

**Government of Jammu & Kashmir,  
Project Management Unit  
Jhelum & Tawi Flood Recovery Project (World Bank Funded)**

BID [TENDER] NO: Revised/Roads/Kashmir/04

- Upgradation of :**  
**1. Sangam Khudwani Road &  
2. Bijbehara to Kanihama Road.**

**NATIONAL COMPETITIVE BIDDING**

**(Single Envelope Bidding Process without e-Procurement)**

PERIOD OF SALE OF BIDDING DOCUMENT : FROM 30-09-2019  
TO 10-11-2019

TIME AND DATE OF HOURS : DATE 09-10-2019 TIME 1100 hours  
PRE-BID MEETING<sup>1</sup>

LAST DATE AND TIME FOR RECEIPT OF BIDS : DATE 10-11-2019 TIME 1630 hours

\* TIME AND DATE OF OPENING : DATE 15-11-2019 TIME 1700 hours  
HOURS OF BIDS

PLACE OF OPENING OF BIDS: ERA Commercial Complex, Rambagh Srinagar, J&K.

OFFICER INVITING BIDS : Director Technical

September 2019

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# **INVITATION FOR BIDS**

(IFB)

**Government of Jammu & Kashmir,  
Project Management Unit  
Jhelum & Tawi Flood Recovery Project (World Bank Funded)**

**INVITATIONS FOR BIDS (IFB)**

**NATIONAL COMPETITIVE BIDDING**

**Date: 30-09-2019**

**Bid No.: Revised/Roads/Kashmir/04**

1. The Government of India has received credit for financing from the World Bank towards the cost of Jhelum & Tawi Flood Recovery Project and intends to apply a part of the funds to cover eligible payments under the contracts for construction of works as detailed below.
2. Bidding will be conducted through National Competitive Bidding procedures agreed with the World Bank. Bidding is open to all eligible bidders as defined in the World Bank's Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, January 2011 revised July 2014.
3. Bidders from India should, however, be registered with the Government of J&K or other State Governments/Government of India, or State/Central Government Undertakings. Bidders from India, who are not registered as above, on the date of bidding, can also participate provided they get themselves registered by the time of contract signing, if they become successful bidders. **Bidders are advised to note the clauses on eligibility (Section I Clause 4) and minimum qualification criteria (Section III – Evaluation and Qualification Criteria), to qualify for the award of the contract.** In addition, please refer to paragraphs 1.6 and 1.7 of the World Bank's Guidelines setting forth the World Bank's policy on conflict of interest.
4. The Director Technical, PMU JTFRP invites **sealed bids in Single Cover** for the construction of works detailed below in the table. The bidders may submit bids for any or all of the works indicated therein. Interested bidders may obtain further information and inspect the bidding documents at the address given below during office hours.
  - PMU JTFRP office, ERA Commercial Complex, Rambagh Srinagar, J&K.
  - 2<sup>nd</sup> Floor, JKPC Building Railhead Complex Jammu, J&K.
5. Bidding documents may be purchased from the above mentioned addresses office -from **30-09-2019 to 10-11-2019** for a non-refