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the fillings have been cured and dried.

#### **2.22.12 Finishing**

This specification is intended to cover the treatment of concrete surfaces of all structures. Areas requiring special finish not covered by this specification shall be clearly indicated on the drawings and special specifications shall be furnished.

##### **2.22.12.1 Finish for Formed Surfaces**

The type of finish for formed concrete surfaces shall be as follows, unless otherwise specified by the Engineer:

- 1) For surfaces against which backfill, or concrete is to be placed, no treatment is required except repair of defective areas.



- 2) For surfaces below grade which will receive waterproofing treatment, the concrete shall be free of surface irregularities which would interfere with proper application of the waterproofing material which is specified for use.
- 3) Unless specified, surfaces which will be exposed when the structure is in service shall receive no special finish, except repair of damaged or defective concrete, removal of fins and abrupt irregularities, filling of holes left by form ties and rods and clean-up of loose or adhering debris.

Surfaces which will be exposed to the weather, and which would normally be level shall be sloped for drainage. Unless the drawing specifies a horizontal surface or shows the slope required, the tops of narrow surfaces such as stair treads, walls, curbs, and parapets shall be sloped across the width approximately 1 in 30. Broader surfaces such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete, sub-floors to be covered with concrete topping, terrazzo or quarry tile and similar surfaces shall be smooth screeded and levelled to produce even surfaces. Surface irregularities shall not exceed 6 mm. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside decks, floors of galleries and sumps, parapets, gutters, sidewalks, floors & slabs, shall be consolidated, screeded, and floated. Excess water & laitance shall be removed before final finishing. Floating may be done with hand or power tools and started as soon as the screeded surface has attained a stiffness to permit finishing operations, and these shall be the minimum required to produce a surface uniform in texture and free from screen marks or other imperfections. Joints and edges shall be tooled as called for on the drawings or as directed by the Engineer.

#### **2.22.12.2 Standard Finish for Exposed Concrete**

- 1) Exposed concrete shall mean any concrete, other than floors or slabs, exposed to view upon completion of the job.
- 2) Unless otherwise specified on the drawings, the standard finish for exposed concrete shall be a smooth finish.
- 3) A smooth finish shall be obtained with the use of lined or plywood forms having smooth and even surfaces and edges. Panels and form linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms the joint marks shall be smoothed off and all blemishes, projections, etc. removed leaving the surfaces reasonably smooth and unmarred.

#### **2.22.12.3 Integral Cement Concrete Finish**

When specified on the drawings an integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded, as specified on the drawings and as per IS:2571. The surface shall be compacted and then floated with a wood float or power floating machine. The surface shall be tested with a straight edge and any high and low spots eliminated. Floating or trowelling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.

#### **2.22.12.4 Rubbed Finish**

A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings. Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, offsets levelled and voids and/ or damaged sections immediately saturated with water and repaired by filling with a concrete or mortar of the same composition as was used in the surface. The surfaces shall then be thoroughly wetted and rubbed with carborundum or other abrasive. Cement mortar may be used in the rubbing, but the finished surfaces shall not be brush coated with either cement or grout after rubbing. The finished surfaces shall present a uniform and smooth appearance.

#### **2.22.12.5 Protection**

All concrete shall be protected against damage until final acceptance by the Engineer/ Owner.

### 2.22.13 Formwork

The formwork shall consist of shores, bracings, sides of beams and columns, bottom of slabs including ties, anchors, hangers, inserts and shall be properly designed and planned for the work. False work shall be so constructed that vertical adjustments can be made to compensate for taking up and settlements. Wedges may be used at the top or bottom of timber shores, but not at both ends, to facilitate vertical adjustment or dismantling of the formwork.

#### 2.22.13.1 Design of Formwork

The design and engineering of the formwork as well as its construction shall be the responsibility of the Contractor. If so instructed, the drawings and/ or calculations for design of the formwork shall be submitted to the Engineer for approval before proceeding with work at no extra cost to the Employer. The Engineer's approval shall not however relieve the Contractor of his full responsibility for the design and construction of the formwork. The design shall take into account all the loads vertical as well as lateral that the forms will be carrying including live and vibration loadings.

#### 2.22.13.2 Camber

Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The formwork shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per meter (1 to 25) or as directed by the Engineer so as to offset the subsequent deflection. For cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer.

#### 2.22.13.3 Tolerances

Tolerance is specified as permissible variation from lines, grade or dimensions given in drawings. No tolerances specified for horizontal or vertical building lines or footings shall be construed to permit encroachment beyond the legal boundaries. Unless otherwise specified, the following tolerances will be permitted.

##### 2.22.13.3.1 Tolerance for RC Buildings

###### 1) Variation from the plumb

- In the lines and surfaces of columns, piers, walls and in arises 5 mm per 2.5m or 25 mm, whichever is less.
- For exposed corner columns and other conspicuous lines
 

In any bay or 5m maximum	–	5 mm
In 10m or more	–	10 mm

###### 2) Variation from the level or from the grades indicated on the drawings.

- In slab soffits, ceilings, beam soffit and in arisers
 

In 2.5m	–	5 mm
In any bay or 5m maximum	–	8 mm
In 10m or more	–	15 mm
- For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines
 

In any bay or 5m maximum	–	5 mm
In 10m or more	–	10 mm

###### 3) Variation of the linear building lines from established position in plan and related position of columns, wall, and partitions

In any bay or 5m maximum – 10 mm  
 In 10m or more – 20 mm

- 4) Variation in the sizes and locations of sleeves, openings in walls and floors 5 mm except in the case of anchor bolts

- 5) Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls

Minus – 5 mm  
 Plus – 10 mm

- 6) Footings

- Variation in dimension in plans

Minus – 5 mm  
 Plus – 10 mm

- Misplacement or eccentricity

2% of footing width in the direction of misplacement but not more than 50 mm

- Reduction in thickness

Minus – 5% of specified thickness subject to a maximum of 50 mm

- Variation in steps

In a flight of stairs : Rise - 3 mm; Tread- 5 mm

In consecutive steps : Rise - 1.5 mm; Tread- 3 mm

#### 2.22.13.3.2 Tolerances in Other Concrete Structures

- 1) All Structures

- Variation of the constructed linear outline from established position in plan

In 5m – 10 mm  
 In 10m or more – 15 mm

- Variations of dimensions to individual structure features from established positions

In 20m or more – 25 mm  
 In buried construction – 50 mm

- Variation from plumb, from specified batter or from curved surfaces of all structures

In 2.5m – 10 mm  
 In 5m – 15 mm  
 In 10m or more – 25 mm  
 In buried construction – Twice the above amounts

- Variation from level or grade indicated on drawings in slab, beams, soffits, horizontal grooves and visible arisers

In 2.5m – 5 mm  
 In 7.5m or more – 10 mm  
 In buried construction – Twice the above amounts

- Variation in cross-sectional dimensions of columns, beams, buttresses, piers and similar members

Minus – 5 mm

Plus – 10 mm

- Variation in the thickness of slabs, walls, arch sections, and similar members

Minus – 5 mm

Plus – 10 mm

#### 1) Footing for columns, piers, walls, buttresses and similar members

- Variation of dimensions in plan

Minus – 10 mm

Plus – 50 mm

- Misplacement or eccentricity

2% of footing width in the direction of misplacement but not more than 50 mm

- Reduction in thickness

5% of specified thickness subject to a maximum of 50 mm

Tolerances in other types of structures shall generally conform to those given in Clause 2.4 of Recommended Practice for Concrete Formwork (ACI:347)

#### 2.22.13.3 Tolerances in Fixing Anchor Bolts

1) Anchor bolts without sleeves :  $\pm 1.5$  mm in plan

2) Anchor bolts with sleeves :  $\pm 5.0$  mm in elevation

For bolts upto& including 28 mm diameter :  $\pm 5$  mm in all directions

For bolts 32 mm diameter and above :  $\pm 3$  mm in all direction

3) Embedded parts:  $\pm 5$  mm in all direction

#### 2.22.14 Type of Formwork

Formwork may be of timber, plywood, metal, plastic, or concrete. For special finishes the formwork may be lined with plywood, steel sheets, oil tempered hard board, etc. Sliding forms and slip forms may be used with the approval of the Engineer.

#### 2.22.15 Formwork Requirements

Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as called for on the drawings. Ample studs, walers, braces, ties, straps, shores, etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete has set sufficiently to permit removal of the form. In special cases where form vibrators are to be used, the shuttering shall be close boarded. Timber shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with the concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.

Plywood shall be used for exposed concrete surfaces, where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surfaces which are to be rubbed finished shall be planned to remove irregularities or unevenness in the face. Formwork with linings will be permitted.

All new and used form lumber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness and cleanliness of surfaces. Form lumber unsatisfactory in any respect shall not be used and if rejected by the Engineer, shall be removed from the site.

Shores supporting successive stories shall be placed directly over those below or be so designed and placed that the load will be transmitted directly on to them. Truss supports shall be provided for shores that cannot be secured on adequate foundations.

Formwork, during any stage of construction showing signs of distortion or distorted to such a degree that the intended concrete work will not conform to the exact contours indicated on the drawings shall be repositioned and strengthened. Poured concrete affected by the faulty formwork, shall be removed entirely and the formwork corrected prior to placing new concrete.

Excessive construction camber to compensate for shrinkage, settlement, etc. that may impair the structural strength of members shall not be permitted.

Forms for sub-structure concrete may be omitted when, in the opinion of the Engineer the open excavation is firm enough to act as the form. Such excavations shall be slightly larger than required by the drawings to compensate for irregularities in excavation and to ensure the design requirements.

Forms shall be so designed and constructed that their removal shall not damage the concrete. Face formwork shall provide true vertical and horizontal joints, conform to the architectural features of the structure as to location of joints and be as directed by the Engineer.

Where exposed smooth or rubbed concrete finishes are required, the forms shall be constructed with special care so that the resulting concrete surfaces require a minimum finish.

#### **2.22.15.1 Bracing, Struts and Props**

Shuttering shall be braced, strutted, propped and so supported that it shall not deform underweight and pressure of the concrete and also due to the movement of men and other materials. Bamboo shall not be used as props or cross bearers.

The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slabs can be removed without disturbing the beam bottoms. Re-propping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the shuttering.

If the shuttering for a column is erected for the full height of the column, one side shall be left open and built up in sections as placing of concrete proceeds, or windows may be left for pouring concrete from the sides to limit the drop of concrete to 1m or as directed by the Engineer.

#### **2.22.15.2 Mould Oil**

Care shall be taken to see that the faces of formwork coming in contact with concrete are perfectly cleaned and two coats of mould oil or any other approved materials applied before fixing reinforcement and placing concrete. Such coating shall be insoluble in water, non-staining and not injurious to the concrete. It shall not become flaky or be removed by rain or wash water. Reinforcement and/ or other items to be cast in the concrete shall not be placed until coating of the forms is complete. Adjoining concrete surfaces shall also be protected against contamination from the coating materials.

#### **2.22.15.3 Chamfers and Fillets**

All corners and angles exposed in the finished structure shall be formed with mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise specified shall be 20 mm x 20 mm. Care shall be exercised to ensure accurate mouldings.

The diagonal face of the moulding shall be planed or surfaced to the same texture as the forms to which it is attached.

#### **2.22.15.4 Vertical Construction Joint Chamfers**

Vertical construction joints on faces which will be exposed at the completion of the work shall be chamfered as above except where not permitted by the Engineer for structural or hydraulic reasons.

#### **2.22.15.5 Wire Ties**

Wire ties passing through the walls shall not be allowed. In their place bolts passing through sleeves shall be used.

#### **2.22.15.6 Reuse of Forms**

Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary, repaired and the inside retreated to prevent adhesion, to the satisfaction of the Engineer. Warped lumber shall be resized. The Contractor shall equip himself/ herself with enough shuttering to complete the job in the stipulated time.

#### **2.22.15.7 Removal of Forms**

The Contractor shall record on the drawing or on a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed therefrom.

In no circumstances shall forms be struck until the concrete reaches strength of at least twice the stress due to self-weight and any construction/ erection loading to which the concrete may be subjected at time of striking formwork.

Informal circumstances (generally where temperatures are above 200C) forms may be struck after expiry of the following periods:

<b>Item (Private)</b>	<b>Ordinary Portland cement concrete</b>	<b>Rapid hardening Portland cement concrete</b>
Walls, columns, and vertical sides of beams	24 to 48 hours or as directed by the Engineer	24 hours
Slabs (props left under)	3 days	2 days
Beam soffits (Props left under)	7 days	4 days
Removal of props to slabs Spanning up to 4.5m Spanning over 4.5m	7 days 14 days	4 days 8 days
Removal of props to beams & arches Spanning up to 6m Spanning over 6m	14 days 21 days	8 days 12 days

Striking shall be done slowly with utmost care to avoid damage to arises and projections and without shock or vibration, by gently easing the wedges. If after removing the formwork, it is found that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.

Reinforced temporary openings shall be provided, as directed by the Engineer to facilitate removal of formwork which otherwise may be inaccessible.

Tie rods, clamps, form bolts, etc. which must be entirely removed from walls or similar structures shall be loosened neither sooner than 24 hours nor later than 40 hours after the concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time. Ties withdrawn from walls and grade beams shall be pulled towards the inside face. Cutting ties back from the faces of walls and grade beams shall not be permitted.

For liquid retaining structures no sleeves for through bolts shall be used nor shall through bolts be removed. The bolts, in this case, shall be cut at 25 mm depth from the surface and then the hole shall be made good by sand cement mortar of the same proportions as the concrete just after striking the formwork.

## **2.22.16 Foundation Bedding, Bonding and Jointing**

All surfaces upon or against which concrete will be placed shall be suitably prepared by thorough cleaning, washing and dewatering, as may be indicated in the plans or as the Engineer may direct, to meet the various situations encountered in the work.

Soft or spongy areas shall be cleaned out and backfilled with either a soil-cement mixture, lean concrete or clean sand fill compacted to a minimum density of 90% Modified Proctor, unless otherwise mentioned in Bill of Quantities.

Prior to construction of formwork for any item where soil will act as bottom form, approval shall be obtained from the Engineer as to the suitability of the soil.

### **2.22.16.1 Preparation of Rock Strata of Foundations**

To provide tight bond with rock foundations, the rock surface shall be prepared and the following general requirements shall be observed.

Concrete shall not be deposited on large sloping rock surfaces. Where required by the Engineer or as indicated on the plans, the rock shall be cut to form rough steps or benches to provide roughness or a more suitable bearing surface.

Rock foundation stratum shall be prepared by picking, barring, wedging and similar methods which will leave the rock in an entirely sound and unshattered condition.

Shortly before concrete is placed, the rock surface shall be cleaned with high pressure water and air jet even though it may have been previously cleaned in that manner.

Prior to placing concrete, the rock surface shall be kept wet for a period of 2 to 4 hours unless otherwise directed by the Engineer.

Before placing concrete on work surfaces all water shall be removed from depressions to permit thorough inspection and proper bonding of the concrete to the rock.

Before placing concrete on work surfaces all water shall be removed from depressions to permit thorough inspection and proper bonding of the concrete to the rock.

### **2.22.16.2 Preparation of Earth Strata of Foundations**

All earth surfaces upon which or against which concrete is to be placed shall be well compacted and free from standing water, mud or debris. Soft, yielding solid shall be removed and replaced with suitable earth well compacted as directed by the Engineer. Where specified lean concrete shall be provided on the earth stratum for receiving concrete. The surface of absorptive soil against which concrete is to be placed shall be moistened thoroughly so that no moisture will be drawn from the freshly placed concrete and later shall help to cure the concrete.

### **2.22.16.3 Preparation of Concrete Surfaces**

The preparation of concrete surfaces upon which additional concrete is to be placed later, shall preferably be done by scarifying and cleaning while the concrete is between its initial and final set. This method shall be used wherever practicable and shall consist of cutting the surface with picks and stiff brooms and by use of an approved combination of air and water jet as directed by the Engineer. Great care shall be taken in performing this work to avoid removal of too much mortar and the weakening of the surface by loosening of aggregate.

When it is not practicable to follow the above method, it will be necessary to employ air tools to remove laitance and roughen the surface.

The final required result shall be a pitted surface from which all dirt, unsound concrete, laitance and glazed mortar have been removed.

### **2.22.16.4 Bonding Treatment (Mortar)**

After rock or concrete surfaces upon which new concrete is to be placed have been scarified, cleaned and wetted as specified herein, they shall receive a bonding treatment, immediately before placement of the concrete.

The bonding medium shall be a coat of cement-sand mortar. The mortar shall have the same cement-sand proportions as the concrete which shall be placed on it. The water-cement ratio shall be determined by placing conditions and as approved by the Engineer.

Bonding mortar shall be placed in sufficient quantity to completely cover the surface about 10 mm thick for rock surface and about 5 mm thick for concrete surfaces. It shall be brushed or broomed over the surface and worked thoroughly into all cracks, crevices and depressions. Accumulations or puddles of mortar shall not be allowed to settle in depressions and shall be brushed out to a satisfactory degree, as determined by the Engineer.

Mortar shall be placed at such a rate that it can be brushed over the surface just in advance of placement of concrete. Only as much area shall be covered with mortar, as can be covered with concrete before initial set in the mortar takes place. The amount of mortar that will be permitted to be placed at any one time, on the area which it is to cover, shall be in accordance with the Engineer's directions.

### **2.22.17 Cleaning and Bonding Formed Construction Joints**

Vertical construction joints shall be cleaned as specified above or by other methods approved by the Engineer. In placing concrete against formed construction joints, the surface of the joints, where accessible, shall be coated thoroughly with the specified bed-joint bonding mortar immediately before they are covered with concrete or by scrubbing with wire brooms dipped into the fresh concrete. Where it is impracticable to apply such a mortar coating, special precautions shall be taken to ensure that the new concrete is brought into intimate contact with the surface of the joint by careful puddling and spading with aid of vibrators and suitable tools.

### **2.22.18 Expansion and Contraction Joints**

Provision shall be made for expansion and contraction in concrete by use of special type of joints at locations shown on the drawing. Contraction joint surfaces shall be treated as per the specifications, drawings or as directed by the Engineer.

### **2.22.19 Hot Weather Requirement**

All concrete work performed in hot weather shall be in accordance with IS:456 except as here-in modified.



Admixtures may be used only when approved by the Engineer.

Adequate provisions shall be made to lower concrete temperatures by cooling ingredients, eliminating excessive mixing, preventing exposure of mixers and conveyors to direct sunlight and the use of reflective paints on mixers, etc. The temperature of the freshly placed concrete shall not be permitted to exceed 38°C.

Consideration shall be given to shading aggregate stockpiles from direct rays of the sun and spraying stockpiles with water, use of cold water when available, and burying, insulating, shading and/ or painting white the pipe lines and water storage tanks and conveyances.

In order to reduce loss of mixing water, the aggregates, wooded forms, sub-grade, adjacent concrete and other moisture absorbing surfaces shall be well wetted prior to concreting. Placement and finishing shall be done as quickly as possible.

Extra precautions shall be taken for the protection and curing of concrete. Consideration shall be given to continuous water curing and protection against high temperatures and drying hot winds for a period of at least 7 days immediately after concrete has set and after which normal curing procedures may be resumed.

## **2.22.20 Concrete Underwater**

Under all ordinary conditions, all foundations shall be completely dewatered and concrete placed in the dry. However, when concrete placement under water is necessary, all work shall conform to IS:456.

## **2.22.21 Precast Concrete**

Precast concrete shall comply with IS:456 and with the following requirements:

All precast units shall be cast on a suitable bed or platform with firm foundation and free from wind.

The Contractor shall be responsible for accuracy of the level or shape of the bed or platform. A suitable serial number and the date of casting shall be impressed or painted on each unit.

### **2.22.21.1 Striking Forms**

Side shutters shall not be struck in less than 24 hours after depositing concrete and no precast unit shall be lifted until the concrete reaches' strength of at least twice the stress to which the concrete may be subjected to at the time of lifting.

### **2.22.21.2 Precast Units**

The lifting and removal of precast units shall be undertaken without causing shock, vibration or undue bending. The Contractor shall satisfy the Engineer or his representative that the methods proposed to be adopted for these operations will not over-stress or otherwise affect seriously the strength of the precast units. The reinforced side of the units shall be distinctly marked.

### **2.22.21.3 Curing**

All precast work shall be protected from the direct rays of the sun for at least 7 days after casting and during that period each unit shall be kept constantly watered or preferably be completely immersed in water if the size of the unit so permits. Otherwise curing practice as given in Clause 9.10 shall be followed.

## 2.22.22 Slots, Openings, etc.

Slots, openings or holes, pockets etc. shall be provided in the concrete work in the positions as indicated in the drawings or as directed by the Engineer. Any deviation from the approved drawings shall be made good by the Contractor at his own expense, without damaging any other work. Sleeves, bolts, inserts, etc. shall also be provided in concrete work where so specified.

## 2.22.23 Grouting

### 2.22.23.1 Standard Grout

Grout shall be provided as specified on the drawings.

The proportions of grout shall be such as to produce a flowable mixture consistent with minimum water content and shrinkage. The grout proportions shall be limited as follows:

Use	Grout Thickness	Mix Proportions	Max W/C Ratio
Fluid mix	Under 25 mm	One part Portland Cement to one part sand	0.44
General	25 mm and over but less than 50 mm	One part Portland Cement to two parts of sand	0.53
Stiff mix	50 mm and above	One part Portland Cement to 3 parts of sand	0.53

### 2.22.23.2 Sand

- 1) Sand shall be such as to produce a flowable grout without any tendency to segregate.
- 2) Sand, for general grouting purposes, shall be graded within the following limits :
  - Passing IS 2.36 mm sieve : 95 to 100%
  - Passing IS 2.18 mm sieve : 65 to 95%
  - Passing IS 300 micron sieve : 10 to 30%
  - Passing IS 150 micron sieve : 3 to 10%
- 3) Sand for fluid grouts shall have the fine material passing the 300 and 150 micron sieves at the upper limits specified above.
- 4) Sand, for stiff grouts shall meet the usual grading specifications for concrete.

Surfaces to be grouted shall be thoroughly roughened and cleaned of all foreign matter and latency.

Anchor bolts, anchor bolt holes and the bottom of equipment and column base plates shall be cleaned of all oil, grease, dirt and loose material. The use of hot, strong caustic solution for this purpose will be permitted.

Prior to grouting, the hardened concrete surfaces to be grouted shall be saturated with water.

Water in anchor bolt holes shall be removed before grouting is started.

Forms around base plates shall be reasonably tight to prevent leakage of the grout.

Adequate clearance shall be provided between forms and base plate to permit grout to be worked properly into place.

Grouting, once started, shall be done quickly and continuously to prevent segregation, bleeding and breakdown of initial set. Grout shall be worked from one side of one end to the other to prevent

entrapment of air. To distribute the grout and to ensure more complete contact between base plate and foundation and to help release entrapped air, link chains can be used to work the grout into place.

Grouting through holes in base plates shall be by pressure grouting.

Variations in grout mixes and procedures shall be permitted if approved by the Engineer.

Variations in grout mixes and procedures shall be permitted if approved by the Engineer.

### **2.22.23.3 Special Grout**

Special grout, where specified on the drawings, shall be provided in strict accordance with the manufacturer's instructions/ specifications on the drawings.

### **2.22.24 Inspection**

All materials, workmanship and finished construction shall be subject to the continuous inspection and approval of the Engineer.

All materials supplied by the Contractor and all work or construction performed by the Contractor rejected as not in conformance with the specifications and drawings, shall be immediately replaced at no additional expense to the Owner.

Approvals of any preliminary materials or phase or work shall in no way relieve the Contractor from the responsibility of supplying concrete and or producing finished concrete in accordance with the specifications and drawings.

All concrete shall be protected against damage until final acceptance by the Engineer or his representative.

### **2.22.25 Clean-up**

Upon the completion of concrete work, all forms, equipment, construction tools, protective coverings and any debris resulting from the work shall be removed from the premises.

All debris such as empty containers, scrap wood, etc. shall be removed to 'dump' daily or as directed by the Engineer.

The finished concrete surfaces shall be left in a clean condition satisfactory to the Engineer.

### **2.22.26 Preparation of Mortars and its Grade**

#### **2.22.26.1 Grade of Masonry Mortar**

The grade of masonry mortar shall be defined by its compressive strength in N/mm<sup>2</sup> at the age of 28 days as determined by the standard procedure detailed in IS:2250.

For proportioning the ingredients by volume, the conversion of weight into volume shall be made on the following basis :

- |                           |   |             |
|---------------------------|---|-------------|
| 1) Dry hydrated lime      | : | 700 kg/cum  |
| 2) Burnt clay Pozzolana   | : | 860 kg/cum  |
| 3) Lime Pozzolana mixture | : | 770 kg/cum  |
| 4) Coarse sand (dry)      | : | 1280 kg/cum |
| 5) Fine sand (dry)        | : | 1600 kg/cum |

6) Fly ash : 590 kg/cum

#### **2.22.26.2 Cement Mortar**

This shall be prepared by mixing cement and sand with or without the addition of Pozzolana as specified.

#### **2.22.26.3 Proportioning**

Cement bag weighting 50 kg shall be taken as 0.035 cubic metre. Other ingredients in specified proportion shall be measured using boxes of size 40 x 35 x 25 cm. Sand shall be measured on the basis of its dry volume.

#### **2.22.26.4 Mixing**

The mixing of mortar shall be done in mechanical mixers operated manually or by power as decide by the Engineer. The Engineer may, however, permit hand mixing at his discretion taking into account the nature, magnitude and location of the work and practicability of the use of mechanical mixers or where item involving small quantities are to be done or if in his opinion the mechanical mixer is not to be used. The Contractor shall take permission of the Engineer in writing before the commencement of the work.

- 1) Mechanical Mixing: Cement and sand in the specified proportions shall be mixed dry thoroughly in a mixer. Water shall then be added gradually and wet mixing continued for at least three minutes. Only the required quantity of water shall be added to produce mortar of workable consistency but not stiff paste. Only the quantity of mortar, which can be used within 30 minutes of its mixing shall be prepared at a time. Mixer shall be cleaned with water each time before suspending the work.
- 2) Hand Mixing: The measured quantity of sand shall be leveled on a clean masonry platform and cement bags emptied on top. The cement and sand shall be thoroughly mixed dry by being turned over and over, backwards and forwards, several times till the mixture is of a uniform colour. The quantity of dry mix which can be used within 30 minutes shall then be mixed in a masonry trough with just sufficient quantity of water to bring the mortar to a stiff plaster of necessary working consistency. However if hand mixing is allowed by the Engineer then the Contractor shall use plasticizer as per IS code at no extra cost

#### **2.22.26.5 Precautions**

Mortar shall be used as soon as possible after mixing and before it begins to set, and in any case within half hour, after the water is added to the dry mixture.

#### **2.22.27 Measurement and Rate**

The cement concrete shall be measured in cubic metres. In reinforced concrete the volume occupied by the reinforcement shall not be deducted.

Any concrete used in excess of the theoretical dimensions as shown on the drawings shall not be paid for.

The unit rate for concrete work under various categories shall be all inclusive and no claims for extra payment on account of such items as leaving holes, embedding inserts, etc. shall be entertained unless separately provided for in the schedule of quantities. No extra claim shall also be entertained due to change in the number, position and/ or dimensions of holes, slots or openings, sleeves, inserts or on account of any increased lift or scaffolding etc. All these factors shall be taken into consideration while quoting the unit rates. Unless provided for in the Bill of Quantities the rates shall also include fixing inserts in all concrete work, whenever required.

Payments of concrete shall be made on the basis of unit rates quoted for the respective items in the Bill of Quantities.

Payment for beams shall be made for the quantity based on the depth being reckoned from the underside of the slabs and length measured as the clear distance between supports. Payment for columns shall be made for the quantity based on height reckoned upto the underside of slabs.

The unit rate for precast concrete members shall include formwork, moulding, finishing, hoisting and setting in position including setting mortar, provision of lifting arrangement etc. complete.

## **2.23 Brick Masonry**

### **2.23.1 Description**

This work shall consist of construction of structures with bricks jointed together by cement mortar in accordance with the details shown on the drawings or as approved by the Engineer.

### **2.23.2 Applicable Codes**

The following Bureau of Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to:

IS : 1077	Common burnt clay building bricks – Specification
IS : 1200	Method of measurements for building and Civil engineering works
IS : 1725	Specification for soil based blocks used in general building construction
IS : 1905	Code of practice for structural use of unreinforced masonry
IS : 2116	Specification for sand for masonry mortars
IS : 2180	Specification for heavy duty burnt clay building bricks
IS : 2185	Specification for concrete masonry units : Part 2 – Hollow and solid concrete blocks
IS : 2212	Code of practice for brickwork
IS : 2691	Specification for burnt clay facing bricks
IS : 3414	Code of practice for design and installation of joints in buildings
IS : 3952	Specification for burnt clay hollow blocks for walls and partitions

Others BIS Codes not specifically mentioned here but pertaining to the use of bricks for structural purposes form part of these specifications.

### **2.23.3 Materials**

All materials to be used in the work shall conform to the requirements given elsewhere in the section.

### **2.23.4 Personnel**

Only trained personnel shall be employed for construction and supervision.

### **2.23.5 Cement Mortar**

Cement and sand shall be mixed in specified proportions given in the drawings. Cement shall be proportioned by volume. The unit weight of cement shall be 1.44 tonnes per cubic metre. Sand shall be proportioned by volume taking into account due allowance for bulking. All mortar shall be mixed with a minimum quantity of water to produce desired workability consistent with maximum density of

mortar. The mix shall be clean and free from injurious type of soil/acid/alkali/organic matter or deleterious substances.

The mixing shall preferably be done in a mechanical mixer operated manually or by power. Hand mixing can be resorted to as long as uniform density of the mix and its strength are assured subject to prior approval of the Engineer. Where hand mixing is permitted, specific permission is to be given by the Engineer. Hand mixing operation shall be carried out on a clean water-tight platform, where cement and sand shall be first mixed dry in the required proportion by being turned over and over, backwards and forwards several times till the mixture is of uniform colour. Thereafter, minimum quantity of water shall be added to bring the mortar to the consistency of a stiff paste. The mortar shall be mixed for at least two minutes after addition of water.

Mortar shall be mixed only in such quantity as required for immediate use. The mix which has developed initial set shall not be used. Initial set of mortar with ordinary Portland cement shall normally be considered to have taken place in 30 minutes after mixing. In case the mortar has stiffened during initial setting time because of evaporation of water, the same can be re-tampered by adding water as frequently as needed to restore the requisite consistency, but this re-tampering shall not be permitted after 30 minutes. Mortar remaining unused for more than 30 minutes shall be rejected and removed from site of work.

### **2.23.6                    Soaking of Bricks**

All bricks shall be thoroughly soaked in a tank filled with water for a minimum period of one hour prior to being laid. Soaked bricks shall be removed from the tank sufficiently in advance so that they are skin dry at the time of actual laying. Such soaked bricks shall be stacked on a clean place where they are not contaminated with dirt, earth, etc.

### **2.23.7                    Joints**

The thickness of joints shall not exceed 10 mm. All joints on exposed faces shall be tooled to give concave finish.

### **2.23.8                    Laying**

All brickwork shall be laid in an English bond, even and true to line, in accordance with the drawing or as directed by the Engineer, plumb and level and all joints accurately kept. Half and cut bricks shall not be used except, when necessary, to complete the bond. Closer in such cases shall be cut to the required size and used near the ends of the walls. The bricks used at the face and also at the angles forming the junction of any two walls shall be selected whole bricks of uniform size, with true and rectangular faces.

All bricks shall be laid with frogs up on a full bed of mortar except in the case of tile bricks. Each brick shall be properly bedded as set in position by slightly pressing while laying, so that the mortar gets into all their surface pores to ensure proper adhesion. All head and side joints shall be completely filled by applying sufficient mortar to brick already placed and on brick to be placed. All joints shall be properly flushed and packed with mortar so that no hollow spaces are left. No bats or cut bricks shall be used except to obtain dimensions of the different courses for specified bonds or wherever a desired shape so requires.

The brickwork shall be built in uniform layers and for this purpose wooden straight edge with graduations indicating thickness of each course including joint shall be used. Corners and other advanced work shall be raked back. Brickwork shall be done true to plumb or in specified batter. All courses shall be laid truly horizontal and vertical joints shall be truly vertical. Vertical joints in alternate courses shall come directly one over the other. During construction, no part of work shall rise more than one metre above the general construction level, to avoid unequal settlement and improper jointing. Where this is not possible in the opinion of the Engineer, the works shall be raked back according to the bond (and not toothed) at an angle not steeper than 45 degrees with prior approval of the Engineer. Toothing may also be permitted where future extension is contemplated.

Before laying bricks in foundation, the foundation slab shall be thoroughly hacked, swept clean and wetted. A layer of mortar not less than 12 mm thick shall be spread on the surface of the foundation slab and the first course of bricks shall be laid.

### **2.23.9 Jointing Old and New Work**

Where fresh masonry is to join the masonry that is partially/entirely set, the exposed jointing surface of the set masonry shall be cleaned, roughened and wetted, so as to effect the best possible bond with the new work. All loose bricks and mortar or other material shall be removed.

In case of vertical or inclined joints, it shall be further ensured that proper bond between the old and new masonry is obtained by interlocking the bricks. Any portion of the brickwork that has been completed shall remain undisturbed until thoroughly set.

In case of sharp corners, especially in skew bridges, a flat cutback of 100 mm shall be provided so as to have proper and bonded laying of bricks.

### **2.23.10 Curing**

Green work shall be protected from rain by suitable covering and shall be kept constantly moist on all faces for a minimum period of seven days. Brickwork carried out during the day shall be suitably marked indicating the date on which the work is done so as to keep a watch on the curing period. Top of the masonry work shall be left flooded with water at the close of the day. Watering may be done carefully so as not to disturb or wash out the green mortar.

During hot weather, all finished or partly completed work shall be covered or wetted in such a manner as will prevent rapid drying of the brickwork.

During the period of curing of brickwork, it shall be suitably protected from all damages. At the close of day's work or for other period of cessation, watering and curing shall have to be maintained. Should the mortar perish i.e., become dry, white or powdery, through neglect of curing, work shall be pulled down and rebuilt as directed by the Engineer. If any stains appear during watering, the same shall be removed from the face.

### **2.23.11 Scaffolding**

The scaffolding shall be sound, strong and safe to withstand all loads likely to come upon it. The holes which provide resting space for horizontal members shall not be left in masonry under one metre in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled with dense concrete and made good. Scaffolding shall be got approved by the Engineer. However, the Contractor shall be responsible for its safety.

### **2.23.12 Equipment**

All tools and equipment used for mixing, transporting and laying of mortar and bricks shall be clean and free from set mortar, dirt or other injurious foreign substances.

### **2.23.13 Finishing of Surfaces**

#### **2.23.13.1 General**

All brickwork shall be finished in a workman-like manner with the thickness of joints, manner of striking or tooling as described in these above specifications.

The surfaces can be finished by 'joining' or 'pointing' or by 'plastering' as given in the drawings.

For a surface which is to be subsequently plastered or pointed, the joints shall be squarely raked out to a depth of 15 mm, while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

#### **2.23.13.2 Jointing**

In jointing, the face of the mortar shall be worked out while still green to give a finished surface flush with the face of the brickwork. The faces of brickwork shall be cleaned to remove any splashes of mortar during raising the brickwork.

#### **2.23.13.3 Pointing**

Pointing shall be carried out using mortar not leaner than 1:3 by volume of cement and sand or as shown on the drawing. The mortar shall be filled and pressed into the raked joints before giving the required finish. The pointing shall be ruled type for which it shall, while still green, be ruled along the centre with half round tools of such width as may be specified by the Engineer. The super flush mortar shall then be taken off from the edges of the lines and the surface of the masonry shall be cleaned of all mortar. The work shall conform to IS:2212.

#### **2.23.13.4 Plastering**

Plastering shall be done where shown on the drawing.

Plastering shall be started from top and worked down. Holes in masonry work shall be properly filled with broken brick and mortar in advance of the plastering while the scaffolding is being taken down. The plaster shall be finished off with a wooden straight edge. Finally, the surface shall be finished off with a mason wooden float.

When recommencing the plastering beyond the work suspended earlier, the edges of the old plaster shall be scrapped, cleaned and wetted before plaster is applied to the adjacent areas.

No portion of the surface shall be left unfinished for patching up at a later period.

The plaster shall be finished true to plumb surface and to the proper degree of smoothness as directed by the Engineer.

The average thickness of plaster shall not be less than the specified thickness. The minimum thickness over any portion of the surface shall not be less than that specified by more than 3 mm.

Any cracks which appear in the surface and all portions which show hollow when tapped, or are found to be soft or otherwise defective, shall be cut in rectangular shape and re-done as directed by the Engineer.

#### **2.23.13.5 Curing of Finishes**

Curing shall commence as soon as the mortar used for finishing has hardened sufficiently not to be damaged during curing. It shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages.

#### **2.23.13.6 Scaffolding for Finishes**

Stage scaffolding shall be provided for the work. This shall be independent of the structure.

#### **2.23.14 Acceptance of Work**

All work shall be true to the lines and levels as indicated on the drawing or as directed by the Engineer, subject to tolerances as indicated in these specifications.



Mortar cubes shall be tested in accordance with IS:2250 for compressive strength. The frequency of testing shall be one sample for every cubic metre of mortar, subject to a minimum of 1 sample for each section of work, 4 in a day. The Engineer's decision on the number of samples shall be final.

In case of plaster finish, the minimum surface thickness shall not be less than the specified thickness by more than 3 mm.

### **2.23.15 Measurements for Payment**

Brickwork of 250 mm thick and above shall be measured in cubic metres and that of 125 mm thick shall be measured in square metres. Any extra work done by the Contractor over the specified dimensions shall be ignored.

The work of plastering and pointing shall be measured in square meters of the surface treated wherever applicable.

### **2.23.16 Rate**

The contract unit rate for brickwork (if applicable) shall include the cost of all labour, materials, tools and plant, scaffolding and other expenses incidental to the satisfactory completion of the work, sampling, testing and supervision as described in these specifications and as shown on the drawings.

The contract unit rate for plastering (if applicable) shall include the cost of all labour, materials, tools and plant, scaffolding and all incidental expenses, sampling and testing and supervision as described in these specifications.

The contract unit rate for pointing (if applicable) shall include erecting and removal of scaffolding, curing, all labour, materials, and equipment incidental to complete the pointing, raking out joints, cleaning, wetting, filling with mortar, trowelling, pointing and watering, sampling and testing and supervision as described in these specifications.

The contract unit rate for architectural coping (if applicable) shall include cost of all labour, materials, tools and plant, sampling and testing and supervision as described in these specifications.

## **2.24 Road and Pavement Work**

### **2.24.1 Materials**

All materials used in the works shall be of the best kind and to the approval of the Engineer. All materials shall comply with the relevant Bureau of Indian Standard specification.

#### **2.24.1.1 Supply of Brick Materials**

The minimum compressive strength of burnt clay bricks when tested flat shall not be less 85 kg/cm<sup>2</sup> for individual bricks and 105 kg/cm<sup>2</sup> for average of 5 (five) specimens and the size may be mentioned below with a tolerance of  $\pm 5$  per cent.

1st class bricks shall be manufactured with well-plugged earth and must be box moulded. The finished size of bricks shall be approx. 25 cm x 12.5 cm x 7.5 cm. These shall be of uniform size and colour, thoroughly and evenly burnt and should ring clearly when struck, be well shaped, square and true with even surface and straight unbroken edges without cracks, rainpouts, flaws of any kind. These should not absorb more than 1/6th of their weight of water when saturated.

Picked jhama bricks shall be manufactured as in 11.1.2.2 above except that those shall be slightly over-burnt. The shape, size etc. shall conform as far as practicable to those of 1st class bricks.

Jhama bats shall be obtained from uniformly vitrified and heavy picked jhamabricks and the size shall be 1/4th to 3/4th full bricks. The colour of bats shall be copper red to black and must not be spongy. All lump jhama shall be broken to ½ brick size before it can be accepted as bats.

Jhama metal for road works, jhama chips for concrete works shall be obtained by breaking good quality jhama bats, must not be spongy or with any coating of foreign material. The metal or chips shall be of more or less cubical in shape and correspond to the specified range of size.

### 2.24.1.2 Collection and Supply of Hard Stone Materials

Stone materials for road works or aggregate for cement concrete (plain or reinforced) shall be hard, of uniform and fine texture, free from faults or planes of weakness and free from weathered faces. These must also be free from loam, clay, or any surface coating, free from organic matter or other impurities. The materials shall be stacked at roadside lands or other lands (as directed by the Engineer) in specified heights without causing inconvenience to traffic and in such a way as to afford maximum facilities of work. Aggregates for cement concrete work shall conform to IS:383. Physical requirements and grading of aggregates for pavement courses shall be as specified for particular type of work. Stones when immersed in water for 24 hours shall not absorb water by more than 5 percent of their dry weight when tested in accordance with IS:1124.

Hard stone boulders shall be supplied as per above specification regarding hardness, texture etc. and shall be rough dressed with thickness (when laid as per natural bedding) closely conforming to that specified.

Road metals shall be obtained by breaking large blocks conforming to above specification regarding hardness etc., must be more or less cubical in shape and shall be well graded within the range of size specified.

Stone chips shall be obtained by breaking large and hard blocks, must be cubical in shape and gradient within specified size range. These shall be washed clean as directed by the Engineer.

Shingles shall be hard, must have clean surface and on being broken the fractured surface must indicate a uniform and fine texture free from laminations or planes of weakness. The size shall be within specified limits.

Gravels shall be as per shingles above, moreover these shall be washed clean before supply.

The stone aggregate shall be designated by their standard sizes and shall conform to the requirements set forth in the following table. The actual work of laying pavement course and concrete works shall however be governed by the respective specifications of different works. The size and quantities of aggregates to be supplied shall be so selected such that the grading requirements for which the supply is intended are satisfied.

### 2.24.1.3 Size Requirements for Stone Aggregates

**Table 9: Size requirements for Stone Aggregates**

Sl. No.	Standard size of aggregate	Designation of sieve through which the aggregate shall wholly pass	Designation of sieve on which aggregate shall wholly be retained
1	75 mm	105 mm	63 mm
2	63 mm	90 mm	53 mm
3	45 mm	53 mm	26.5 mm
4	26.5 mm	45.5 mm	22.4 mm
5	22.4 mm	26.5 mm	13.2 mm
6	13.2 mm	22.4 mm	11.2 mm
7	11.2 mm	13.2 mm	6.7 mm

Sl. No.	Standard size of aggregate	Designation of sieve through which the aggregate shall wholly pass	Designation of sieve on which aggregate shall wholly be retained
8	6.7 mm	11.2 mm	2.8 mm
9	5.6 mm	9.5 mm	2.36 mm

#### 2.24.1.4 Sand

All sand shall be clean, sharp and free from clay, loam, and organic or other foreign matter and shall be obtained from approved source. The Contractor shall get the samples of sand to be used in different kinds of work approved by the Engineer before using the same in work. Sand which in the opinion of the Engineer is dirty must be washed to his satisfaction at cost and expenses of the Contractor.

Sand may be classified as follows according to size :

- i) Coarse sand : 4.75 mm to 2.00 mm IS sieve
- ii) Medium sand : 2.00 mm to 42.5 micron IS sieve
- iii) Fine sand : 42.5 micron to 7.5 micron IS sieve

Sand for all concrete works shall conform to provisions stipulated IS:383. The fineness modulus of sand shall be greater than 2.0 and less than 3.5.

Medium sand may be used in cement mortar for masonry, plaster etc. and also for bituminous works of road.

#### 2.24.1.5 Bitumen

The bitumen shall be paving bitumen of VG 30 Grade as per Indian Standard Specifications for "Paving Bitumen", conforming to IS:73. Bitumen must be sourced from Indian Oil Corporation or any other recognized manufacturer/processor.

### 2.24.2 Water Bound Macadam Sub-base/ Base Course

#### 2.24.2.1 Description

Sub-base/ base course shall consist of clean, crushed aggregates mechanically interlocked by rolling, and bonded together with screening, binding material where necessary and water laid on properly prepared sub-grade/ sub-base/ base, or existing pavement, as the case may be and finished in accordance with requirement of these specifications and in close conformity with the lines, grades, cross-sections and thickness as per approved drawings or otherwise directed by the Engineer.

#### 2.24.2.2 Materials: Coarse Aggregates General Requirements

Coarse aggregates shall be either crushed or broken stone, crushed slag, over-burnt brick aggregates (jhamametal), or other naturally occurring aggregates such as kankar or laterite of suitable quality (which shall be used in sub-base course only) as stated here-in-after and approved by the Engineer. The aggregates shall conform to the physical requirement set forth in Table 9. The type and size range of aggregate shall be as specified in the Contract.

**Table 10: Physical Requirements of Coarse Aggregates for Sub-base/ Base Course**

Test	Test Method	Requirements
(a)* Los Angles Abrasion Value or	IS:2386 (Part IV)	50 percent max.

* Aggregate Impact Value	IS:2386 (Part IV) or IS:5640	** 40 percent max.
(b) *** Flakiness Index	IS:2386 (Part I)	15 percent max.

\* Aggregates may satisfy requirements of either of the two tests.

\*\* Aggregates like brick, metal, kankar and laterite which get softened in presence of water shall be tested for impact value under wet conditions in accordance with IS:5640.

\*\*\* The requirement of flakiness index and elongation index shall be enforced only in the case of crushed broken stone and crushed slag.

1. **Crushed or Broken Stone:** When crushed or broken stone is specified as the coarse aggregate, it shall be hard, durable and free from excess of flat, elongated, soft and disintegrated particles, dirt and other deleterious materials.
2. **Crushed Slag:** Crushed slag shall be made from air cooled blast furnace slag. It shall be of angular shape, reasonably uniform in quality and density and generally free from thin, elongated and soft pieces, dirt or other deleterious materials. Crushed slag shall not weigh less than 1120 kg/m<sup>3</sup> and the percentage of glossy material in it shall not exceed 20.
3. **Over-burnt Brick Aggregate (Jhama Metal):** Jhama brick aggregate shall be made out of over burnt bricks or brick bats and shall be free from dust and other objectionable and deleterious materials.
4. **Laterite:-**Laterite shall be hard, compact, heavy and of dark colour. The light coloured sandy laterite as well as those containing much ochrous clay shall be rejected.
5. **Kankar:-**Kankar shall be tough, having blue almost opalescent fracture. It shall not contain any clay in the cavities between nodules.

### Grading Requirements of Coarse Aggregate

The coarse aggregates shall conform to one of the grading given in Table 11, provided however, the use of grading 1 shall be restricted to sub-base courses only.

**Table 11: Grading Requirements of Coarse Aggregates**

Grading No.	Size Range	Sieve Designation	Percent by Weight Passing the Sieve
1	90 mm to 45 mm	125 mm	100
		90 mm	90-100
		63 mm	25-60
		45 mm	0-15
		22.4 mm	0-5
2	63 mm to 45 mm	90 mm	100
		63 mm	90-100
		53 mm	25-75
		45 mm	0-15
		22.4 mm	0-5
3	53 mm to 22.4 mm	63 mm	100
		53 mm	95-100
		45 mm	65-90
		22.4 mm	0-10
		11.2 mm	0-5

<b>Sulphur contents</b>	<b>maximum 2 percent</b>
<b>Water absorption</b>	<b>maximum 10 percent</b>

### 2.24.2.3 Screenings

Screenings to fill voids in the coarse aggregate shall generally consist of the same material as the coarse aggregate. However, where permitted, predominantly non-plastic material such as moorum or gravel (other than rounded river borne material) may be used for this purpose provided liquid limit and plasticity index of such material are below 20 and 6 respectively and fraction passing 75 micron sieve does not exceed 10 percent.

Screenings shall conform to the grading set forth in Table 12. Screenings of Type A or B, as specified shall be used with coarse aggregates of Grading II.

**Table 12: Grading for Screenings**

<b>Grading Classification</b>	<b>Size of Screenings</b>	<b>Sieve Designation</b>	<b>Percent by Weight Passing the Sieve</b>
A	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.6 mm	15-35
		180 micron	0-10
B	11.2 mm	11.2 mm	100
		5.6 mm	90-100
		180 micron	15-35

The use of screening shall be omitted in the case of soft aggregates such as brick metal, jhama, kankar and laterite etc. as they are likely to get crushed to a certain extent under rollers.

### 2.24.2.4 Binding Material

Binding material to be used for sub-base/ base construction as a filler material meant for preventing ravelling shall comprise of a suitable material approved by the Engineer having plasticity index value of less than 6 as determined in accordance with IS:2720 (Part V).

Application of binding material may not be necessary, when the screenings used are of crushable type such as forum or gravel.

### 2.24.2.5 Construction Operations

- a) **Preparation of base** : The sub-grade/ sub-base/ base shall be prepared to the specified grade and camber and made free of dust and other extraneous materials. Any ruts of soft yielding places shall be corrected in an approved manner and rolled until firm. Any sub-base/ base surface irregularities when predominant shall be made good by providing appropriate type of profile corrective course (leveling course).

As far as possible, laying sub-base/ base course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two courses. The existing thin bituminous wearing course shall be completely picked out where sub-base/ base is proposed to be laid over it.

- b) **Spreading coarse aggregate** : The coarse aggregate shall be spread uniformly and evenly upon the prepared sub-grade/ sub-base/ base to proper profile by using templates across the road in such quantities as specified in this Contract.

The spreading shall be done from stockpiles. In no case aggregate shall be dumped in heaps directly on the surface prepared to receive the aggregate nor shall hauling over un-compacted or partially compacted base be permitted. No segregation of large or fine aggregate shall be allowed and the coarse aggregate as spread shall be of uniform gradation with no pocket of fine materials.

The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved drawing. The coarse aggregate shall not normally be spread more than 3 days in advance of the subsequent construction operations.

- c) **Rolling** : Immediately following the spreading of the coarse aggregate, rolling shall be started with three wheeled power rollers of 8 to 10 tonne capacity or vibratory rollers of approved type. The type of roller to be used shall be approved by the Engineer based on trial run.

Rolling shall be discontinued when the aggregates are partially compacted with sufficient void space in them to permit application of screenings. However, where screenings are not to be applied, as in the case of crushed aggregates like brick metal, laterite, kankar etc., compaction shall be continued until the aggregates are thoroughly keyed. During rolling slight sprinkling of water may be done, if necessary. Rolling shall not be done when the sub-grade is soft or yielding or when it causes wave like motion in the sub-grade or sub-base course

The rolled surface shall be checked transversely and longitudinally with templates for any irregularities which shall be corrected by loosening the surface, adding or removing necessary amounts of aggregate and re-rolling until the entire surface conforms to desired camber and grade. In no case shall the use of screenings be permitted to make up depressions.

- d) **Application of screenings** : After completion of rolling of the coarse aggregate as per specification given in (c) above, screenings shall be applied gradually over the surface to completely fill the interstices. These shall not be damp or wet at the time of application. Dry rolling shall be done while the screenings are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregate. The screenings shall not be dumped in piles but be spread uniformly in successive thin layers either by the spreading motion of hand shovels or by mechanical spreaders, or directly from trucks with suitable grit spreading arrangement. Trucks operating for spreading the screenings shall be so driven as not to disturb the coarse aggregate.

The screening shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand brooms or both. In no case, shall the screening be applied too fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of roller on the coarse aggregate. These operations shall continue until no more screenings can be formed into the voids of the coarse aggregate.

The spreading, rolling and brooming of screenings shall be carried out in only such lengths of the road which could be compacted within one day's operation.

- e) **Sprinkling of water and grouting** : After the screenings have been applied, the surface shall be copiously sprinkled with water, swept and rolled. Hand broom shall be used to sweep the wet screenings into voids and distribute them evenly. The sprinkling, sweeping and rolling operations shall be continued with additional screenings applied as necessary, until the coarse aggregate has been thoroughly keyed, well bonded and firmly set in its full depth and a grout has been formed of screenings. Care shall be taken to see that the base or sub-grade does not get damaged due to the addition of excessive quantities of water during construction.
- f) **Application of binding material** : After the application of screenings in accordance with paragraphs (d) and (e) above, the binding material where it is required to be used (as per conditions noted in 11.2.3.5) shall be applied successively in two or more thin layers at a slow and uniform

rate. After each application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms or mechanical brooms to fill the voids properly, and rolled during which water shall be applied to wheels of the rollers if necessary to wash down the binding material sticking to them. These operations shall continue until the resulting slurry after fillings of voids, forms a wave ahead of the wheels of the moving roller.

- g) **Setting and drying** : After the final compaction of sub-base/ base course, the pavement shall be allowed to dry overnight. Next morning hungry spots shall be filled with screenings or binding material as directed, lightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the sub-base/ base course has set. The Engineer shall have the discretion to stop hauling traffic from using the completed sub-base/ base coarse if in his opinion it would cause excessive damage to the surface.

#### **2.24.2.6 Measurement for Payment**

Water bound macadam shall be measured as finished work in position in cubic metres.

#### **2.24.2.7 Rate**

The contract unit rate for water bound macadam sub-base/ base course shall be payable in full for carrying out the required operations as per specification and BOQ.

#### **2.24.3 Tack Coat**

##### **2.24.3.1 Scope**

This work shall consist of application of a single coat of low viscosity liquid bituminous material to an existing road surface preparatory to another bituminous construction over it.

##### **2.24.3.2 Materials**

###### **Binder**

The binder used for tack coat shall be bituminous emulsion.

##### **2.24.3.3 Construction Operation**

###### **Preparation of Base**

The surface on which the tack coat is to be applied shall be thoroughly swept and scraped clean of dust and any other extraneous material before the application of the binder.

###### **Application of Binder**

Binder may be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer and sprayed on the base at the rate as specified. It shall be the responsibility of the Contractor to carefully handle the inflammable bituminous cutback material so as to safeguard against any fire mishap. The binder shall be applied uniformly with the aid of either self-propelled or towed bitumen pressure sprayer with self-heating arrangement and spraying bar with nozzles having constant volume or pressure system, capable of spraying bitumen at specified rates and temperature so as to provide uniform unbroken spread of bitumen. Work shall be planned so that no more than the necessary tack coat for the day's operation is placed on the surface. After application and prior to succeeding construction allow the tack coat to cure, without being disturbed, until the water/ cutter has completely evaporated, as determined by the Engineer.

The binder shall be applied uniformly at specified rates and temperature so as to provide a uniform unbroken spread of bitumen.

#### 2.24.3.4 Measurement for Payment

Tack coat shall be measured in terms of surface area of application in square metres.

#### 2.24.3.5 Rate

The contract unit rate for tack coat shall be payable in full for carrying out the required operations as per specification and BOQ.

### 2.24.4 Bituminous Macadam

#### 2.24.4.1 Description

This work shall consist of construction in a single course, of specified thickness as shown in drawing of compacted crushed aggregates premixed with a bituminous binder, laid immediately after mixing on a base prepared previously in accordance with the requirements of the specifications and BOQ, and in conformity with the lines, grades and cross-sections shown on the drawings or directed by the Engineer.

#### 2.24.4.2 Binder Materials

The bitumen shall be paving bitumen of suitable penetration grade as per Indian Standards specification IS:73 for 'Paving Bitumen'. The actual grade of bitumen to be used shall be decided by the Engineer appropriate to the region, traffic, rainfall and other environmental conditions.

#### 2.24.4.3 Aggregates

The aggregates shall consist of crushed stone, crushed gravel (shingle) or other stones. They shall be clean, strong, durable of fairly cubical shape and free of disintegrated piece, organic and other deleterious matter, and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the necessary physical requirements as per PWD (Roads) specification for 'Surface Dressing' except that the flakiness index and water absorption shall be limited to a maximum of 35% and 2% respectively.

The aggregates for bituminous macadam for different thickness shall conform to the grading given in the Table below.

**Table 13: Aggregate Grading for 75 mm and 50 mm Compacted Thickness of Bituminous Macadam**

Sieve Designation	Percent by Weight Passing the Sieve	
	75 mm thick	50 mm thick
45 mm	100	—
26.5 mm	75-100	100
22.5 mm	60-95	75-100
11.2 mm	30-55	50-85
5.6 mm	15-35	20-40
2.8 mm	5-20	5-20
90 micron	0-5	0-5



**Proportioning of Materials**

The binder content for premixing shall be 3.0 to 3.5 percent by weight of the total mix, except when otherwise directed by the Engineer.

The quantities of aggregates to be used shall be sufficient to yield the specified thickness after compaction.

**Variation in Proportioning of Materials**

The Contractor shall have the responsibility for ensuring proper proportioning of materials and producing a uniform mix. A variation in binder content of  $\pm 0.3$  percent by weight of total mix shall however, be permissible for individual specimens taken for quality control tests.

**2.24.4.4 Construction Operations****Weather and Seasonal Limitations**

The work of laying bituminous macadam shall not be taken up during rainy or foggy weather or when the base course is damp or wet, or during dust storm or when the atmospheric temperature in shade is  $15^{\circ}\text{C}$ .

**Preparation of Base**

The base on which bituminous macadam is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross sections in accordance with specification for bituminous base or as directed by the Engineer. The surface shall be thoroughly swept and scraped clean and free from dust and foreign matter. A priming coat where needed shall be applied as per direction of the Engineer.

**Tack Coat**

A tack coat as specified earlier shall be applied over the base except when the laying of bituminous levelling course is without opening to traffic.

**Preparation and Transport of Mix**

Bituminous macadam mix shall be prepared in a Hot Mix Plant of adequate capacity and capable to yield a mix of proper and uniform quality with thoroughly coated aggregates. The plant shall have coordinated set of essential units capable of producing uniform mix with the job mix formula. The temperature of binder at the time of mixing shall be in the range of  $150^{\circ}\text{C}$  to  $163^{\circ}\text{C}$  and that of aggregates in the range of  $155^{\circ}\text{C}$  to  $163^{\circ}\text{C}$ , provided that at no time shall the difference in temperature between the aggregates and binder exceed  $14^{\circ}\text{C}$ .

Mixing shall be thorough to ensure that a homogenous mixture is obtained in which all particles of the aggregates are coated uniformly, and the discharge temperature of mix shall be between  $130^{\circ}\text{C}$  to  $160^{\circ}\text{C}$ . The mixture shall be transported from the mixing plant to the point of use in suitable tipper vehicles. The vehicles employed for transport shall be clean and be covered over in transit, if so, directed by the Engineer.

**Spreading**

The mix transferred from the tipper at work site to the paver shall be spread immediately by means of a self-propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix lure to the specified lines, grade and cross sections. However, in restricted locations and in narrow widths, where the available plants cannot operate in the opinion of the Engineer, he may permit manual laying of the mix.

The temperature of mix at the time of laying shall be in the range  $120^{\circ}\text{C}$  to  $135^{\circ}\text{C}$ .

In multi-layer construction, the longitudinal joint in one layer shall be offset from that in the layer below by about 150 mm. However, the joint in the topmost layer shall be at the centre line of the pavement.

Longitudinal joints and edges shall be constructed true to the delineating line parallel to the centre line of the road. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

### **Rolling**

After the spreading of mix, rolling shall be done by 8 to 10 tonne power rollers or other approved plant. Rolling shall start as early as possible after the material has been spread. Rolling shall be done with care to keep from unduly roughening the pavement surface.

Rolling of the longitudinal joint shall be done immediately behind the paving operation. After this the rolling shall commence at the edges and progress towards the centre longitudinally except that on super-elevated portions where it shall progress from the lower to the upper edge parallel to the centre line of the pavement.

The initial or breakdown rolling shall be done with 8 to 12 tonnes three-wheel steel roller as soon as possible to roll the mixture without cracking the surface or having the mix pick up on the roller wheels. The second or intermediate rolling shall follow the breakdown rolling as closely as possible and shall be done while the paving mix is still at a temperature that will result in a maximum density. The final rolling shall be done while the material is still workable enough for removal of roller marks, with 8 to 10 tonne tandem roller. The rolling shall be continued till the entire surface has been rolled to 95% of average laboratory Marshall density.

When the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding fresh material. The rolling shall then be continued till the entire surface has been rolled to compaction, there is no crushing of aggregates and all roller marks have been eliminated. Each pass of the roller shall uniformly overlap not less than 1/3rd of the track made in the preceding pass. The roller wheels shall be kept damp, if necessary, to avoid the bituminous material from sticking to the wheels and being picked up. In no case shall fuel lubricating oil be used for this purpose.

Rolling operations shall be completed in every respect before the temperature of the mix falls below 100°C.

Rollers shall not stand on newly laid material where there is a risk that it will be deformed thereby. The edges along and transverse of the bituminous macadam laid and compacted earlier shall be cut to their full depths so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

#### **2.24.4.5 Measurement for Payment**

Bituminous macadam shall be measured in terms of surface area of application in square metres.

#### **2.24.4.6 Rate**

The contract unit rate for bituminous macadam shall be payable in full for carrying out the required operations as per specification and BOQ.

#### **2.24.5 Premix Carpet**

##### **2.24.5.1 Description**

This work shall consist of laying and compacting an open graded carpet of specified thickness in a single course composed of suitable small sized aggregates premixed with a bituminous binder on a

previously prepared base, in accordance with the requirements of these specification to serve as a wearing course.

### 2.24.5.2 Materials

#### **Binder**

The binder shall be bitumen of a suitable grade appropriate to the region, traffic, rainfall and other environmental conditions as directed by the Engineer and satisfying the requirements of IS:73, IS:217, IS:454 or other approved cutback as applicable.

#### **Aggregates**

The aggregates shall consist of crushed stone, crushed gravel/ shingle or other stones. This shall be clean, durable, fairly cubical in shape and free from disintegrated pieces, organic or other deleterious matters and different coatings. They shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the quality requirements as per Table below except that the Flakiness Index shall be limited to a maximum of 30%.

Sl. No.	Description of Aggregate Size	Permissible Variation by Weight of Total Mix
1	Passing 5.6 mm sieve	± 5%
2	Passing 2.8 mm sieve	± 4%
3	Passing 710 micron sieve	± 3%
4	Passing 180 micron sieve	± 1%
5	Binder	± 0.3%

#### **Proportioning of Materials**

The materials shall be proportioned as per quantities given in the Table below :

**Table 14: Quantities of Materials required for 10 m<sup>2</sup> of Road Surface for 2 cm thick Open-Graded Premix Carpet**

Aggregates for Carpet	
(a)	Stone chippings 13.2 mm size passing 22.4 mm sieve and retained on 11.2 mm sieve
(b)	Stone chippings 11.2 mm size passing 13.2 mm sieve and retained on 5.6 mm sieve
	Total
Binder for premixing (quantities in terms of straight run bitumen)	
(a)	For 0.18 m <sup>3</sup> of 13.2 mm size stone chippings at 52 kg per m <sup>3</sup>
(b)	For 0.09 m <sup>3</sup> of 11.2 mm size stone chippings at 56 kg per m <sup>3</sup>
	Total

### 2.24.5.3 Construction Operation

#### **Weather and Seasonal Limitation**

Same as in the case of bituminous macadam stated earlier.

### **Preparation of Base**

The underlying base on which the bituminous carpet is to be laid shall be prepared and conditioned to the specified lines, grade and cross section in accordance similar to wearing course, detailed and as directed by the Engineer. The surface shall be well cleared by removing caked earth and other foreign matter with wire brushes, sweeping with brooms and finally dusting with sacks, as necessary.

### **Tack Coat**

A tack coat complying specification of tack coat detailed earlier shall be applied over the base preparatory for laying of the carpet. Application of tack coat shall, however, not be necessary when the laying of carpet follows soon after the provision of a bituminous base/ levelling course, without opening to traffic.

### **Preparation of Premix**

Mixers of approved type shall be employed for mixing the aggregate with the bituminous binder.

The binder shall be heated to the temperature appropriate to grade of bitumen approved by the Engineer in boilers of suitable design avoiding local over-heating and ensuring a continuous supply.

The aggregates shall be dry and suitably heated to a temperature as directed by the Engineer before these are placed in the mixer. After about 15 seconds of dry mixing, the heated binder shall be distributed over the aggregate at the rate specified.

The mixing of binder with chippings shall be continued until the chippings are thoroughly coated with binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or wheel barrows. The vehicles employed for transport shall be clean and the mix being transported covered in transit, if so directed by the Engineer.

The temperature of binder at the time of mixing shall be in the range of 150°C to 163°C and that of aggregate in the range of 155°C to 163°C. The discharge temperature of mix shall be between 130°C and 160°C.

### **Spreading and Rolling**

The premixed material shall be spread on the road surface with rakes to the required thickness and camber or distributed evenly with the help of a drags spreader without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out. As soon as sufficient length of bituminous materials has been laid, rolling shall commence with 8-10 tonne power rollers, preferably of smooth wheel tandem type of other approved plant. Rolling shall begin at the edges and progress towards the centre longitudinally, except that on the super-elevated portions, where it shall progress from the lower to upper edge parallel to the centre line of the pavement.

When the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding pre-mixed materials. Rolling shall then be continued until the entire surface has been rolled to compaction and the roller marks eliminated. In each pass of the roller, preceeding track shall be overlapped uniformly by at least 1/3<sup>rd</sup> width. The roller wheels shall be kept damp to prevent the premix from adhering to the wheels and being picket up. In no case shall fuel/ lubricating oil be used for this purpose. Excess use of water for this purpose shall be avoided.

Roller shall not stand on newly laid material while there is a risk that it will be deformed thereby.

The edges along and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

### **Seal Coat**

A seal coat conforming to specifications of West Bengal PWD (Roads) and drawing shall be applied to the surface immediately after laying the carpet. No traffic shall be allowed on the road till the seal coat has been placed.

#### **2.24.5.4 Measurement for Payment**

Measurement shall be in square meters.

#### **2.24.5.5 Rate**

The contract unit rate shall be payable in full for carrying out the required operations as per specification and BOQ.

#### **2.24.6 Mastic Asphalt**

##### **2.24.6.1 Description**

This work shall consist of constructing a single layer of bitumen mastic wearing coarse for road pavements and bridge decks. Mastic asphalt is an intimate homogeneous mixture of selected well graded aggregates, filler and bitumen in such proportions as to yield a plastic and void less mass, which when applied hot can be trowelled and floated to form a very dense impermeable surfacing.

##### **2.24.6.2 Materials**

#### **Binder**

The binder shall be paving grade bitumen of a suitable grade satisfying the requirements of physical properties as given below.

**Table 15: Requirements of Physical Properties of Binder**

Sl. No.	Characteristics	Requirement	Method of tests
1	Penetration at 25 <sup>0</sup> C	15 ± 5	IS:1203
2	Softening point, <sup>0</sup> C	65 ± 10	IS:1205
3	Loss on heating for 5 hr at 163 <sup>0</sup> C, % by mass	2% (maximum)	IS:1212
4	Solubility in trichloroethylene, % by mass	95%	IS:1216
5	Ash (mineral matter), % by mass	1%	IS:1217

### **Coarse Aggregates**

The coarse aggregates shall consist of hard durable crushed stones This shall be clean, strong and free from disintegrated pieces, organic or other deleterious matters and adherent coatings.

The aggregates shall satisfy the physical requirements as per Table given.

**Table 16: Physical Requirement for Coarse Aggregates for Mastic Asphalt**

Sl. No.	Property	Test	Specification
1	Cleanliness (dust)	Grain size analysis	Maximum 5% passing 0.075 mm sieve
2	Particle shape	Flakiness & elongation index (combined)	Maximum 30%
3	Strength #	Los Angeles abrasion value Aggregate impact value	Maximum 35% Maximum 27%
4	Durability	Soundness Sodium sulphate Aggregate impact value	Maximum 12% Maximum 18%
5	Water absorption	Water absorption	Maximum 2%
6	Stripping	Coating and stripping of bitumen aggregate mixtures	Minimum retained coating 95%
7	Water sensitivity ##	Retained tensile strength	Minimum 80%

# Aggregates may satisfy requirements of either of the two tests

## The water sensitivity test is only required, if the maximum retained coating in the stripping test is less than 95%.

The percentage and grading of the coarse aggregates to be incorporated in the bitumen mastic depending upon the thickness of the finished coarse shall be as given below.

**Table 17: Grade & Thickness of Mastic Asphalt Paving and Grading of Coarse Aggregate**

**Fine Aggregates**

Application	Thickness range (mm)	Nominal size of coarse aggregates (mm)	Coarse aggregate content, % by mass of total mix
Roads & carriageways	25-50	13	40 ± 10
Heavily stressed areas i.e. junction & toll plazas	40-50	13	45 ± 10
Nominal size of coarse aggregates		13 mm	
IS sieve (mm)		Cumulative % passing by weight	
19		100	
13.2		88-96	
2.36		0-5	

The fine aggregates shall be the fraction passing 2.36 mm and retained of 75 micron sieve consisting of crusher run screening, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from soft or flaky pieces and organic or deleterious substances.

**Filler**

The filler shall be limestone powder passing 75-micron sieve and shall have a minimum CaCO<sub>3</sub> content of 80% by weight when determined in accordance with IS:1514. The grading of the fine aggregates inclusive of filler shall be as given below:

**Table 18: Grade of Fine Aggregates (Inclusive of Filler)**

IS Sieve	Percent by weight of aggregates
36 mm but retained on 0.60 mm	
60 mm but retained on 0.212 mm	
212 mm but retained on 0.075 mm	
0.075 mm	

**2.24.6.3 Mix Design****Hardness Number**

The bitumen mastic shall have a hardness number at the time of manufacture of 60 to 80 at 25°C prior to the addition of coarse aggregates and 10 to 20 at 25°C at the time of laying after adding coarse aggregates. The hardness number shall be determined in accordance with the method specified in IS:1195.

**Binder Content**

The binder content shall be so fixed as to achieve the requirements of the mix set forth in Sub-clause 13.6.2.1 and shall be in the range of 14 to 17% by weight of total mix as given in table below showing composition of bitumen mastic blocks without coarse aggregate.

**Table 19: Composition of Bitumen Mastic Blocks without Coarse Aggregate**

IS sieve	% by weight of mastic asphalt	
	Minimum	Maximum
2.36 mm but retained on 0.60 mm	0	22
0.60 mm but retained on 0.212 mm	4	30
0.212 mm but retained on 0.075 mm	8	18
0.075 mm	25	45
Bitumen content	14	17

**Job  
Mix****Formula**

The Contractor shall intimate the Engineer in writing, at least 30 days before the start of the work, the job mix formula proposed to be used by him for the work. It shall indicate the source and location of materials, proportion of all materials such as binder and aggregates, single definite percentage passing each sieve for the mix aggregates and results of the tests recommended in various tables and clauses in this specification.

**2.24.6.4 Construction Operations****Weather and Seasonal Limitation**

Same as per IRC specifications.

**Preparation of Base**

The base on which bitumen mastic is to be laid shall be prepared, shaped and conditioned to the profile required and as directed by the Engineer. In case of a cement concrete base, the surface shall be thoroughly power brushed clean and free of dust and other deleterious matter. Under no circumstances

shall bitumen mastic be spread on a base containing a binder which might soften under high application temperatures. If any such spots or area are there, the same shall be cut out and repaired before the bitumen mastic is laid.

### **Tack Coat**

A tack coat complying specification of tack coat detailed earlier shall be applied on the base, subject to approval of the Engineer.

### **Preparation of Bitumen Mastic**

Preparation of bitumen mastic consists of two stages.

The first stage shall be mixing of filler and fine aggregates and then heating the mixture to a temperature of 170°C to 200°C. Required quantity of bitumen shall be heated to 170°C to 180°C and added to the heated aggregate. They shall be mixed and cooked in an approved type of mechanically agitated mastic cooker for some time till the materials are thoroughly mixed. Initially the filler alone is to be heated in the cooker for about an hour and then half the quantity of binder is added. After heating and mixing for some time, the fine aggregates and balance quantity of binder are to be added and further cooked for about one hour.

The second stage is incorporation of coarse aggregates and cooking the mixture for a total period of 3 hours. During cooking and mixing, care shall be taken to ensure that the contents in the cooker are, at no time, heated to a temperature exceeding 210°C.

In case where the material is not required for immediate use, it shall be cast into blocks with filler, fine aggregates and binder, weighing about 25 kg each. These blocks when required to be used, have to be reheated in the mechanically agitated cooker to a temperature of not less than 175°C, nor more than 210°C, thoroughly incorporated with the requisite quantity of coarse aggregates and mixed continuously. Mixing shall be continued until laying operations are completed so as to maintain the coarse aggregates in suspension. At no stage during the process of mixing shall the temperature exceed 210°C.

The bitumen mastic blocks (without coarse aggregates) shall show on analysis a composition within the limits as given above.

The mix shall be transported to the laying site in a towed mixer transporter having arrangement for stirring and keeping the mix hot during transportation.

### **Spreading**

The bitumen mastic shall be laid normally in one coat, at a temperature between 175 - 210°C and sprayed uniformly by hand using wooden floats or by machine on the prepared and regulated surface. The thickness of the mastic asphalt shall be as given above unless otherwise directed by the Engineer. Where necessary, battens of the requisite dimensions shall be employed. Any blow holes that appeared on the surface shall be punctured while the material is hot and the surface made good by further floating.

### **Joints**

It shall be ensured that all construction joints are properly and truly made. These joints shall be made by warming existing bitumen mastic by the application of excess quantity of the hot mastic mix which afterwards shall be trimmed to leave flush with the surfaces on either side.

### **Surface Finish**

The bitumen mastic surface can be slippery after floating. In order to provide resistance to skidding, the bitumen mastic after spreading, while still hot, and in plastic condition shall be covered with a layer of stone aggregate. This aggregate shall be 13.2 mm size (passing the 19.0 mm sieve and retained on 9.5



mm sieve) or 9.5 mm size (passing the 13.2 mm sieve and retained on 6.7 mm sieve), subject to the approval of the Engineer. Hard stone chips of approved quality pre-coated with bitumen at the rate of  $2 \pm 0.4\%$  of S-65 penetration grade. The addition of 2% of filler complying with the grading requirement as given in the table below may be required.

**Table 20: Grading Requirement for Filler**

IS sieve (mm)	Cumulative % passing by weight of total aggregate
0.60	100
0.30	95-100
0.075	85-100

The chips shall then be applied at the rate of  $0.005 \text{ m}^3$  per  $10 \text{ m}^2$  and rolled or otherwise spread into the surface of the mastic layer when the temperature of bitumen mastic is not less than  $100^\circ\text{C}$ .

### **Opening to Traffic**

The traffic may be allowed after completion of the work when the bitumen mastic's temperature at the mid depth of the completed layer has cooled down to the daytime maximum ambient temperature.

### **Quality Control of Work**

The type and grade of bitumen; the quality, grade and percentage of coarse/ fine aggregates and filler; the temperature control for heating the materials/ mix; laying, floating and compacting; hardness number of the bitumen mastic etc. shall be strictly followed as per specification or as directed by the Engineer.

The quality control tests for coarse and fine aggregates shall be exercised by the Engineer in accordance with IRC specifications. The surface of the bitumen mastic tested with a straight edge 3m long, placed parallel to the centre of the carriageway shall have no depression greater than 7 mm. The same limit shall also apply in case of transverse profile when tested with a camber template.

### **Measurement for Payment**

Mastic asphalt shall be measured as finished work in square metres at a specified thickness as indicated in the BOQ.

## **2.24.7 Temporary Road Restoration**

Temporary road restoration shall be done with recovered road crust and other sub-base materials as per direction of the Engineer. Rolling and labour charges shall be included in this item for payment as per BOQ. The rolling shall be done with 4 tonne vibratory roller (from time to time as settlement takes place). The temporary restored road shall be allowed to settle (through one monsoon if a monsoon period is available) after completion of the stretch of pipeline. During this period there may be some settlement while rolling which shall be filled up again with recovered road crust, sub-base materials, jhama/ stone / binders and rolled with roller to give an even surface to the temporary road. This operation shall be done until permanent road restoration work commences. The rate for this item shall include rolling/ watering charges/ all labour and manpower costs/ all material costs. No extra payment shall be made other than rate quoted for this item.

## **2.24.8 Road Kerb and Channel**

### **2.24.8.1 Scope**

This specification covers the requirements for precast concrete units for kerbs and channels to be provided at the road edges and shall generally be in accordance to IS:5758.

### **2.24.8.2 Materials**

The materials to be used for the precast concrete units viz. cement and aggregates shall be in accordance to the specifications as mentioned earlier. The maximum size of coarse aggregates may be as large as possible within the limits specified but in no case greater than one-fourth of the minimum thickness of the section.

The concrete shall be minimum of M25 grade, with the strength requirements specified in IS:456.

The kerbs and channels manufactured shall be properly matured by being stacked for at least 28 days or cured in some other manner proved to the satisfaction of the Engineer to give equivalent results.

### **2.24.8.3 Size of Road Kerb and Channel**

The kerbs, channels shall be of size 150 mm x 300 mm and shall be manufactured to an uniform length of 500 mm unless otherwise directed by the Engineer.

### **2.24.8.4 Finish and Colour**

The kerbs, channels etc. shall be supplied in natural colour.

### **2.24.8.5 Freedom from Defects**

All angles of the precast units with the exception of the angles resulting from the splayed or chamfered faces in the sections shall be true right angles. The arrises shall be clean and with the exception of the rounded arrises shall be sharp. The wearing surfaces shall be true and out of winding. On being fractured, the interior of the products shall present a clean homogeneous appearance.

### **2.24.8.6 Moulding**

The kerbs, channels etc. may be made by any process. In case those are made under hydraulic pressure, the pressure employed shall not be less than 7 MN/m<sup>2</sup> over the entire surface receiving the pressure.

### **2.24.8.7 Tests**

The samples of kerbs, channels etc. shall be tested for transverse strength and absorption of water in accordance with the test procedure given in IS:5758. No separate payment shall be made to the Contractor for testing of samples. The Engineer shall witness the tests of the samples to be arranged by the Contractor. At least 50 numbers of samples manufactured under a single batch shall be placed for testing. The Engineer shall witness test for 1% of the total number of kerbs and channels placed for testing, subject to a minimum of 3. The Engineer at all reasonable times, shall have access to the place where the kerbs, channels etc. are manufactured or stored, for the purpose of examining and sampling the materials and the finished products, inspecting the process of manufacture, testing and marking the products. The Contractor shall, free of extra charge, provide or make arrangements for the provision of every facility and all labour required for such examination, sampling, inspecting, testing and marking before delivery. The Contractor shall ensure that accurate apparatus are used for the purpose of testing.

In case of failure to meet the test requirements of any one of the samples, the Engineer shall ask to carry out tests for additional 1% of the total number of kerbs and channels placed for testing, subject to a minimum of 3 numbers of samples from the batch comprising the same order. In case of failure to fulfill the test requirements for any one of the additional samples being tested, the Engineer may reject the entire batch of kerbs, channels etc. represented by the samples and shall not be used in the project. The Engineer's decision shall be final and binding.

Even after delivery at site, if any defective kerbs or channels are identified, same shall be removed from site. Also, the kerbs, channels getting damaged even after laying shall be replaced by the Contractor. For these no additional payment will be made to the Contractor.

#### **Test for Transverse Strength**

Kerbs, channels etc. shall support without damage load in accordance with Table 1, IS:5758 taking into account the aging factor.

#### **Test for Absorption of Water**

The test shall be carried out in accordance with IS:5758. Absorption of water in the first ten minutes shall not exceed 3% and the absorption after 24 hours shall not exceed 8%, the percentages being calculated on the dry mass of the test pieces.

### **2.24.8.8 Laying of Road Kerb and Channel**

Road kerbs and channels shall be laid after preparing the bed by cutting or filling the existing road edge or hard crust true to line, grade and slope as per direction of the Engineer. The kerbs and channels are to be laid over 75 mm thick cement concrete (M15) as shown in drawing. All the joints shall be filled with cement sand mortar 1:4. Curing of mortar joints shall be done at least for 3 days. Backfilling as may be required shall be done with earth and properly compacted.

### **2.24.8.9 Measurement**

The measurement shall be in running metre for road kerb and channel combined. The rate shall be inclusive of cost of all materials and labour. In case of laying of either road kerb or channel, 50% of the quoted rate shall be payable.

### **2.24.9 Precast Paver Blocks**

The precast concrete paver blocks shall be laid in areas as shown in drawings as per the following details.

The area to be paved shall be dressed properly and consolidated as required.

If the sub-surface is hard like pre-mixed bitumen or concrete or brick, it shall be scrapped clean and prepared to receive the concrete paver block.

The free edges shall be locked with precast concrete blocks (M40 grade) of width 100 mm and depth, as required, but not less than 150 mm.

A layer of medium coarse sand 50 mm consolidated thickness shall be spread over the hard surface bitumen/ concrete/ brick.

The interlocking concrete paver blocks of thickness mentioned in BOQ shall be laid and locked to proper line and laid over the consolidated sand.

Wherever required, the edges shall be locked with PCC (1:1.5:3)

Payment shall be made as per items in BOQ.

**2.24.10 Brick Pavement****2.24.10.1 Scope**

The work shall consist of construction of brick pavement in accordance with the requirement of this specification and in conformity with the line, grades, and cross-section shown on the drawing or as directed by the Engineer. The work shall include furnishing of all plants and equipment, materials and labours, and performing all operations, in connection with the work as approved by the Engineer.

**2.24.10.2 Material**

All material shall satisfy the specifications as given elsewhere in this document.

**2.24.10.3 Construction**

The bed shall be prepared by cutting or filling and ramming the filled up earth to the profile as that of finished pavement. Brick-on-edge shall thereafter be laid in Herring Bone pattern with joints set closed in cement mortar 1:6.

**2.24.10.4 Measurement for Payment**

Brick pavement shall be measured in sqm.

**2.24.10.5 Rate**

The contract unit rate for the construction of brick pavement for the payment in full for carrying out the operation required as per this specification including full compensation for all labours, plants, tools and equipment and testing and installation to complete the work as per specification providing all materials to be incorporated in the work including all royalties, fees, storage, rents, where necessary and all leads and lifts.

**2.25 Finishing Works****2.25.1 Scope**

These specifications cover the general requirements of different kinds of finishes.

**2.25.2 Cement Plastering**

The cement plaster shall be of thickness as specified in the BOQ and drawings.

**2.25.3 Scaffolding**

For all exposed brickwork or tile work, double scaffolding independent of the work having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.

For all other work in buildings, single scaffolding shall be permitted. In such cases the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/ columns less than one metre in width or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

Note: In case of special type of brickwork, scaffolding shall be got approved from the Engineer in advance.

#### **2.25.4 Preparation of Surface**

The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scrapping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced. In case of concrete surface if a chemical retarder has been applied to the formwork, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface.

#### **2.25.5 Mortar**

The mortar of the specified mix using the type of sand described in the item of BOQ shall be used. For external work and under coat work, the fine aggregate shall conform to grading zone IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used.

#### **2.25.6 Application**

Ceiling plaster shall be completed before commencement of wall plaster.

Plastering shall be started from the top and worked down towards the floor. All put-log holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster for about 15 x 15 cm area shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be beaten with thin strips of bamboo about one metre long to ensure thorough filling of the joints, and then brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and sideways movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or sandy granular texture is required. Excessive trowelling or over working the float shall be avoided. During this process, a solution of lime putty shall be applied on the surface to make the later workable.

All corners, arrises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises, provision of grooves at junctions etc., where required shall be done without any extra payment. Such rounding, chamfering or grooving shall be carried out with proper templates or battens to the sizes required.

When suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped, cleaned and wetted with lime putty before plaster is applied to the adjacent areas, to enable the two to properly joint together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm to any corners or arrises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakages.

No portion of the surface shall be left out initially to be patched up later on.

The following variations between lime plaster and cement plaster to be noted while preparation of plaster:

- 1) Beating with thin bamboo strips shall not be done on the cement plaster and;
- 2) No lime putty solution shall be applied on the face when finishing. Further the plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

#### **2.25.7 Thickness**

Where the thickness required as per description of the item is 20 mm, the average thickness of the plaster shall not be less than 20 mm whether the wall treated is of brick or stone. In the case of

brickwork, the minimum thickness over any portion of the surface shall not be less than 15 mm while in case of stonework the minimum thickness over the bushings shall not be less than 12 mm.

### **2.25.8 Curing**

Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered.

The plaster shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages at the Contractor's expense by such means as the Engineer may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

## **2.26 Cement Plaster with a Floating Coat of Neat Cement**

The cement plaster shall be 12, 15 or 20 mm thick, finished with a floating coat of neat cement, as described in the BOQ and drawings.

Specifications for this item of work shall be same as described earlier except for the additional floating coat which shall be carried out as below:

When the plaster has been brought to a true surface with the wooden straight edge, it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth so that the whole surface is covered with neat cement coating. The quantity of cement applied for floating coat shall be 1 kg per sqm. Smooth finishing shall be completed with trowel immediately and in no case later than half an hour of adding water to the plaster mix. The rest of the specifications described in earlier shall apply.

### **2.26.1 Cement Plaster (6 mm) on Cement Concrete and Reinforced Cement Concrete Work**

#### **2.26.1.1 Scaffolding**

Stage scaffolding shall be provided for the work. This shall be independent of the walls.

#### **2.26.1.2 Preparation of Surface**

Projecting burrs of mortar formed due to the gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brushed. In addition, concrete surfaces to be plastered shall be pock marked with a pointed tool, at spacing of not more than 5 cm centres, the pock being made not less than 3 mm deep. This is to ensure a proper key for the plaster. The mortar shall be washed off and surface cleaned of all oil, grease etc. and well wetted before the plaster is applied.

#### **2.26.1.3 Mortars**

Mortars of the specified mix using the types of sand described in the item shall be used. It shall be as specified.

#### **2.26.1.4 Application**

To ensure even thickness and a true surface, gauges of plaster 15 x 15 cm shall be first applied at not more than 1.5m intervals in both directions to serve as guides for the plastering. Surface of these gauged areas shall be truly in the plane of the finished plaster surface. The plaster shall then be applied in a uniform surface to a thickness slightly more than the specified thickness and shall then be brought to true and even surface by working a wooden straight edge reaching across the gauges. Finally the surface shall be finished true with a trowel or with wooden float to give a smooth or sandy

granular texture as required. Excess troweling or over working of the floats shall be avoided. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

Plastering of ceiling shall not be commenced until the slab above has been finished and centering has been removed. In the case of ceiling of roof slabs, plaster shall not be commenced until terrace work has been completed. These precautions are necessary in order that the ceiling plaster is not disturbed by the vibrations set up in the above operations.

#### **2.26.1.5 Finish**

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceed with a true straight edge not less than 2.5m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

#### **2.26.1.6 Thickness**

The average thickness of plaster shall not be less than 6 mm. The minimum thickness over any portion of the surface shall not be less than 5 mm.

#### **2.26.1.7 Curing**

The specifications shall be as detailed earlier.

#### **2.26.1.8 Precautions**

Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut out in rectangular shape and re-done as directed by the Engineer.

When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly, when the wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6 mm drawn with any suitable method with the wall while the plaster is green.

To prevent surface cracks appearing between junctions of column/ beam and walls, 150 mm wide chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/ column in one vertical plane shall be carried out in one go. For providing and fixing chicken wire mesh with U nails payment shall be made separately.

#### **2.26.1.9 Measurements**

Length and breadth shall be measured correct to a cm and its area shall be calculated in sqm correct to two places of decimal. Dimensions before plastering shall be taken.

Thickness of plaster shall be exclusive of the thickness of the key i.e., depth or rock marks and hacking.

Exterior plastering at a height greater than 10m from average ground level shall be measured separately in each storey height. Patch plastering (in repairs) shall be measured as plastering new work.

Deduction shall not be made for openings or for ends of columns, or columns caps of 0.5 sqm each in area and under. No additions shall be made either for plastering of the sides of such openings. For openings etc. of areas exceeding 0.5 sqm, deduction shall be made for the full opening but the sides of such opening shall be measured for payment.

#### **2.26.1.10 Rate**

The rate shall include the cost of all labour and materials and incidentals involved in all the operations described above.

## **2.26.2 Neat Cement Punning**

The specifications given for floating coat described earlier shall apply. Specification for scaffolding shall be as described in earlier.

### **2.26.2.1 Curing**

Curing shall start as soon as the plaster has hardened sufficiently not to be damaged when watered.

### **2.26.2.2 Finish**

Specifications for finish shall be as described in earlier.

### **2.26.2.3 Precautions**

Specifications precautions shall be as described earlier.

### **2.26.2.4 Measurements**

The measurements for neat cement punning shall be taken over the finished work. The length and breadth shall be measured correct to a cm. The area shall be calculated in sqm correct to two places of decimal.

Deductions in measurements for opening etc. will be regulated as follows:

- 1) No deduction shall be made for openings or ends of joists, beams, posts, girders, steps etc. upto 0.5 sqm in area and no additions shall be made either for the jambs, soffits and sills of such openings. The above procedure shall apply to both faces of wall.
- 2) Deduction for opening exceeding 0.5 sqm but not exceeding 3 sqm each shall be made for reveals, jambs, soffits, sills, etc. of these openings.
- 3) When both faces of walls are plastered with same plaster, deductions shall be made for one face only.
- 4) When two faces of walls are plastered with different types of plaster or if one face is plastered and other is pointed or one face is plastered and other is unplastered, deduction shall be made from the plaster or pointing on the side of frame for the doors, windows etc., on which width of reveals is less than that on the other side but deduction shall be made on the other side.
- 5) Where width of reveals on both faces of wall is equal, deduction of 50% of area of opening on each faces shall be made from area of plaster and/ or pointing as the case may be.
- 6) For opening having door frame equal to or projecting beyond thickness of wall, full deduction for opening shall be made from each plastered face of wall.

#### **Note:**

- Different qualities of plastering referred in this Clause shall not include '18 mm plastering with terrazo finish', as the method of measurement in the case of the later is different. In such cases where the plaster on the other face consists of a plaster with terrazo finish, method of addition and deductions for the ordinary plaster face shall be regulated as if that face alone is plastered and the other is given an entirely different type of non-comparable treatment.
- For opening exceeding 3 sqm in area, deduction shall be made in the measurements for the full opening of the wall treatment on both faces, while at the same time, jambs, sills and soffits shall be measured for payment.



- In measuring jambs, sills and soffits, deduction shall not be made for the area in contact with the frame of doors, windows etc.

### 2.26.2.5 Rates

The rate shall include the cost of all labour and materials involved in all the operations described above.

## 2.27 Unplasticized Pvc (UPVC) Pipes

### 2.27.1 Scope

This specification covers the requirements for manufacturing, stacking, supplying, laying, jointing and testing of uPVC pipes used for sewerage and drainage.

### 2.27.2 Applicable Codes

Laying of uPVC pipes and fittings/ specials shall comply with all currently applicable statutes regulations, standard and codes. In particular, the following standards, unless otherwise specified herein shall be referred. In all cases, the latest revision of the standards/ codes shall be referred to. If requirements of this specification conflicts with the requirements of the standards/ codes, this specification shall govern.

IS:4985	Unplasticized PVC pipes for potable water supplies – Specification
IS:7834	Specifications for injection moulded PVC fittings with solvent cement joints for water supplies
IS:10124	Specification for fabricated PVC fittings for potable water supplies
IS:12235	Thermoplastics pipes and fittings – Methods of test
IS:13592	Specification for uPVC pipes for soil and waste discharge systems inside buildings including ventilation and rainwater system

Other IS codes not specifically mentioned here but pertaining to the use of uPVC pipes form part of these specifications.

### 2.27.3 Manufacture

The uPVC pipes and fittings shall be of approved brand conforming to IS:4985, IS:7834 and IS:10124 shall be free from defects (as specified in BOQ). The pipes used for sewers shall be Class 3 (Pressure rating 6 kg/cm<sup>2</sup>).

Pipes have one end socketed and the other end plain, which fits snugly without the use of couplers and joined by solvent cement.

### 2.27.4 Typical UPVC Pipe Properties

Content of calcium carbonate (treated) shall be between 8-10% by weight. Specific gravity shall be between 1.40 - 1.46.

uPVC pipes used for the sewerage system shall have the following wall thicknesses:

• 160 mm dia	5.4 to 6.2 mm (min. & max. thickness)
• 200 mm dia	6.8 to 7.9 mm (min. & max. thickness)
• 225 mm dia	7.6 to 8.8 mm (min. & max. thickness)

Pipes purchased from Indian approved manufactures shall have ISI mark. If pipes are purchased from countries other than India, it shall have the appropriate certification confirming the above specifications.

### **2.27.5                Stacking**

The uPVC pipes must be stacked in a neat manner so that there is no sagging owing to defective stacking. The bottommost layer of pipe must be placed on a horizontal surface over buffer blocks closely placed to prevent any sagging of the pipe. The subsequent layer of pipes shall be placed at right angles to the bottom layer. These pipes may be stacked in tiers upto maximum of 10 tiers. Storing shall be such as to prevent direct exposure to sunlight.

### **2.27.6                Inspection of Pipes**

The pipes and fittings shall be inspected before laying for defects, cracks etc. and any pipe or fitting found unsuitable shall be rejected.

### **2.27.7                Laying and Jointing of uPVC Pipes and Fittings**

uPVC pipes shall be laid true to line and level in properly excavated trenches with the help of sight rails and boning rods. Checking of all levels shall be with calibrated modern levelling equipment.

uPVC pipes shall be laid in excavated trenches over a bed of compacted silver sand cushion and compacted silver sand surround as indicated in drawing and BOQ.

The jointing shall be done with elastomeric rubber ring gaskets or using solvent cement. The elastomeric rubber ring gasket must be Manufacturer's supply. In case of jointing with solvent cement, Manufacturer's recommendation must be followed. Jointing shall be done as per the requirement and as per the relevant BIS Codes.

### **2.27.8                Testing**

Mechanical tests during the manufacture of pipes and the hydrostatic tests at works shall be carried out under the conditions and pressures specified in the relevant Indian Standards.

On completion, all pipes are to be flushed with clean water. The 'as laid' uPVC pipes are not required to be hydraulically tested with water or otherwise. However, the Contractor must ensure good engineering practice while laying and jointing the pipes.

### **2.27.9                Damage to Pipe Lines**

If any damage is caused to the pipeline during execution of work or while cleaning the pipeline as specified, the Contractor shall be held responsible for the same and shall replace the damaged pipeline at his own cost to the full satisfaction of the Engineer.

### **2.27.10              Measurement**

Measurement for 'as laid' pipes shall be taken as shown in standard drawing. Payment for pipe laying shall be made as per the relevant BOQ item only after satisfaction by the Engineer.

## **2.28                   Gully pits/ catch pits/ inspection pits**

### **2.28.1                General**

Gully pits, catch pits and inspection pits shall be as shown in the drawing.

Each gully pit or catch pit shall have one polyelastomer grating of size as shown in drawing. Inspection pits shall be provided with RCPC manhole cover. Loading capacity of the grating/ manhole cover to

be provided shall be decided by the Engineer, depending on loading pattern to the road and its position.

### **2.28.2 Excavation**

The excavation for gully pits, catch pits and inspection pits shall be done true to dimensions and levels as indicated on plans or directed by the Engineer.

### **2.28.3 Measurement**

The costs of road crust excavation, earthwork in excavation including disposal of spoil, backfilling, road restoration and uPVC pipes, however, shall be paid separately as per BOQ item. Addition or reduction in rates for brickwork shall be made for every 150 mm increase or decrease in depth of the gully pits/ inspection pits/ inspection pits.

## **2.29 Pipe laying using jack pushing technique**

### **2.29.1 Pipe Jack Pushing Contractor**

The pipe jack pushing work shall be undertaken by a specialist Pipe Jacking Contractor with prior approval from the Engineer. The nominated Contractor will have to give an undertaking for safe and satisfactory construction work. Any damage caused to the abutting structures shall be made good by the Contractor at no extra cost. Also any defects that may crop up during the progress of work shall be made good without any extra cost.

### **2.29.2 Pipes**

All concrete pipes shall be manufactured by the jack pushing specialist or procured from standard manufacturers and shall be handled, unloaded, stacked and jointed in accordance with that specified in earlier sections. Concrete grade shall be minimum M40 and thickness of wall shall be as per relevant IS Code. MS pipe shall be used for jack pushing as per BoQ

All concrete pipes for use in pipe jacking shall be adequate to withstand the dead and live loads, its self weight and the load that will obviate from the jacking force. The manufacturing tolerance in pipes shall be in conformity to IS:458. Pipes shall be supplied after under-water curing or other means of curing so as to achieve the minimum strength of concrete specified. These pipes shall have thrusting surfaces at the ends of the pipe which are square to the pipe axis and free from significant undulations and protuberant surfaces.

The Contractor shall mention the following before commencement of work.

- a) The effective length of pipes
- b) The area of the end thrusting surfaces
- c) The thrust loads for which the pipe is designed
- d) The total length of pipes required
- e) Number of pipes required
- f) The number, position and diameter of grout holes that may be required
- g) The number and size of the jacking and reception shafts

### **2.29.3 Excavation**

Excavation shall be undertaken within a shield which must be kept close to the working face at all times. The shield shall be equipped with steering jacks to adjust the alignment. In loose materials, face boards shall be available for closing the exposed excavation at the end of each shift, or when jacking ceases.

#### **2.29.4 Pipe Jacking Crew**

Pipe jacking crew must be experienced and well versed in pipe jacking work. An Engineer or Ganger experienced in the pipe jacking technique, representing the Pipe Jacking Contractor, shall be present at all times during the progress of work and shall be responsible for maintaining correct line and level.

#### **2.29.5 Pit Details**

The size of thrust pit shall be adequate for handling/ lowering/ lifting of jacking equipment, men, materials, shield, joists etc. The pit shall be suitably supported with sheeting/ walling & strut for safe working. A detailed drawing shall be submitted by the Contractor for information and understanding of the Engineer.

The thrust wall shall be adequate to withstand the jack loads for installation of the pipeline. It shall be constructed normal to the proposed line of thrust. Intermediate jacking stations may be used at the discretion of the Pipe Jacking Contractor where frictional resistance or other causes might otherwise necessitate unreasonably high jacking forces. All such information shall be furnished by Pipe Jacking Contractor prior to commencement of work.

#### **2.29.6 Jacking Equipment**

The Contractor shall use jacking equipment which is designed to provide the forces necessary for installation of the pipes. The thrust load shall be imparted through the pipe to a suitable thrust ring which shall be rigid to ensure even distribution of the load without creating point loading.

#### **2.29.7 Joint Leakage**

After completion of jacking, minor leaks at pipe joints should be sealed with epoxy putty suitable for damp application.

#### **2.29.8 Measurement & Payment**

Measurement for items shall be made as per items in the BOQ only. No extra payment shall be made on account of excavation of any kind, pit shoring and dewatering. The rates quoted by the Contractor should be inclusive of all tools, equipment, plant, machinery, safety arrangements, guards on 24 hours basis, barricades, lighting etc. all complete. No extra item will be applicable for payment. It is to be clearly understood that since this work will be undertaken by a specialist Contractor it will be deemed that the Contractor has seen the site in detail and any unforeseen item envisaged by the Contractor must be taken care of and its costs should be included in the quoted rates.

The Contractor must thoroughly inspect the site before quoting. Over and above what has been written in the above items the Contractor must consider in his rates (if he thinks fit) costs of bentonite lubrication, dewatering of any kind, transportation and removal of all equipment & machinery, removal of obstructions from inside the pipe and rendering the site usable. The Contractor must also abide by the specifications.

### **2.30 Outfall structures**

#### **2.30.1 Scope of Work**

The proposed sewerage and drainage network is proposed to have outfall arrangements at strategic locations as shown in the drawings to divert portion of storm water generated from upstream to the outfall canals. The outfall structures essentially consist of the following three components:

Overflow structure – This is essentially a manhole with one incoming sewer and two outgoing sewers: one of smaller size, but at level lower to or at same level of incoming sewer; other at higher elevation, meant to handle storm water flow only.

Controlling arrangement, by providing sluice gate, weir gate or flap gate – this is necessary to prevent possibility of any backflow from the outfall canal system to the proposed S&D system.

Outlet conduit downstream of the controlling arrangement upto outfall channel.

## 2.30.2 Overflow Structure

The outfall structure shall be similar to manhole construction, but of dimension as shown in the drawing. The specifications to be followed for the overflow structure shall be similar to that mentioned earlier.

## 2.30.3 Controlling Arrangement

### 2.30.3.1 Sluice Gate

The sluice gates to be provided shall be of HDPE with wall mounted flange back frame with rising spindle. The sluice gates shall be suitable for required seating and unseating water head depending on salient levels of the system and water level of the outfall channel. The sluice gates shall have necessary manual operating system.

Material of construction for different components of the sluice gate:

• Hand wheel hub	Cast iron as per IS:210, FG 200
• Pillar mounted ungeared headstock (PUGH)	Cast iron as per IS:210, FG 200
• Thrust nut	Leaded tin bronze as per IS:318, LTB 2
• Bottom seal	HDPE backed with EPDM cord
• Guide backing seal	EPDM
• Shutter side guide	HDPE
• Stem	SS, ASTM A276, Type 304
• Shutter/ slide	HDPE reinforced with SS, ASTM A240, Type 304
• Stem/ spindle	SS, ASTM A240, Type 304
• Gate frame	SS, ASTM A240, Type 304
• All fasteners (nuts, bolts, washers) for gate assembly, anchor fasteners for gate frame and anchor bolts for headstock pillar	SS, ASTM A276, Type 304
• Paint for gate assembly	Black coal tar epoxy paint
• Paint for headstock	Grey epoxy paint

Allowable deviation for dimensions without specified tolerances shall be in accordance with the latest edition of IS:2102.

The Contractor shall collect gate details and necessary information of the vertical thrust load likely to be generated from the sluice gate assembly and water head from the Manufacturer and provide the same to the Engineer. Design of the outfall structure as a whole shall be reviewed by the Engineer and shall suggest the necessary modifications. Any changes suggested by the Engineer shall be final and binding to the Contractor.

Prior to despatch the sluice gates from the factory, the following shop tests need to be conducted in presence of the Engineer:

- 1) Movement test to check interference free movement of the complete assembly
- 2) Dimensional checking for important dimensions with respect to the approved drawing

- 3) Seat clearance check for clearance between mating sealing faces – with the sluice gate in closed condition, 0.1 mm thick feeler gauge shall not pass through between mating sealing faces
- 4) Material test certificates for all important components of sluice gates such as frame, shutter, anchor fasteners, rubber seals, spindle etc. shall be furnished at the time of inspection.

The visit of Engineer to the factory for testing shall be arranged by the Contractor at his expense and will not be reimbursed.

Installation of the sluice gate shall be done strictly fulfilling the Manufacturer's requirements/ suggestions.

The Contractor shall provide anchoring template for each size of the sluice gate assembly to enable insert the mechanical anchor fastener in place without the gate assembly.

Transit stops as may be provided by the Manufacturer shall not be removed until the gate is installed, initially operated to the satisfaction of the Engineer.

### 2.30.3.2 Weir Gate

The downward opening weir gates to be provided shall be of HDPE with wall mounted flange back frame with rising spindle. The weir gates shall be suitable for required seating and unseating water head depending on salient levels of the system and water level of the outfall channel. The weir gates shall have necessary manual operating system.

Material of construction for different components of the weir gate shall be as follows:

• Hand wheel hub	Cast iron as per IS:210, FG 200
• Pillar mounted ungeared headstock (PUGH)	Cast iron as per IS:210, FG 200
• Thrust nut	Leaded tin bronze as per IS:318, LTB 2
• Bottom seal	HDPE backed with EPDM cord
• Guide backing seal	EPDM
• Shutter side guide	HDPE
• Stem	SS, ASTM A276, Type 304
• Shutter/ slide	HDPE reinforced with SS ASTM, A240, Type 304
• Stem/ spindle	SS, ASTM A240, Type 304
• Gate frame	SS, ASTM A240, Type 304
• All fasteners (nuts, bolts, washers) for gate assembly, anchor fasteners for gate frame and anchor bolts for headstock pillar	SS, ASTM A276, Type 304
• Paint for gate assembly	Black coal tar epoxy paint
• Paint for headstock	Grey epoxy paint

Allowable deviation for dimensions without specified tolerances shall be in accordance to the latest edition of IS:2102.

The Contractor shall collect gate details and necessary information of the vertical thrust load likely to be generated from the weir gate assembly and water head from the manufacturer and provide the same to the Engineer. Design of the outfall structure as a whole shall be reviewed by the Engineer

and shall suggest the necessary modifications. Any changes suggested by the Engineer shall be final and binding to the Contractor.

Prior to despatch the weir gates from the factory, the following shop tests need to be conducted in presence of the Engineer:

- 1) Movement test to check interference free movement of the complete assembly
- 2) Dimensional checking for important dimensions with respect to the approved drawing
- 3) Seat clearance check for clearance between mating sealing faces – with the weir gate in closed condition, 0.1 mm thick feeler gauge shall not pass through between mating sealing faces
- 4) Material test certificates for all important components of weir gates such as frame, shutter, anchor fasteners, rubber seals, spindle etc. shall be furnished at the time of inspection.

The visit of Engineer to the factory for testing shall be arranged by the Contractor at his expense and shall not be reimbursed.

Installation of the weir gate shall be done strictly fulfilling the Manufacturer's requirements/ suggestions.

The Contractor shall provide anchoring template for each size of the weir gate assembly to enable insert the mechanical anchor fastener in place without the gate assembly.

Transit stops as may be provided by the manufacturer shall not be removed until the gate is installed, initially operated to the satisfaction of the Engineer.

### 2.30.3.3 Flap Gate

Flap gates to be provided shall be of HDPE, mounted on the face of a wall, hinged at top and designed to open automatically at 50 mm differential pressure on the upstream side of flap. When the water level on downstream side of flap is more than that on the upstream side of the flap, the flap shall automatically close to prevent back flow from the outfall channel into the system.

Material of construction for different components of the flap gate shall be as follows :

• Hinge pin	SS ASTM A276 Type 304
• Hinge bracket	SS ASTM A276 Type 304
• Rubber seal	EPDM rubber
• Flap	HDPE reinforced with SS ASTM A240 Type 304
• Frame	HDPE
• All fasteners (nuts, bolts, washers) for gate assembly	SS ASTM A276 Type 304

Allowable deviation for dimensions without specified tolerances shall be in accordance to the latest edition of IS:2102.

The Contractor shall provide the Engineer detailed dimensional details of the flap gate assembly. Design of the outfall structure as a whole shall be reviewed by the Engineer and shall suggest necessary modifications. Any changes suggested by the Engineer shall be final and binding to the Contractor.

The HDPE frame as well as the flap shall be sufficiently rigid to withstand the designated water head as well as the effects of pulsating motion. The frame shall be flange back type to suit the designated head and site condition. The frame shall be provided with shock absorbing dual resilient sealing arrangement to enable seating of flap on the seal while closing due to pressure head from downstream to achieve reasonably leak tight closure.

Back flange of the gate aperture shall be precisely machined or rolled flat and drilled to engage with the mechanical anchor fasteners mounted on the wall. A rubber gasket shall be provided between the wall and the frame for ease in future dismantling of the flap gate for repairs/ replacement.

The resilient seals made of EPDM rubber shall be secured in dovetailed grooves which shall be easily replaceable. The sealing faces on the frame and flap shall be precisely finished for proper contact. The clearance between the sealing faces, in flap closed position, shall not exceed 0.1 mm.

The flap shall be provided with a safety stop to prevent the chances of its opening while handling or while installation. This shall be removed only after installation and prior to field testing.

Prior to despatch the flap gates from the factory, the following shop tests need to be conducted in presence of the Engineer:

- 1) Shop leakage test by applying unseating hydraulic pressure to verify leakage characteristics when the flap is closed due to seating head acting on it from upstream side
- 2) Sensitivity test to verify whether the flap is opening even at desired unseating head of 50 mm water column from invert of flap gate
- 3) Dimensional checking for important dimensions with respect to the approved drawing
- 4) Seat clearance checking – with the flap in closed condition, 0.1 mm thick feeler gauge shall not pass through between mating sealing faces
- 5) Material test certificates for all important components of flap gates such as frame, shutter, anchor fasteners, rubber seals etc. shall be furnished at the time of inspection.

The visit of the Engineer to the factory for testing shall be arranged by the Contractor at his expense and shall not be reimbursed.

Installation of the flap gate shall be done strictly fulfilling the Manufacturer's requirements/ suggestions.

The Contractor shall provide drilling template for each size of the flap gate assembly for pre-drilling of holes on the face of wall to enable insert the mechanical anchor fastener in place without the gate assembly. The drilling template shall be marked for centre line of opening in horizontal as well as vertical direction for proper location and alignment.

#### **2.30.4                    Outlet Conduit**

The outlet conduits are generally rectangular conduits of size as shown in the drawings and generally of brick masonry construction. Specifications of different items of the work are as spelt out earlier.

#### **2.30.5                    Measurements**

For construction of the overflow structure and outlet conduit measurement of individual items of work shall be taken and payment shall be made as per BOQ provision. For sluice gate/ weir gate/ flap gate payment shall be made based on actual numbers of gates supplied and fixed against each size and as per rate in the BOQ.

### **2.31                        Miscellaneous**

#### **2.31.1                    Single Brick Flat Soling**

##### **2.31.1.1                Scope**

The work shall consist of construction of single brick flat soling in accordance with the requirement of this specification and in conformity with the line, grades, and cross-section shown on the drawing and as directed by the Engineer. The work shall include furnishing of all plants and equipment, materials and labours, and performing all operations, in connection with the work as approved by the Engineer.



**2.31.1.2 Material**

1st class bricks shall be used for the purpose satisfying the provision as given elsewhere in this document.

**2.31.1.3 Construction**

Prior to laying of the bricks, bed shall be prepared, compacted thoroughly with necessary cushioning over the bed. Brick shall be laid thereafter; all joints in between shall be filled up with sand including ramming and watering.

**2.31.1.4 Measurement for Payment**

Single brick flat soling shall be measured in sqm.

**2.31.1.5 Rate**

The contract unit rate for the construction of single brick flat soling, where applicable for payment, in full for carrying out the operation required as per this specification including full compensation for all labours, plants, tools and equipment to complete the work as per specification providing all materials to be incorporated in the work including all royalties, fees, storage, rents, where necessary and all leads and lifts.

**2.31.2 Weep Hole****2.31.2.1 Description**

Weep holes shall be provided in all types of earth retaining works as shown on the drawing or directed by the Engineer to drive moisture from the backfilling. Weep holes shall be provided with 100 mm dia. AC pipe for structures in plain/reinforced concrete or brick masonry. Weep holes shall extend through the full width of concrete/masonry with slope of about 1 vertical: 20 horizontals towards the draining face. The spacing of weep holes shall generally be 1m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.

**2.31.2.2 Test and Standards of Acceptance**

The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria.

**2.31.2.3 Measurements for Payment**

The measurement for payment for weep holes shall be in numbers.

**2.31.2.4 Rate**

The contract unit rate of weep holes shall include the cost of all labours, materials, tools and plants, and other cost necessary for completion of work as per this specification.

**2.31.3 Specification for Construction Joints****2.31.3.1 Location**

The location of construction joints shall be as shown on the drawing or as approved by the Engineer. If additional/new joints are approved by the Engineer, the following considerations for their location shall be taken into account.

- i) Joint shall be provided in non-aggressive zones or in non-splash zones. If not feasible, the joints shall be sealed.
- ii) Joints should be positioned where they are readily accessible for preparation and concreting such as location where the cross section is relatively small and where reinforcement is not congested.
- iii) In beams and slabs, joints should not be near the supports. Construction joints between slabs and ribs in composite beams should be avoided.
- iv) For box girders, it is preferable to cast the soffit and the webs without any joint.
- v) Location of joints shall minimize the effects of the discontinuity on the durability, structural integrity and the appearance of the structure.

### **2.31.3.2 Preparation of Surface of the Joint**

Laitance shall be removed before fresh concrete is cast. The surface shall be roughened. Care shall be taken that they should not dislodge the coarse aggregates. Concrete may be brushed with a stiff brush soon after casting while the concrete is still fresh.

If the concrete has partially hardened, it shall be treated by wire brushing or with a stiff water jet followed by drying with air jet immediately.

Fully hardened concrete shall be treated with mechanical hand tools or grit blasting, taking care not to split or crack aggregate particles.

Before further concrete is cast, the surface should be thoroughly cleaned to remove debris and accumulated rubbish, one effective method being by air jet.

Where there is likely to be a delay before placing the next concrete lift, protruding reinforcement shall be protected. Before the next lift is placed, rust, loose mortar or other contamination shall be removed from the reinforcements. In aggressive environment, the concrete shall be cut back to expose the reinforcements for a length of about 50 mm to ensure that contaminated concrete is removed.

The joint surface shall not be contaminated with release agents, dust or curing membrane.

### **2.31.3.3 Concreting of Joints**

The old surface shall be thoroughly cleaned and soaked with water. Standing water shall be removed shortly before the new concrete is placed and the new concrete shall be thoroughly compacted. Concreting shall be carried out continuously upto the construction joints.

Surface retarders may be used to improve the quality of construction joints.

Expansion Joint shall comply with relevant latest IS Codes.

## **2.31.4 Expansion Joint/ Contraction Joint**

### **2.31.4.1 Description**

It is a movement joint with complete discontinuity in both reinforcement and concrete and is intended to accommodate either expansion or contraction of the structure. In general, such a joint requires the provision of an initial gap between the adjoining parts of a structure which by closing or opening accommodates the expansion or contraction of the structure. The initial gap is filled with a joint filler. Joint fillers are usually compressible sheet or strip materials used as spacers. They are fixed to the face of the first placed concrete and against which the second placed concrete is cast. With an initial gap of 30 mm, the maximum expansion or contraction that the filler materials may allow may be of the order of 10 mm. Joint fillers, as at present available cannot by themselves function as water-tight

expansion joints. But they can only be relied upon as spacers to provide the gap in an expansion joint when the gap is bridged by a water bar (rubber water stop).

#### **2.31.4.2 Measurement of Payment**

The expansion/ contraction joint shall be measured in running meter.

#### **2.31.4.3 Rate**

The contract unit rate shall include the cost of all material, labour, equipment and other incidental charges for fixing of joint in all respect as per this specification.

### **3 Technical Specification for Improvement of Urban Road and Transport Infrastructure**

#### **3.1 Scope of work**

The work to be carried out under the Contract shall consist of the various items as generally described in the Contract Documents as well as in the Bill of Quantities furnished in the Bidding Documents.

The scope of work shall include compliance by the Contractor with all Conditions of Contract, whether specifically mentioned or not in the various Sections of these Specifications, all materials, apparatus, plant, equipment, tools, fuel, water, strutting, timbering, transport, offices, stores, workshop, staff, labour and the provision of proper and sufficient protective works, diversions, temporary fencing, and lighting.

It shall include all works related to safety of road user. It shall also include safety of workers at construction site, first- aid equipment, suitable accommodation for the staff and workmen with adequate sanitary arrangements, the effecting and maintenance of all insurances, the payment of all wages, salaries, fees, royalties, duties or other charges arising out of the erection of works and the regular clearance of rubbish, reinstatement and clearing-up of the site as may be required on completion of works, safety of the public and protection of the works and adjoining land/ structures.

The Contractor shall ensure that all actions are taken to build in quality assurance (QA) in the planning, management, and execution of works. The quality assurance shall cover all stages of work such as setting out, selection of materials, selection of construction methods, selection of equipment and plant, deployment of personnel and supervisory staff, quality control testing, etc.

The QA program shall cover the details as per IRC:SP:47 and IRC:SP:57. These shall broadly cover quality assurance aspects of all services rendered, all items to be supplied and all activities to be performed under the contract including temporary structures and equipment which will influence the quality of the completed works or the progress of the contract.

#### **3.2 Inspection of Materials before Incorporation**

All materials shall be inspected, tested and accepted by the Engineer as per these specifications, before incorporation in the work. The frequencies and methods of sampling and testing materials, including those required for definite purpose and not covered by these specifications shall be in accordance to the relevant IRC or BIS / BS Standards in order of priority.

All materials or work not conforming to the requirements of the Specifications shall be considered unacceptable and rejected. The unacceptable materials or work that are rejected shall be immediately removed unless the defects are corrected and approved by the Engineer.

##### **3.2.1 Inspection of Materials at Source**

The Engineer may choose to inspect material at source. In the event, the following conditions shall be met.

- a) The Contractor and the manufacturer of material shall assist and co-operate with the Engineer in conducting the inspection.
- b) The Engineer shall have right to enter areas of plant where the manufacture or production of material is conducted.

### **3.3 Site Information**

The information about the site of work and site conditions in the elsewhere in the bidding documents are given for guidance only but it shall be the responsibility of the Contractor to satisfy himself regarding all aspects of site conditions.

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

Whereas the right-of-way to the bridge sites/road works 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, field laboratory, site for plants and equipment, maintenance and repair workshop, construction workers' camp, stores etc.

### **3.4 Clearing and grubbing**

#### **3.4.1 Scope**

This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, rubbish, top organic soil, etc. to an average depth of 150 mm in thickness, which in the opinion of the Engineer are unsuitable for incorporation in the works, from the area of road land containing road embankment, drains, cross-drainage structures and such other areas as may be specified on the drawings or by the Engineer. It shall include necessary excavation, backfilling of pits resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials with all leads and lifts. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional works to that effect vide Clause 306. Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan including the procedure to be followed for disposal of waste materials, etc., and the schedules for carrying out temporary and permanent erosion control works as stipulated in Clause 306.3 of MoRTH specification

#### **3.4.2 Excavation for roadways and drains**

##### **3.4.2.1 Scope**

This work shall consist of excavation, removal and disposal of materials necessary for the construction of roadway, side drains and waterways in accordance with requirements of these Specifications and the lines, grades and cross-sections shown in the drawings or as indicated by the Engineer. It shall include the hauling and stacking of or hauling to sites of embankment and subgrade construction suitable cut materials as required, as also the disposal of unsuitable cut materials in specified manner, with all leads and lifts, reuse of cut materials as may be deemed fit, trimming and finishing of the road to specified dimensions or as directed by the Engineer.

### **3.5 Setting out**

The Contractor shall establish working benchmarks tied with the Reference benchmark in the area soon after taking possession of the site. The Reference benchmark for the area shall be as indicated in the Contract Documents and the values of the same shall be obtained by the Contractor from the Engineer. The working benchmarks shall be at the rate of four per km and at or near all drainage structures, over-bridges and underpasses. The working benchmarks/levels should be got approved from the Engineer.

The lines and levels of formation, side slopes, drainage works, carriageways and shoulders shall be carefully set out and frequently checked, care being taken to ensure that correct gradients and cross-sections are obtained everywhere.

To facilitate the setting out of the works, the centre line of the carriageway or highway must be accurately established by the Contractor and approved by the Engineer.

On construction reaching the formation level stage, the centre line shall again be set out by the Contractor and when approved by the Engineer, shall be accurately referenced in a manner satisfactory to the Engineer by marker pegs set at the outer limits of the formation.

The Contractor shall, in connection with the setting out of the centre line, survey the terrain along the road and shall submit to the Engineer for his approval, a profile along the road centre line and cross-sections at intervals as required by the Engineer.

### **3.6 Methodology and sequence of work**

Prior to start of the construction activities at site, the Contractor shall, within 28 days after the date of the agreement unless otherwise stipulated in the Contract, submit to the Engineer for approval, the detailed method statement. The method statement shall be submitted in two parts.

- The general part of the method statement shall describe the Contractor's proposals regarding preliminary works, common facilities and other items that require consideration at the early stage of the contract. The general part shall include information on:
  - Sources of materials like coarse aggregates and fine aggregates, quantity, and quality of materials available in different sources.
  - Sources of manufactured materials like bitumen, cement, steel reinforcement, pre-stressing strands and bearings etc. He shall also submit samples/test certificates of materials for consideration of the Engineer.
  - Locations of the site facilities such as batching plant, hot mix plant,
  - crushing plant, etc.
  - Details of facilities available for transportation of men/material and equipment.
  - Information on procedure to be adopted by the Contractor for prevention and mitigation of negative environmental impact due to construction activities.
  - Safety and traffic arrangement during construction.
  - Implementation of activities provided in the Environmental Management Plan.

#### **3.6.1 Excavation for Roadway and Drains**

The work for Improvement of urban roads and drains shall be done as the Clause 301.1 consist of excavation, removal and disposal of materials necessary for the construction of roadway, side drains and waterways in accordance with requirements of these Specifications and the lines, grades and cross-sections shown in the drawings or as indicated by the Engineer.

It shall include the hauling and stacking of or hauling to sites of embankment and subgrade construction suitable cut materials as required, as also the disposal of unsuitable cut materials in specified manner, with all leads and lifts, reuse of cut materials as may be deemed fit, trimming and finishing of the road to specified dimensions or as directed by the Engineer.

#### **3.6.2 Marsh Excavation**

The excavation of soil from marshes/swamps shall be carried out as per the program approved by the Engineer.

Excavation of marshes shall begin at one end and proceed in one direction across the entire marsh immediately ahead of backfilling with materials like boulders, sand moorum, bricks bats, dismantled concrete as approved by the Engineer. The method and sequence of excavating and backfilling shall be such as to ensure, to the extent practicable, the complete removal or displacement of all muck from within the lateral limits indicated on the drawings or as staked by the Engineer.

### **3.6.3 Backfilling**

Backfilling of masonry/concrete Hume pipe or drain excavation shall be done with approved material with all leads and lifts after concrete/masonry/hume pipe is fully set and carried out in such a way as not to cause undue thrust on any part of the structure and/or not to cause differential settlement. All space between the drain walls and the side of the excavation shall be backfilled to the original surface making do allowance for settlement, in layers not exceeding 150 mm compacted thickness to the required density, using suitable compaction equipment such as trench compactor, mechanical tamper, rammer or plate compactor as directed by the Engineer.

### **3.6.4 Excavation for Structures.**

Excavation for structures shall consist of the removal of material for the construction of foundations for bridges, culverts, retaining walls, headwalls, cutoff walls, pipe culverts and other similar structures, in accordance with the requirements of these Specifications and the lines and dimensions shown on the drawings or as indicated by the Engineer. The work shall include construction of the necessary cofferdams and cribs and their subsequent removal; all necessary sheeting, shoring, bracing, draining and pumping; the removal of all logs, stumps, grubs and other deleterious matter and obstruction, necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.

### **3.6.5 Preparation of Foundation Base.**

The bottom of the foundation shall be levelled both longitudinally and transversely or stepped as directed by the Engineer. Before footing is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Engineer, the extra depth shall be made up with concrete as per Clause 2104.1 of MoRTH Specification at the cost of the Contractor.

## **3.7 Embankment construction**

### **3.7.1 Description**

These Specifications shall apply to the construction of embankments including sub-grades, earthen shoulders and miscellaneous backfills with approved material obtained from approved source, including material from roadway and drain excavation, borrow pits or other sources. All embankments sub-grades, earthen shoulders and miscellaneous backfills shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer

### **3.7.2 Material**

The materials used in embankments, subgrades, earthen shoulders and miscellaneous backfills shall be soil, moorum, gravel, reclaimed material from pavement, fly ash, pond ash, a mixture of these or any other material as approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish, or any other ingredient likely to deteriorate or affect the stability of the embankment.

The following types of material shall be considered unsuitable for embankment:

- a) Materials from swamps, marshes and bogs.
- b) Peat, log, stump and perishable material; any soil that classifies as OL, OI, OH or Pt in

accordance with IS:1498.

- c) Materials susceptible to spontaneous combustion.
- d) Materials in a frozen condition.
- e) Clay having liquid limit exceeding 50 and plasticity index exceeding 25. and
- f) Materials with salts resulting in leaching in the embankment.

Density Requirements of Embankment and Subgrade Materials shown in the Table below.

**Table 21: Density Requirements of Embankment and Subgrade Materials**

Sl.No.	Type of Work	Maximum dry unit weight tested as per IS:2720 (Part 8)
1	Embankments up to 3 m height, not subjected to extensive flooding	Not less than 15.2 kN/cu.m
2	Embankments exceeding 3 m height or embankments of any height subject to long periods of inundation	Not less than 16 kN/ cu.m
3	Subgrade and earthen shoulders/verges/backfill	Not less than 17.5 kN/cu.m

### 3.7.3 Compaction Requirements.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the subgrade material when compacted to the density requirements as in Table 23 shall yield the specified design CBR value of the sub-grade.

**Table 22: Compaction Requirements**

Sl. No.	Type of work/material	Relative compaction as percentage of max. laboratory dry density as per IS:2720 (Part 8)
1)	Subgrade and earthen shoulders	Not less than 97%
2)	Embankment,	Not less than 95%
3)	Expansive Clays	
	a) Subgrade and 500 mm portion just below the subgrade	Not allowed
	b) Remaining portion of embankment	90–95%

### 3.7.4 Setting Out.

The limits of embankment/sub-grade shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork. The embankment/sub-grade shall be built sufficiently wider than the design dimension so that surplus material may be trimmed, ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.



### **3.7.5 Compacting Ground Supporting Embankment/Sub-Grade**

Where necessary, the original ground shall be levelled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling in accordance with Clauses 305.3.5 of MoRTH Specification and 305.3.6 so as to achieve minimum dry density as given in Table 22

#### **3.7.5.1 Compaction.**

Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Static three-wheeled roller, self-propelled single drum vibratory roller, tandem vibratory roller, pneumatic tyre roller, pad foot roller, etc., of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

#### **3.7.5.2 Drainage**

The surface of the embankment/sub-grade at all times during construction shall be maintained at such a crossfall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

#### **3.7.5.3 Surface Finish and Quality Control of Work**

The surface finish of construction of sub-grade shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised in accordance with Clause 903.

#### **3.7.5.4 Sub-grade Strength**

It shall be ensured prior to actual execution that the material to be used in the sub-grade satisfies the requirements of design CBR.

### **3.8 Turfing with sods**

#### **3.8.1 Scope**

This work shall consist of furnishing and laying of the live sod of perennial turf forming grass on embankment slopes, verges (earthen shoulders) or other locations shown on the drawings or as directed by the Engineer. Unless otherwise specified, the work shall be taken up as soon as possible following construction of the embankment, provided the season is favourable for establishment of the sod.

### **3.9 SURFACE/SUB-SURFACE DRAINS**

#### **3.9.1 Scope**

The work shall consist of constructing surface and/or sub-surface drains in accordance with the requirements of these Specifications and to the lines, grades, dimensions and other particulars shown on the drawings or as directed by the Engineer. Schedule of work shall be so arranged that the drains are completed in proper sequence with road works to ensure that no excavation of the completed road works is necessary subsequently or any damage is caused to these works due to lack of drainage.

#### **3.9.2 Surface Drains**

Surface drains shall be excavated to the specified lines, grades, levels and dimensions to the requirements of Clause 301. The excavated material shall be removed from the area adjoining the drains and if found suitable, utilized in embankment/sub-grade construction. All unsuitable material

shall be disposed of as directed.

The excavated bed and sides of the drains shall be dressed to bring these in close conformity with the specified dimensions, levels and slopes.

### **3.9.3 Sub-Surface Drains**

#### **3.9.3.1 Scope**

Sub-surface drains shall be of close-jointed perforated pipes, open-jointed unperforated pipes, surrounded by granular material laid in a trench or aggregate drains to drain the pavement courses. Sub-surface drains designed using Geosynthetics and approved by the Engineer can also be used.

#### **3.9.3.2 Pipe**

Perforated pipes for the drains may be metal/asbestos cement/cement concrete/Poly Vinyl Chloride (PVC)/Poly Propylene (PP)/Polyethylene (PE) and unperforated pipes of metal vitrified clay/cement concrete/asbestos cement PVC/PP/PE. The type, size and grade of the pipe to be used shall be as specified in the Contract. In no case, however, shall the internal diameter of the pipe be less than 100 mm. Holes for perforated pipes shall be on one half of the circumference only and conform to the spacing indicated on the drawings. Size of the holes shall not ordinarily be greater than half of D85 size of the material surrounding the pipe, subject to being minimum 3 mm and maximum 6 mm. D85 stands for the size of the sieve that allows 85 percent of the material to pass through it.

### **3.10 Granular sub-base**

#### **3.10.1 Scope**

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub- base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

#### **3.10.2 Materials**

The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag, or combination thereof depending upon the grading required. Use of materials like brick metal, Kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the gradings given in Table 400-1 and physical requirements given in Table 400-2. Gradings III and IV of MoRTH specification shall preferably be used in lower sub-base. Gradings V and VI shall be used as a sub-base-cum-drainage layer. The grading to be adopted for a project shall be as specified in the Contract. Where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150 mm.

**Table 23: Physical Requirements for Materials for Granular Sub-base**

<b>Aggregate Impact Value (AIV)</b>	<b>IS:2386 (Part 4) or IS:5640</b>	<b>40 maximum</b>
Liquid Limit	IS:2720 (Part 5)	Maximum 25
Plasticity Index	IS:2720 (Part 5)	Maximum 6

CBR at 98% dry density (at IS:2720-Part 8)	IS:2720 (Part 5)	Minimum 30 unless otherwise specified in the Contract
--	------------------	---

### 3.10.3 Preparation of Sub-grade

Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80–100 kN smooth wheeled roller.

### 3.10.4 Spreading and Compacting

The sub-base material of the grading specified in the Contract and water shall be mixed mechanically by a suitable mixer equipped with provision for controlled addition of water and mechanical mixing.

### 3.10.5 Rolling

Immediately after spreading, grading and levelling of the mixed material, compaction shall be carried out with approved equipment preceded by a few passes of lighter rollers if necessary.

Care shall be taken to see that the compaction of lime stabilised material is completed within three hours of its mixing, or such shorter period as may be found necessary in dry weather.

## 3.11 Wet mix macadam sub-base/base

### 3.11.1 Scope

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared sub-grade/sub- base/ base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be up to 200 mm with the approval of the Engineer.

**Table 24: Physical Requirements of Coarse Aggregates for Wet Mix Macadam for Sub-base/Base Courses**

Sl. No.	Test	Test Method	Requirements
1)	Los Angeles Abrasion value or Aggregate Impact value	IS:2386 (Part-4) IS:2386 (Part-4) or IS:5640	40 percent (Max.) 30 percent (Max.)
2)	Combined Flakiness and Elongation indices (Total)	IS:2386 (Part-1)	Percent (Max.) *

### 3.11.2 Grading Requirements

The aggregates shall conform to the grading given in Table 26.

**Table 25: Grading Requirements of Aggregates for Wet Mix Macadam**

IS Sieve Designation	Percent by weight passing the IS Sieve
53.00 mm	100
45.00 mm	95–100
26.50 mm	–
22.40 mm	60–80
11.20 mm	40–60
4.75 mm	25–40
2.36 mm	15–30
600.00 micron	8–22
75.00 micron	0–5

### 3.11.3 Spreading of Mix

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub-grade/sub-base/base in required quantities. In no case shall these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

### 3.11.4 Compaction

After the mix has been laid to the required thickness, grade and crossfall/camber the same shall be uniformly compacted to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100kN weight may be used. For a compacted single layer up to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN with an arrangement.

### 3.11.5 Setting and Drying

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

## 3.12 SHOULDERS, ISLANDS AND MEDIANS

### 3.12.1 SHOULDERS

#### 3.12.1.1 Scope

The work shall consist of constructing shoulder (hard/paved/earthen with brick or stone block edging) on either side of the pavement, median in the road dividing the carriageway into separate lanes and islands for channelizing the traffic at junctions in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross- sections shown on the drawings or as directed by the Engineer.

#### 3.12.1.2 Materials

Shoulder on either side of the road may be of selected earth/granular material/paved conforming to the requirements of Clause 305/401 and the median may be of selected earth conforming to the requirements of Clause 305.

### 3.12.2 Median/Traffic islands

Median/Traffic islands shall be raised and kerbed at the perimeter and the enclosed area filled with earth and suitably covered with grass turf/shrubs as per Clause 307 and/or paved as per Clauses 410.3.4 or 410.3.5 of MoRTH specification.

Paved shoulders shall consist of sub-base, base and surfacing courses, as shown in the drawings and materials for the same shall conform to relevant Specifications of the corresponding items. Where paved or hard shoulders are not provided, the pavement shall be provided with brick/stone block edgings as shown in the drawings. The brick shall conform to Clause 1003 of MoRTH Specifications. Stone blocks shall conform to Clause 1004 of these Specifications and shall be of size 225 mm x 110 mm x 75 mm.

#### 3.12.2.1 Scope

This work shall consist of constructing cement concrete kerbs and kerbs with channel in the central median and/or along the footpaths or separators in conformity with the lines, levels and dimensions as specified in the drawings or as directed by the Engineer.

#### 3.12.2.2 Materials

Kerbs and kerb with channel shall be provided in cement concrete of Grade M 20 in accordance with Section 1700 of MoRTH Specifications.

#### 3.12.2.3 Type of Construction

These shall be cast-in-situ construction with suitable kerb casting machine in all situations except at locations where continuous casting with equipment is not practicable. In those locations precast concrete blocks shall be used.

#### 3.12.2.4 Equipment

A continuous kerb casting equipment of adequate capacity and controls, capable of laying the kerbs in required cross-sections and producing a well-compacted mass of concrete free of voids and honeycombs, shall be used.

#### 3.12.2.5 Construction Operations

Kerb shall be laid on firm foundation of minimum 150 mm thickness of cement concrete of M 15 grade cast in-situ or on extended width of pavement. The foundation shall have a projection of 50 mm beyond the kerb stone. Before laying the foundation of lean concrete, the base shall be levelled and slightly watered to make it damp.

#### 3.12.2.6 Precast Concrete Blocks and Interlocking Concrete Block Pavements

The precast concrete blocks and interlocking concrete block pavement shall be laid on abedding of sand of thickness specified in the drawing. The grading of the sand layer shall be as in Table 400-16.

**Table 26: 400-16**

IS Sieve Size	Percent Passing
9.52 mm	100
4.75 mm	95–100
2.36 mm	80–100
1.18 mm	50–95
600 micron	25–60

IS Sieve Size	Percent Passing
300 micron	10–30
150 micron	0–15
75 micron	0–10

The joints shall be filled with sand passing a 2.35 mm size with the grading as in Table 400-17.

**Table 27: 400-17**

IS Sieve Size	Percent Passing
2.36 mm	100
1.18 mm	90–100
600 micron	60–90
300 micron	30–60
150 micron	15–30
75 micron	0–10

The bedding sand slightly moist, the moisture content being about 4 percent. The bedding sand shall be compacted by vibratory plate compactor.

The blocks shall be laid to the levels indicated on the drawings and to the pattern directed by the Engineer. The surface tolerance shall be  $\pm 10$  mm with respect to the design level. The blocks shall be embedded using a hammer.

### 3.13 TRAFFIC SIGNS

#### 3.13.1 Scope

The work shall consist of the fabrication, supply and installation of ground mounted traffic signs on roads. The details of the signs shall be as shown in the drawings and in conformity with the Code of Practice for Road Signs, IRC:67-2010.

#### 3.13.2 Materials

The various materials and fabrication of the traffic signs shall conform to the following requirements:

#### 3.13.3 Concrete

Concrete for foundation shall be of M 15 Grade as per Section 1700 or the grade shown on the drawings or otherwise as directed by the Engineer.

#### 3.13.4 Reinforcing Steel

Reinforcing steel shall conform to the requirement of IS:1786 unless otherwise shown on the drawing.

#### 3.13.5 Bolts, Nuts, Washers

High strength bolts shall conform to IS:1367 whereas precision bolts, nuts, etc., shall conform to IS:1364.

### 3.13.6 Plates and Supports

Plates and support sections for the signposts shall conform to IS:226 and IS:2062 or any other relevant IS Specifications.

### 3.14 Substrate

Sign panels shall be fabricated on aluminium sheet, aluminium composite panel, fibre glass sheeting, or sheet moulding compound. Aluminium sheets used for sign boards shall be of smooth, hard and corrosion resistant aluminium alloy conforming to IS:736-Material Designation 24345 or 1900. Aluminium Composite Material (ACM) sheets shall be sandwiched construction with a thermoplastic core of Low-Density Polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness and 3 mm or 4 mm (as specified in the Contract), and aluminium skin of thickness 0.5 mm and 0.3 mm respectively on both sides.

The mechanical proportion of ACM and that of aluminium skin shall conform to the requirements given in Table 800-1, when tested in accordance with the test methods mentioned against each of them.

**Table 28: Specifications for Aluminum Composite Material (ACM)**

Sl. No.	Description	Specification	
		Standard Test	Acceptable Value
<b>A</b>	<b>Mechanical Properties of ACM</b>		
1)	Peel off strength with retro reflective sheeting (Drum Peel Test)	ASTM D903	Min. 4 N/mm
2)	Tensile strength	ASTM E8	Min. 40 N/mm <sup>2</sup>
3)	0.2% Proof Stress	ASTM E8	Min. 34 N/mm <sup>2</sup>
4)	Elongation	ASTM E8	Min. 6%
5)	Flexural strength	ASTM 393	Min. 130 N/mm <sup>2</sup>
6)	Flexural modulus	ASTM 393	Min. 44.00 N/mm <sup>2</sup>
7)	Shear strength with Punch shear test	ASTM 732	Min. 30 N/mm <sup>2</sup>
<b>B</b>	<b>Properties of Aluminium Skin</b>		
1)	Tensile strength (Rm)	ASTM E8	Min. 65 N/mm <sup>2</sup>
2)	Modulus of elasticity	ASTM E8	Min. 70,000 N/mm <sup>2</sup>
3)	Elongation	ASTM E8	A50 Min. 2%
4)	0.2% Proof Stress	ASTM E8	Min. 10 N/mm <sup>2</sup>

### 3.15 Plate Thickness

Shoulder mounted ground signs with a maximum side dimension not exceeding 600 mm shall not be less than 1.5 mm thick with Aluminium and 3 mm thick with Aluminium Composite Material. All other signs be at least 2 mm thick with Aluminium and 4 mm thick with Aluminium Composite Material. The thickness of the sheet shall be related to the size of the sign and its support and shall be such that it does not bend or deform under prevailing wind and other loads.

In respect of sign sizes not covered by IRC:67, the structural details

(Thickness, etc.) shall be as per the approved drawings or as directed by the Engineer.

### **3.16 Traffic Signs having Retro-Reflective Sheeting**

#### **3.16.1 General Requirements**

The retro-reflective sheeting used on the sign shall consist of the white or coloured sheeting having a smooth outer surface which has the property of retro-reflection over its entire surface. It shall be weather-resistant and show colour fastness. It shall be new and unused and shall show no evidence of cracking, scaling, pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having tested the sheeting for co-efficient of retro-reflection, day/night-time colour luminous, shrinkage, flexibility, linear removal, adhesion, impact resistance, specular gloss and fungus resistance and its having passed these tests shall be obtained from a Government Laboratory/Institute, by the manufacturer of the sheeting

### **3.17 RCC Storm Water Drains.**

#### **3.17.1 General**

Materials to be used in the work shall conform to the specifications mentioned on the drawings, the requirements laid down in this section and specifications for relevant items of work.

If any material, not covered in these Specifications, is required to be used in the work, it shall conform to relevant Indian Standards, if there are any, or to the requirements specified by the Engineer.

#### **3.17.2 Materials**

##### **3.17.2.1 Bricks**

Burnt clay bricks shall conform to the requirements of IS:1077, except that the minimum compressive strength when tested flat, shall not be less than 8.4 MPa for individual bricks and mean strength not less than 10.5 MPa for a group of 5 specimens. They shall be free from cracks and flaws and nodules of free lime. The brick shall have smooth rectangular faces with sharp corners and emit a clear ringing sound when struck. The size may be according to local practice with a tolerance of  $\pm 5$  percent.

##### **3.17.2.2 Stones**

Stones shall be of the type specified. They shall be hard, sound, free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stones with round surface shall not be used.

The stones, when immersed in water for 24 hours, shall not absorb water of more than 5 percent of their dry weight when tested in accordance with IS:1124.

##### **3.17.2.3 Cement**

Cement to be used shall be any of the following types with the prior approval of the Engineer.

- a) Ordinary Portland cement, 33 Grade, conforming to IS:269.



- b) Ordinary Portland cement, 43 Grade, conforming to IS:8112.
- c) Ordinary Portland cement, 53 Grade, conforming to IS:12269.
- d) Sulphate resisting Portland cement, conforming to IS:12330.
- e) Portland Pozzolana cement (fly ash based) conforming to IS:1489 (Part 1)
- f) Portland slag cement conforming to IS:455
- g) Rapid Hardening Portland cement, conforming to IS:8041.
- h) Low heat Portland cement conforming to IS:12600

Cement of 33 grade conforming to IS:269 shall be used only after ensuring that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 450 Kg/cum of concrete (excluding any mineral admixture).

Cements of 43 and 53 grades conforming to IS:8112 and IS:12269 respectively may be used provided the minimum cement content mentioned elsewhere from durability considerations, is not reduced.

### 3.17.2.4 COARSE AGGREGATES

For plain and reinforced cement concrete (PCC and RCC) or prestressed concrete (PSC) works, coarse aggregates shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone, crushed gravel, natural gravel or a suitable combination thereof or other approved inert material.

. All coarse aggregates shall conform to IS: 383 and tests for conformity shall be carried out as per IS:2386, Parts I to VIII.

The contractor shall submit for the approval of the Engineer, the entire information indicated in Appendix A of IS:383.

Maximum nominal size of coarse aggregate for various structural components in PCC, RCC or PSC, shall conform to Section 1700 of MoRTH Specifications.

### 3.17.2.5 FINE AGGREGATES

For masonry work, sand shall conform to the requirements of IS:2116.

All fine aggregates shall conform to IS:383 and tests for conformity shall be carried out as per IS:2386, (Parts I to VIII). The Contractor shall submit to the Engineer the entire information indicated in Appendix A of IS:383. The fineness modulus of fine aggregate shall neither be less than 2.0 nor greater than 3.5.

### 3.17.2.6 MS Steel Reinforcement.

#### Reinforcing Bars

For plain and reinforced cement concrete (PCC and RCC) or prestressed concrete (PSC) works, the reinforcement/ untensioned steel, shall consist of the following grades of reinforcing bars.

**Table 29: Grades of Reinforcing Bars**

<b>Grade Designation</b>	<b>Bar Type Conforming to Governing Specifications</b>	<b>IS Characteristic Strength <math>f_y</math> MPa</b>	<b>Elastic Modulus GP</b>
Fe240	IS:432 Part I Mild Steel	240	200
Fe 415	IS:1786 High Strength Deformed Steel Bars (HSD)	415	200
Fe 500 or Fe 500D	IS:1786 High Strength Deformed Steel Bars (HSD)	500	200
Fe 600	IS:1786 High Strength Deformed Steel Bars (HSD)	600	200

### **3.17.2.7 Water**

Water used for mixing and curing shall be clean and free from oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel.

### **3.17.2.8 TIMBER**

The timber used for structural purposes shall conform to IS:883.

### **3.17.2.9 CONCRETE ADMIXTURES**

#### **3.17.2.9.1 General**

Admixtures may be added to the concrete before or during mixing with a view to modifying one or more of the properties of concrete in the plastic or hardened state.

#### **3.17.2.9.2 Mineral Admixtures**

Any of the following mineral admixtures may be used as part replacement of Portland Cement with the approval of the Engineer.

### **3.17.2.10 Form Work**

#### **3.17.2.10.1 Description**

Formwork shall include all temporary or permanent forms required for forming the concrete of the shape, dimensions and surface finish, as shown on the drawing or as directed by the Engineer, together with all props, staging, cantering, scaffolding and temporary construction required for their support.

#### **3.17.2.10.2 Materials.**

All materials shall comply with the requirements of IRC:87. Materials and components used for formwork shall be examined for damage or excessive deterioration before use/re-use and shall be used only if found suitable after necessary repairs. In case of timber formwork, the inspection shall not only cover physical damages but also signs of attacks by decay, rot or insect attack or the development of splits.

Forms shall be constructed with metal or timber. The metal used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or steel or plastic spacers shall be permitted. Structural steel tubes used as support for forms shall have a minimum wall thickness of 4 mm. Other materials conforming to the requirements of IRC:87 may also be used if approved by the Engineer.

### 3.17.2.10.3 Lining of Form Work.

The formwork shall be lined with material approved by the Engineer so as to provide a smooth finish of uniform texture and appearance. This material shall leave no stain on the concrete and shall be so fixed to its backing as not to impart any blemishes. It shall be of the same type and obtained from only one source throughout for the construction of any one structure. The contractor shall make good any imperfections in the resulting finish as required by the Engineer. Internal ties and embedded metal parts shall be carefully detailed, and their use shall be subject to the approval of the Engineer.

### 3.17.2.10.4 Steel Reinforcement.

This work shall consist of furnishing and placing coated or uncoated mild steel or high strength deformed reinforcement bars of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer.

### 3.17.2.10.5 Bending of Reinforcement.

Bar bending schedule shall be furnished by the Contractor and got approved by the Engineer before start of work.

Reinforcing steel shall conform to the dimensions and shapes given in the approved Bar Bending Schedules.

Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer using a proper bar bender, operated by hand or power to obtain the correct shape and radii of bends.

## 3.17.2.11 Structural Concrete.

### 3.17.2.11.1 Description.

The work shall consist of producing, transporting, placing, and compacting of structural concrete including fixing formwork and temporary works etc. and incidental construction in accordance with these Specifications and in conformity with the lines, grades and dimensions, as shown on the drawings or as directed by the Engineer.

### 3.17.2.11.2 Grades of Concrete

The grades of concrete shall be designated by the characteristic strength as given in Table 1700-1, where the characteristic strength is defined as the strength of concrete below which not more than 5 percent of the test results are expected to fall.

**Table 30: 1700-1 Grades of Concrete**

Type of Concrete/Grade designation			Characteristic strength in MPa
Nominal Mix Concrete	Standard Concrete	High Performance Concrete	
M15	M15		15

Type of Concrete/Grade designation			Characteristic strength in MPa
Nominal Mix Concrete	Standard Concrete	High Performance Concrete	
M20	M20		20
	M25		25
	M30	M30	30
	M40	M35	35

**Table 31:** Requirement of Concrete for different exposure Condition using 20 mm aggregate.

Exposure Condition	Maximum Water Cement Ratio	Minimum Cement Content, kg/m <sup>3</sup>	Minimum Grade of Concrete
Moderate	0.45	340	M25
Severe	0.45	360	M30
Very Severe	0.40	380	M40

### 3.17.2.12 Requirements of nominal Mix Concrete

Requirements for nominal mix concrete unless otherwise specified shall be as given in Table 1700-6

**Table 32:** 1700-6. Requirements for nominal Mix Concrete

Concrete Grade	Total Quantity of dry aggregate by Mass per 50 kg of Cement to be taken as the sum of individual Masses of Fine and Coarse aggregates (kg)	Proportion of Fine to Coarse aggregate (by Mass)	Maximum Quantity of Water for 50 kg of Cement (litres)	
			PCC	RCC
M 15	350	Generally, 1:2, subject to upper limit 1:1.5 and lower limit of 1:2.5	25	
M 20	250		25	22

### 3.17.2.13 Batching Mixing, Transporting, Placing and Compaction.

### **3.17.2.13.1 General**

Prior to start of concreting, the Contractor shall submit for approval of the Engineer, his programme along with list of equipment proposed to be used by him for batching, mixing, transporting and placing concrete.

### **3.17.2.13.2 Batching of Concrete**

In batching concrete:

- The quantity of cement, aggregate and mineral admixtures, if used, shall be determined by mass.
- Chemical admixtures, if solid, shall be determined by mass.
- Liquid admixtures may be measured in volume or mass, and
- Water shall be weighed or measured by volume in a calibrated tank.

The concrete shall be sourced from on-site or off-site batching and mixing plants, or from approved Ready Mixed Concrete plants, preferably having quality certification.

Except where supply of properly graded aggregate of uniform quality can be maintained over a period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions when required, the different sizes being stocked in separate stockpiles. The materials should be stockpiled several hours, preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible to ensure that the specified grading is maintained.

### **3.17.2.14 Mixing Concrete**

#### **3.17.2.14.1 Mixing at site**

All concrete shall be machine mixed. In order to ensure uniformity and good quality of concrete the ingredients shall be mixed in a power-driven batch mixer with hopper and suitable weigh batching arrangement or in a central mix plant. Hand mixing shall not be permitted. The mixer or the plant shall be at an approved location considering the properties of the mixes and the transportation arrangements available with the Contractor. The mixer or the plant shall be approved by the Engineer.

#### **3.17.2.14.2 Placing of Concrete**

All formwork and reinforcement contained in it shall be cleaned and made free from standing water, dust, snow, or ice immediately before placing of concrete.

#### **3.17.2.14.3 Compaction of Concrete**

Concrete shall be thoroughly compacted by vibration or other means during placing and worked around the reinforcement, tendons or duct formers, embedded fixtures and into corners of the formwork to produce a dense homogeneous void-free mass having the required surface finish. When vibrators are used, vibration shall be done continuously during the placing of each batch of concrete until the expulsion of air has practically ceased and in a manner that does not promote segregation.

#### **3.17.2.14.4 Construction Joints.**

Construction joints shall be avoided as far as possible. In no case shall the locations of such joints be changed or increased from those shown on the drawings except with the express approval of the Engineer.

Joints should be positioned where they are readily accessible for preparation and concreting. Construction joints should be positioned to minimize the effects of the discontinuity of the durability,

structural integrity and appearance of the structure. As far as possible, joints should be provided in non-aggressive zones,

### **3.17.2.14.5 Protection and Curing.**

Concreting operations shall not commence until adequate arrangements for concrete curing have been made by the Contractor. Curing and protection of concrete shall start immediately after compaction of the concrete.

The concrete shall be protected from:

- a) Premature drying out particularly by solar radiation and wind.
- b) High internal thermal gradients
- c) Leaching out by rain and flowing water
- d) Rapid cooling during the first few days after placing.
- e) Low temperature or frost
- f) Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement.

Concrete shall be protected, without allowing ingress of external water, by means of wet (not dripping) gunny bags, hessian etc. Once the concrete has attained some degree of hardening (approximate 12 hrs after mixing), moist curing shall commence and be continued through the requisite period. Where members are of considerable size and length, with high cement content, accelerated curing methods may be applied, as approved by the Engineer.

### **3.17.2.14.6 Test and Standards of Acceptance.**

Concrete shall conform to the surface finish and tolerance as prescribed in these Specifications for respective components.

Random sampling and lot by lot acceptance inspection, shall be made for the 28 days cube strength of concrete.

Concrete under acceptance, shall be notionally divided into lots for the purpose of sampling before commencement of work. The basis of delimitation of lots shall be as follows:

- i) No individual lot shall be more than 30 cum in volume.
- ii) Different grades of mixes of concrete shall be divided into separate lots.
- iii) Concrete of a lot shall be used in the same identifiable component of the bridge.

### **3.17.2.15 Sampling and testing**

Concrete for preparing 3 test cubes shall be taken from a batch of concrete at point of delivery for construction, according to procedure laid down in IS:1199.

A random sampling procedure shall be adopted which ensures that each of the concrete batches forming the lot under acceptance inspection has equal chance of being chosen for taking cubes.

150 mm cubes shall be made, cured and tested at the age of 28 days for compressive strength in accordance with IS:516. The 28-day test strength result for each cube shall form an item of the sample. Tests at other age shall also be performed, if specified.

### **3.18 Environmental, Health and Safety Requirements**

#### **3.18.1 Environmental**

Implementation of site-specific EMP, including site-specific HS plan, including HS-C19 plan, and other requirements as per approved IEE/EMP etc.

#### **3.18.2 Health and Safety**

The Contractor shall, always, have a nominated EHS Officer responsible for safety precautions at the Works. The EHS Officer shall be properly qualified and experienced in water supply and operation of water supply. The Contractor shall notify the Employer of the identity of the EHS Officer.

#### **3.18.3 Health and Safety Procedures**

The Contractor shall, no later than one month prior to the Commencement to the Operation Service submit to the Employer's Representative for review and consent, written health, and safety procedures (the "Health and Safety Manual") covering all aspects of the operation and maintenance of the Works, including (but limited to):

- i. Health and safety procedures for the Works including Health and Safety COVID-19 Plan (HS-C19 Plan), in accordance with the relevant government regulations and guidelines on COVID-19 prevention and control, or in the absence thereof, good international practice guidelines such as those from the World Health Organization.
- ii. Use of, storage of, safety arrangements, and evacuation procedures in connection with chlorine and chemical facilities.
- iii. Fire hazard inspection procedures
- iv. The Health and Safety Manual shall be updated on an annual basis. A copy of the Health and Safety Manual shall be always kept on the site.

#### **3.18.4 Protection of the Environment.**

The Contractor shall comply with all applicable national environmental standards. Where national standards are absent or less stringent, the Contractor shall comply with internationally recognized standards acceptable to the Employer, including relevant World Health Organization (WHO) and internationally recognized EHS guidelines, as specified in the Employer's Requirements. The Contractor shall ensure that environmental monitoring results demonstrate compliance with the applicable standards at all times and shall immediately implement corrective measures in the event of exceedances

#### **3.18.5 Contractor's obligations.**

The Contractor shall ensure.

- i. its operating procedures follow good health and safety practice.
- ii. the Works is always maintained in a safe condition.
- iii. to train all its staff on health and safety issues in accordance with the Health and Safety Manual and the Staff Training Plan.
- iv. to provide for all staff and visitors the necessary protective and safety equipment and clothing.
- v. to provide all necessary safety and first aid equipment.





## Drawings

Enclosed as Appendix -1

## PROJECT SIGNAGE REQUIREMENTS

1. The Contractor is responsible for the design, supply and installation of the project information signage. The signage shall provide relevant information to the public about the project, including the proper designation of the project, the Employer, the Contractor and the Bank.
2. For this purpose, one or several sign boards shall be installed at the Site as soon as practicable after the Commencement Date and shall remain in place at all times until taking-over of the Works. If sign board(s) is(are) damaged or becomes unreadable during this period, it shall be promptly replaced by the Contractor at the Contractor's cost.
3. The sign board design shall be submitted by the Contractor to the Project Manager for review in accordance with GCC Sub-Clause 21.2. Unless otherwise required under the applicable Laws, the sign board design should comply with the following:
  - a) **General**
    - The number and locations of sign board(s)
  - b) **Content**
    - Country's flag/logo
    - Project and Contract title
    - Accepted Contract Amount
    - Time for Completion
    - Bank's name and logo (in accordance with Branding Tool Kit – Visual Identity guidelines of the Asian Development Bank and, as the case may be, the other financiers' requirements)
    - Employer's name
    - Contractor's name
    - Engineer's name
    - Complaint handling contact information (email and/ or phone number)
  - c) **Design**
    - The General layout including sample colors: to be proposed by the Contractor
    - Dimensions: minimum of 2.5 Meters X 2.5 Meters
    - Font size and type: they should be such as to ensure that the content shall be visible from a distance.
    - Language of the signage: national and/or local language and English
    - Material: the sign board(s) shall be made of a material that shall be weatherproof and appropriate to withstand the whole execution period until taking-over of the Works

4. No other signage is allowed except with the approval of the Project Manager. The Contractor shall not post, nor display any sign or item that could provide misleading information about the project. No national symbols or flags other than those of the Country may be displayed without the express approval of the Project Manager.

## Personnel Requirements

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

Sl.No.	Position	Total Work Experience[years]	Experience In Similar Work [years]
1	Project Manager – 01 No. (Graduate Engineer Civil)	15	10
2	Sr. Project Engineer – 04 Nos. (Graduate Engineer - Civil)	10	7
3	Project Engineer – 04 Nos. (Diploma Engineers - Civil)	10	5
4	Quantity Surveyor – 02 Nos. (Diploma Engineers - Civil)	10	5
5	Soil & Material Engineer – 04 No. (Diploma Engineers - Civil)	10	5
6	Survey Engineer – 04 No. (Diploma Engineers - Civil)	10	5
7	Site Supervisor- 08 No. (Diploma Engineers - Civil)	10	5

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

**Table 33: 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	Environment officer	Postgraduate in Environment Science	10	75
2	Health and Safety Officer	Post graduate Degree/Diploma/Certification on Health and safety.	10	100

## Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

Sl.No.	Equipment Type and Characteristics	Minimum Number Required
1.	Vibratory Roller – 8T-10T	02 (two )
2.	Paver Finisher	04 (Four)
3.	Tipper 5.5 cum/ 10T	08 (Eight)
4.	Pneumatic Tyre Roller – 8T-10T	04 (Four)
5.	Bitumen Boiler Oil Fired 1000 Litre	04 (Four)
6.	Bitumen Emulsion Pressure Distributor	02 (two )
7.	Air Compressor 210 Cu. ft	02 (two )
8.	Water Tank 6 KL Capacity (Truck mounted)	02 (two )
9.	Emulsion Sprayer with Tractor	02 (two )

# Section 7: General Conditions of Contract

The General Conditions of Contract (GCC), read in conjunction with the Particular Conditions of Contract (PCC) and other documents listed therein should be a complete document expressing fairly the rights and obligations of both parties. The standard text of the GCC must be retained intact to facilitate its reading and interpretation by Bidders and its review by ADB. Any amendments and additions to the GCC, specific to the contract in hand, should be introduced in Section 8 (Particular Conditions of Contract).

The use of standard conditions of contract for all building and civil works throughout a country will ensure comprehensiveness of coverage, general acceptability of its provisions, savings in cost and time in bid preparation and review, and the development of a solid background of legal case histories.

The form of Conditions of Contract that follows has been developed on the basis of considerable international experience in the drafting and management of contracts, bearing in mind a trend in the construction industry toward simpler, more straightforward language.

The GCC in this bidding document provides for the usual arrangement where the Contractor constructs the Works in accordance with design provided by the Employer, and also for contracts that include, or wholly comprise, contractor-designed civil, mechanical or electrical works. Section 7 is generally based on the Conditions of Contract of the World Bank's *Standard Bidding Documents for Procurement of Works, Smaller Contracts, December 2012*.

The GCC can be used for lump sum contracts and, with the modifications recommended in the PCC, also for small unit price contracts. Design work by the contractor is also provided for in these Conditions.

For relatively simple contracts, the Short Form of Contract, First Edition, 1999 prepared by the Fédération Internationale des Ingénieurs-Conseils (FIDIC) is recommended to be used.

# Table of Contents

A.	General.....	4
1.	Definitions.....	4
2.	Interpretation .....	6
3.	Language and Law .....	6
4.	Contract Agreement.....	6
5.	Assignment.....	7
6.	Care and Supply of Documents .....	7
7.	Confidential Details.....	7
8.	Compliance with Laws .....	7
9.	Joint and Several Liability .....	8
10.	Project Manager's Decisions.....	8
11.	Delegation .....	8
12.	Communications .....	8
13.	Subcontracting.....	8
14.	Other Contractors .....	9
15.	Personnel and Equipment.....	9
16.	Employer's and Contractor's Risks .....	9
17.	Employer's Risks .....	9
18.	Contractor's Risks.....	10
19.	Insurance .....	10
20.	Site Investigation Reports .....	10
21.	Contractor to Construct the Works .....	10
22.	The Works to Be Completed by the Intended Completion Date.....	10
23.	Designs by Contractor and Approval by the Project Manager .....	10
24.	Safety .....	11
25.	Discoveries .....	11
26.	Possession of the Site .....	11
27.	Access to the Site .....	11
28.	Instructions, Inspections, and Audits .....	11
29.	Appointment of the Adjudicator .....	12
30.	Procedure for Disputes .....	12
B.	Staff and Labor.....	12
31.	Forced Labor .....	12
32.	Child Labor .....	12
33.	Workers' Organizations.....	13
34.	Nondiscrimination and Equal Opportunity .....	13
C.	Time Control .....	13
35.	Program.....	13
36.	Extension of the Intended Completion Date .....	14
37.	Acceleration .....	14
38.	Delays Ordered by the Project Manager .....	14
39.	Management Meetings .....	14

40.	Early Warning .....	14
D.	Quality Control.....	15
41.	Identifying Defects .....	15
42.	Tests .....	15
43.	Correction of Defects .....	15
44.	Uncorrected Defects .....	15
E.	Cost Control .....	15
45.	Contract Price .....	15
46.	Changes in the Contract Price .....	15
47.	Variations .....	16
48.	Cash Flow Forecasts .....	16
49.	Payment Certificates.....	16
50.	Payments.....	17
51.	Compensation Events.....	17
52.	Tax.....	18
53.	Currencies .....	18
54.	Price Adjustment.....	18
55.	Retention .....	19
56.	Liquidated Damages .....	19
57.	Bonus .....	19
58.	Advance Payment.....	19
59.	Securities .....	20
60.	Dayworks .....	20
61.	Cost of Repairs .....	20
F.	Force Majeure .....	20
62.	Definition of Force Majeure .....	20
63.	Notice of Force Majeure.....	21
64.	Duty to Minimize Delay .....	21
65.	Consequences of Force Majeure .....	21
66.	Force Majeure Affecting Subcontractor .....	22
67.	Optional Termination, Payment, and Release .....	22
68.	Release from Performance .....	22
G.	Finishing the Contract.....	23
69.	Completion .....	23
70.	Taking Over.....	23
71.	Final Account .....	23
72.	Operating and Maintenance Manuals .....	23
73.	Termination .....	23
74.	Fraud and Corruption.....	24
75.	Payment upon Termination .....	26
76.	Property .....	26
77.	Release from Performance .....	27
78.	Suspension of ADB Loan or Credit.....	27
79.	Eligibility.....	27



## **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 handwritten, typewritten, 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 Employer'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 Project Manager 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 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



## **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 the 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 nondiscrimination 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:

$$P_c = A_c + B_c \text{ Imc/loc}$$

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<sup>1</sup> specified in the PCC, representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency “c;” and

$I_{mc}$  is a consolidated index prevailing at the end of the month being invoiced and  $I_{oc}$  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**

---

<sup>1</sup> 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  $A_c$ , 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.



- 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 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.

### **63. Notice of Force Majeure**

63.1 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 radioactivity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation, or radioactivity; and
- (e) natural catastrophes such as earthquake, hurricane, typhoon, or volcanic activity.

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, 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<sup>2</sup> 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:

---

<sup>2</sup> 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)



- (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 Communication 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.
- 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.<sup>3</sup>

## **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.

---

<sup>3</sup> The undertaking also applies during the period of performance of the contract.

## **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.

## **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

This Particular Conditions of Contract (PCC) complements Section 7 (General Conditions of Contract), specifying data and contractual requirements linked to the special circumstances of the country, Employer, Project Manager, sector, overall project, and the Works. The PCC complements the GCC in the same way the Bid Data Sheet complements the Instructions to Bidders.

The PCC has more detailed terms and conditions, which the Employer will apply in administering the specific contract. These provisions do not constitute a complete standard set of provisions. Employers should prepare country- or project-specific provisions for the PCC, and these should be developed into standard provisions.

Whoever drafts the PCC should be thoroughly familiar with the provisions of the GCC and with any specific requirements of the Contract. Legal advice is recommended when amending provisions or drafting new ones. Note that clause numbers in the PCC correspond to those in the GCC, but the PCC provisions take precedence over those in the GCC.

# Particular Conditions of Contract

Except where otherwise indicated, all PCC forms should be filled out by the Employer prior to issuance of the Bidding Documents. Schedules and reports to be provided by the Employer should be annexed.

## A. General

GCC 1.1(d)	The financing institution is Asian Development Bank.
GCC 1.1(r)	The Employer is: PMU, Directorate of Urban Development (DUD), Government of Nagaland E-mail: <a href="mailto:nuidp.ngl@gmail.com">nuidp.ngl@gmail.com</a>
GCC 1.1(w)	The Intended Completion Date for the whole of the Works shall be <b>Twenty – Four (24) months from the date of commencement.</b>
GCC 1.1(cc)	The Project Manager is: <b>The Employer shall notify the Contractor of the Project Manager's name and address before the Commencement Date.</b>
GCC 1.1(ff)	The Site is located at <b>Dimapur town</b> and is defined in drawings no. <b>SMEC_NGL_DM_LM_001[03]</b>
GCC 1.1(ii)	The Start Date shall be <b>Date of signing of contract</b>
GCC 1.1(mm)	The Works consist of <b>Construction of Roads and roadside drains in the town of Dimapur, Nagaland.</b>
New GCC 1.1 (nn)	<p>"Local" means pertaining to, or originating within, the territory of Employer's Country.</p> <p>"Local Labor" means laborers, workers, or employees (whether unskilled, semi-skilled, or skilled) who are legally entitled to work under the laws of the Employer's Country are ordinarily resident therein.</p> <p>"Local Participation" means the engagement of Local Labor and the implementation of other measures for local job creation and skills development in the performance of the Works, as specified in the Contract</p>
GCC 2.2	Sectional Completions are: <b>Not Applicable.</b>
GCC 2.3(j)	The following documents also form part of the Contract: <b>All Addendum/Corrigendum and Reply to pre bid queries.</b>
GCC 3.1	<p>The language of the contract is <b>English.</b></p> <p>The law that applies to the Contract is the law of <b>India.</b></p>
GCC 11.1	The Project Manager <b>may delegate</b> any of his duties and responsibilities.
GCC 14.1	Schedule of other contractors: Not Applicable
GCC 19.1	<p>The minimum insurance amounts and deductibles shall be</p> <ul style="list-style-type: none"> <li>(a) for loss or damage to the Works, Plant and Materials: <b>Full replacement value, with 3% of full replacement value as deductible</b></li> <li>(b) for loss or damage to Equipment: <b>Full replacement value, with 1% of full replacement value as deductible</b></li> <li>(c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in</li> </ul>

	<p>connection with Contract: <b>INR 5.0 Million, with no deductible</b></p> <p>(d) for personal injury or death:</p> <p>(i) of the Contractor's employees: <b>INR 5.0 Million, with no deductible and unlimited occurrence.</b></p> <p>(ii) of other people: <b>INR 5.0 Million, with no deductible and unlimited occurrence.</b></p>
GCC 20.1	Site Investigation Reports are: <b>Not Applicable.</b>
New GCC 21.2	"The Contractor shall prepare the sign board design in accordance with the Works' Requirements. The sign board design shall be submitted to the Project Manager for Review. No physical Works shall commence on Site until the Project Manager has given (or is deemed to have given) a Notice of No-objection to the sign board design and until the sign board(s) have been properly installed in the agreed-upon location(s) at the Site."
GCC 23.1	The following shall be designed by the Contractor: <b>Not Applicable.</b>
GCC 26.1	The Site Possession Date(s) shall be: <b>The whole of the Site will be handed over no later than the Commencement Date.</b>
GCC 29.1	Appointing Authority for the Adjudicator: <b>President, Institution of Engineers (India), Kohima Chapter.</b>
GCC 30.3	<p>The Adjudicator shall be paid by the hour at the rate of: <b>INR 1,250.00</b></p> <p>The reimbursable expenses are: <b>Expenditure incurred for Transport, Food, Lodging, Report printing.</b></p>
GCC 34.1	<p>The following is added after the last paragraph:</p> <p>The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, people with disabilities, Indigenous Peoples, and/or ethnic minorities, migrant workers, and children (of working age in accordance with Sub-Clause 32.1 [Child Labor]).</p> <p>The Contractor shall ensure that its employees and Subcontractors observe the highest ethical standards and refrain from any form of violence and harassment including any form of bullying, discrimination, misconduct, and shall, at all times, behave in a manner that creates an environment free of unethical behavior, bullying, misconduct, and harassment, including sexual harassment."</p>
GCC 34.2	<p>The following sentence shall apply:</p> <p>Respectful Work Environment</p> <p>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.</p> <p>The Contractor shall conduct training programs for its employees and Subcontractors 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 Project Manager at their first written request.</p>

## B. Time Control

GCC 35.1	The Contractor shall submit for approval a Program for the Works within <b>28</b> days from the date of the Letter of Acceptance.
GCC 35.3	The period between Program updates is <b>Thirty (30)</b> days.  The amount to be withheld for late submission of an updated Program is <b>INR 100,000</b>

## C. Quality Control

GCC 43.1	The Defects Liability Period is: <b>365</b> days.
GCC 43.3	New Sub-Clause 43.3 is added as given below;  <b>Environmental Closure and Post-Construction Obligations:</b> Environmental obligations under the Contract shall continue during the Defects Liability Period. The Contractor shall implement post-construction environmental monitoring, site reinstatement, and corrective measures as required under the EMP and SSEHSMP. Final acceptance of the Works shall be conditional upon the Engineer's confirmation that all environmental obligations have been satisfactorily completed.

## D. Cost Control

GCC 50.5	New Sub-Clause 50.5 is added as given below;  <b>Environmental, Health, and Safety Performance.</b> Without prejudice to any other remedy under the Contract, certification of Interim Payment Certificates shall be conditional upon the Contractor's satisfactory environmental, health, and safety (EHS) performance. Where the Project Manager determines that the Contractor has failed to implement the approved Site-Specific Environmental, Health, and Safety Management Plan (SSEHSMP), Environmental Management Plan (EMP), or corrective actions within the agreed timeframes, the Engineer may withhold or reduce payments until such non-compliance has been rectified to the Engineer's satisfaction.
GCC 50.6	New Sub-Clause 50.6 is added as given below;  If the Contractor fails to meet any requirements assessed using the Key Performance Indicators (KPI) set out in Part E – Performance Damages and/or Part F – Bonuses, of the Particular Conditions, if applicable, as determined by the Project Manager, necessary adjustments to the payments shall be made.
GCC 53.1	The currency of the Employer's country is: <b>INR</b>
GCC 54.1	The Contract <b>is</b> subject to price adjustment in accordance with GCC Clause 54, and the following information regarding coefficients <b>does</b> apply.  The coefficients and indexes for adjustment of prices in local and foreign currencies shall be as specified in the Table(s) of Adjustment Data submitted together with the Letter of Bid.
GCC 55.1	The proportion of payments retained is: <b>7.5% from each payment [except Advance Payment] till 5% of the final Contract Price is retained.</b>
GCC 56.1	The liquidated damages for the whole of the Works are: <b>0.05% of the final Contract Price</b>

	per day. The maximum amount of liquidated damages for the whole of the Works is: <b>10%</b> of the final Contract Price.
GCC 57.1	<b>Not applicable</b>
GCC 58.1	The Advance Payments shall be: <b>10% of the final Contract Price</b> and shall be paid to the Contractor no later than <b>28 days, after receipt of the complete request document from the selected contractor.</b>
GCC 58.3	Repayment of the Advance Payments shall be: <b>15%</b> from each payment certificate.
GCC 59.1	The Performance Security amount is: <b>5% of the final Contract Price in INR.</b>

## E. Finishing the Contract

GCC 72.1	The date by which operating and maintenance manuals are required is: <b>Not Applicable.</b>  The date by which “as built” drawings are required is <b>Within 28 days of contract completion date.</b>
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: <b>5% of the final Contract Price.</b>
GCC 73.2(h)	The maximum number of days is: <b>200.</b>
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 <b>5%</b>

# Part A – Corrupt and Fraudulent Practices

## 1. Purpose

- 1.1 ADB's Anticorruption Policy and Investigation and Enforcement Framework (both as amended from time to time) and this annex apply with respect to procurement under ADB-financed activities.

## 2. Requirements

- 2.1 ADB requires Borrowers (including beneficiaries of ADB-financed activities) 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; and
  - (vi) "integrity violation" means any act, as defined under ADB's Investigation and Enforcement Framework (as amended from time to time), which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: failure to disclose and manage conflict of interest,<sup>1</sup> obstructive practice, violation of debarment, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standards;
- (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

---

<sup>1</sup> "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.

- 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 enforcement and disclosure actions on a firm or an individual at any time, in accordance with ADB's Anticorruption Policy and Investigation and Enforcement Framework, including declaring ineligible, either indefinitely or for a stated period of time, to participate<sup>2</sup> in activities financed, administered, or supported by ADB or to benefit from a contract financed, administered, or supported by ADB 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 the Bidding Document and in contracts financed, administered, or supported by ADB, requiring Bidders, suppliers, 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.
- 2.2 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 required 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 is set out in detail in the Investigation and Enforcement Framework (as amended from time to time).
- 2.3 All Bidders, consultants, contractors, and suppliers shall require their officers, directors, employees, personnel, and 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 required to cooperate fully in any investigation when requested by ADB to do so.
- 2.4 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.<sup>3</sup>

---

<sup>2</sup> 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).

<sup>3</sup> The undertaking also applies during the period of performance of the contract.



## Part B – Environmental, Health, and Safety (EHS)

### Metrics for Progress Reports

Metrics for regular reporting:

- a. Incidents for Nonconformance
  - (i) Environmental incidents or nonconformance with contract requirements as defined in EMP, including contamination, pollution, or damage to ground or water supplies, air, and soil;
  - (ii) Health and safety incidents, accidents, injuries that require treatment, and all fatalities;
  - (iii) Interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none).
- b. Status of All Permits and Agreements
  - (i) Work permits: number required, number received, and actions taken for those not received;
  - (ii) Status of permits and consents:
    - (a) List areas and facilities with permits required (quarries, asphalt, and batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to resident engineer (or equivalent), and status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, and others).
    - (b) List areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, and dates submitted to resident engineer (or equivalent).
    - (c) Identify and highlight major activities and environmental and health and safety mitigation measures undertaken in each area in the reporting period (such as land clearing, provisioning of temporary access, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation).
    - (d) For quarries: indicate status of relocation and compensation (completed, or details of activities and current status in the reporting period).
    - (e) List parts of the Site for which Notice to commence work and confirmation by the Employer as per Sub-Clause 2.1 [*Right of Access to the Site*] was received by the Contractor and the other parts of the Site for which such Notice is pending.
- c. Compliance<sup>4</sup>
  - (i) Compliance status for conditions of all relevant consents and permits for the Work, including quarries, and others: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;
  - (ii) Compliance status of SSHSMP (as per Sub-Clause 4.8 [*Health and Safety Obligations*] and SSEMP as per Sub-Clause 4.18 [*Protection of the Environment*]): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance; and
  - (iii) Other unresolved issues from previous reporting periods related to environmental and social:

---

<sup>4</sup> For projects categorized as Category C for environment for which no EMP has been prepared, item (ii) should be deleted.



continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, and others. Cross-reference other sections as needed.

**d. Supervision**

**(i) Environmental and Social Supervision**

- (a) Environmental specialist: number of days worked, areas inspected, number of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, swamps, forest crossings, and others), highlights of activities and findings (including violations of environmental requirements/best practices, actions taken), and reports to environmental specialist, construction, and site management;
- (b) Social Specialist and Community liaison person(s): number of days worked (hours community center is open), number of people met, highlights of activities (issues raised, and others), and reports to specialist, construction, and site management.

**(ii) Health and Safety Supervision**

- (a) Health and Safety specialist: number of days worked, number of full and partial inspections, and reports to construction and project management;
- (b) Number of workers, work hours, metric of personal protection equipment (PPE) use (percentage of workers with full PPE, partial, and others), worker violations observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, and follow-up actions taken (if any);
- (c) Number of partial and full site inspections (by area: road section, work camp, accommodations, quarries, borrow areas, spoil areas, work site, clinic, HIV/AIDS center, community centers, and others), highlights of activities (including violations of environmental, health and safety and social requirements observed, actions taken), and reports to health and safety specialist, construction, and site management.

**e. Worker Accommodations**

- (i) Number of expats housed in accommodations and number of locals;
- (ii) Date of last inspection and highlights of inspection including status of accommodations' compliance with national and local laws and good practice, including sanitation, space, and others; and
- (iii) Actions taken to recommend or require improved conditions, or to improve conditions.

**f. Training**

- (i) Number of new workers, number receiving induction training, and dates of induction training;
- (ii) Number and dates of toolbox talks, number of workers receiving training related to Environmental, Health, and Safety (EHS);
- (iii) Number and dates of communicable diseases (including sexually transmitted diseases [STDs]) sensitization and/or training, number of workers receiving training (in the reporting period and in the past), and same questions for gender sensitization and flag person training; and
- (iv) Number and date of EHS-related prevention sensitization and/or training events, including number of workers receiving training on EHS Code of Conduct for Contractor's Personnel (in the reporting period and in the past), and others.

**g. Grievances**

List of EHS-related grievances: grievances from affected communities and Worker grievances as recorded in the Contractor's grievance redress mechanism; traffic, road safety, and vehicles and equipment (health and safety or safeguard or environmental specialist needs to provide these requirements):

- (i) Traffic and road safety incidents and accidents involving project vehicles and equipment: provide date, location, damage, cause, follow-up;
  - (ii) Traffic and road safety incidents and accidents involving nonproject vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, and follow-up; and
- h.** Overall condition of vehicles or equipment (subjective judgment by environmental specialist and social specialist); nonroutine repairs and maintenance needed to improve safety and/or environmental and social performance (to control smoke, and others). <https://www.adb.org/sites/default/files/publication/937376/seah-reporting-good-practice-note.pdf> Mitigations and Issues (what has been done):
- (i) Environmental Mitigations
    - (a) Dust: number of working bowsters, number of watering per day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); percentage of rock and spoil lorries with covers, and actions taken for uncovered vehicles;
    - (b) Erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, and emergency repairs needed to control erosion or sedimentation;
    - (c) Quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental protection—land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, and decommissioning implementation;
    - (d) Blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, and others), and incidents of off-site damage or complaints (cross-reference other sections as needed);
    - (e) Spill clean-ups, if any: material spilled, location, amount, actions taken, and disposal (report all spills that result in water or soil contamination);
    - (f) Waste management: types and quantities generated and managed, including amount taken off-site (and by whom) or reused, recycled, or disposed on-site;
    - (g) Details of tree plantings and other mitigations required undertaken in the reporting period;
    - (h) Details of water and swamp protection mitigations required undertaken in the reporting period;
    - (i) The Contractor shall identify and report on any special or temporary right of way and any additional facility that have temporary and/or permanent impacts on affected persons' assets, access to assets, and/or livelihoods (income sources). It shall put in place corresponding mitigation measures, and implement them;
    - (j) Restoration of the environment due to damage caused by the construction activities
  - (ii) Health and Safety Mitigations
    - (a) Occupational Health and Safety (OHS): Implement OHS Plan; provide and enforce PPE use; conduct safety inspections and toolbox talks.

- (b) compliance status of labor management plan and prevention, mitigation, and response measures: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance.
- (c) Establish systems to monitor their own employment practices and the practices of any appointed sub-contractors.
- (d) Workforce Management: Ensure all workers have valid contracts, are registered, and receive induction on EHS code of conduct and grievance mechanism.
- (e) Worker Accommodation and Welfare: Maintain compliant, gender-segregated, and hygienic accommodation with clean water, sanitation, and waste systems.
- (f) Grievance Mechanism: Maintain and publicize Contractor's personnel grievance mechanism and grievance mechanism for the project; ensure anonymity and timely resolution of worker grievances.
- (g) Training and Capacity Building: Conduct training on OHS, labour rights, and respectful workplace behaviour.
- (h) Contractor and Subcontractor Compliance: monitor contractors for compliance with labor, OHS, and welfare standards.
- (i) Child and Forced Labor Prevention: Screen workforce; monitor supply chain; remediate any violations immediately.
- (j) Details of hazard prevention and control mitigations required undertaken in the reporting period.

# **Part C – Performance Damages: Not Applicable.**

## **Part D – Bonuses: Not Applicable**

# Section 9: Contract Forms

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

## Table of Forms

Notice of Intention for Award of Contract .....	2
Letter of Acceptance.....	3
Beneficial Ownership Disclosure Form .....	5
Contract Agreement .....	7
Performance Security .....	8
Advance Payment Security.....	9
Environmental, Health, and Safety Code of Conduct.....	10

# **Notice of Intention for Award of Contract – Not Applicable**

# Invitation to Finalization of the Draft Contract Before Notification of Award

[on letterhead paper of the Employer]

[date]

To: [Name and address of the bidder]  
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 Sheef] is hereby found as the Most Advantageous Bid by our Agency.

You are hereby invited to discussions to finalize the draft contract, through [...enter means of discussions, such as in-person meetings, venue, or electronic correspondence....]. The discussions on the finalization of the draft contract will include the topics given in the Attachment to this Invitation.

Authorized Signature: .....  
Name and Title of Signatory: .....  
Name of Agency: .....

Attachment: Topics to be discussed during finalization of the draft contract.



# 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 in the equivalent of *[amount in words and figures and name of currency]* as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract and any additional security required as a result of the evaluation of your bid, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

*[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: Draft Contract

# Beneficial Ownership Disclosure Form

## NOTE

### NOTE TO BIDDERS:

This Beneficial Ownership Disclosure Form ("Form") is to be completed by the successful Bidder. In case of joint venture, the Bidder must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.

For the purposes of this Form, a Beneficial Owner of a Bidder is any natural person who ultimately owns or controls the Bidder by meeting one or more of the following conditions:

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder.

Contract No. *[please specify]*

To: *[insert complete name of Employer]*

In response to your request in the Letter of Acceptance *dated [insert date of letter of Acceptance]* to furnish additional information on beneficial ownership: *[select one option as applicable and delete the options that are not applicable]*

(i) we hereby provide the following beneficial ownership information.

### Details of beneficial ownership

Identity of Beneficial Owner	Directly or indirectly holding 25% or more of the shares (Yes / No)	Directly or indirectly holding 25 % or more of the Voting Rights (Yes / No)	Directly or indirectly having the right to appoint a majority of the board of the directors or an equivalent governing body of the Bidder (Yes / No)
<i>[include full name (last, middle, first), nationality, country of residence]</i>			

**OR**

(ii) *We declare that there is no Beneficial Owner meeting one or more of the following conditions:*

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder

**OR**

(iii) *We declare that we are unable to identify any Beneficial Owner meeting one or more of the following conditions. [If this option is selected, the Bidder shall provide explanation on why it is unable to identify any Beneficial Owner]*

- directly or indirectly holding 25% or more of the shares
- directly or indirectly holding 25% or more of the voting rights
- directly or indirectly having the right to appoint a majority of the board of directors or equivalent governing body of the Bidder]"

**Name of the Bidder:** \*[insert complete name of the Bidder]\_\_\_\_\_

**Name of the person duly authorized to sign the Bid on behalf of the Bidder:** \*\*[insert complete name of person duly authorized to sign the Bid]\_\_\_\_\_

**Title of the person signing the Bid:** [insert complete title of the person signing the Bid]\_\_\_\_\_

**Signature of the person named above:** [insert signature of person whose name and capacity are shown above]\_\_\_\_\_

**Date signed** [insert date of signing] **day of** [insert month], [insert year]\_\_\_\_\_

\* In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder. In the event that the Bidder is a joint venture, each reference to "Bidder" in the Beneficial Ownership Disclosure Form (including this Introduction thereto) shall be read to refer to the joint venture member.

\*\* Person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached with the Bid Schedules.

# 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 be interpreted in the following order of priority and shall prevail over all other Contract documents.
  - (a) Letter of Acceptance,
  - (b) Letter of Bid,
  - (c) Addenda Nos. [insert addenda number if any]<sup>1</sup>
  - (d) Particular Conditions of Contract, including attachments
  - (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,
  - (j) Environmental, Health, and Safety Code of Conduct for Contractor's Personnel;
  - (k) Environmental, Health, and Safety Management Plan (ESMP) and other EHS assessment and management documents;
  - (l) any other documents shall be added here.<sup>2</sup>
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.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of **India** on the day, month, and year indicated above.

Signed by  
for and on behalf of the Employer

in the presence of

Witness, Name, Signature, Address, Date

Signed by  
for and on behalf the Contractor

in the presence of

Witness, Name, Signature, Address, Date

---

<sup>1</sup> 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.

<sup>2</sup> Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 54.1).

# Performance Security

*[Bank's name and address of issuing branch or office]<sup>3</sup>*

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]<sup>4</sup> [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]*,<sup>5</sup> 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.<sup>6</sup>

.....  
*[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.*

<sup>3</sup> All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

<sup>4</sup> 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.

<sup>5</sup> Insert the date 28 days after the expected 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."

<sup>6</sup> 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]<sup>7</sup>*

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]<sup>8</sup> [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]<sup>9</sup> [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]*,<sup>10</sup> 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.<sup>11</sup>

*Signature(s) and seal of bank (where 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.*

<sup>7</sup> All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

<sup>8</sup> 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.

<sup>9</sup> 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.

<sup>10</sup> 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."

<sup>11</sup> 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.

# Environmental, Health, and Safety Code of Conduct

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

### NOTE TO THE BIDDER

*The minimum content of the Environmental, Health, and Safety (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.*

### NOTE TO BIDDER

***The minimum content of the Environmental, Health, and Safety (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 (EHS) 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 as contained in the Environmental, Health, and Safety Management Plan (EHSMP) and other relevant project documents. It applies to all our staff, laborers, 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 its 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 it believes are not safe or healthy and remove itself from a work situation that it reasonably believes presents an imminent and serious danger to its 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 it believes may represent a violation of this EHS Code of Conduct, or that otherwise concerns it, it should raise the issue promptly. This can be done by calling [insert number] 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 of the employment and/or engagement contract 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]: .....

## NOTE TO THE BIDDER

*The minimum content of the Environmental, Health, and Safety (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.*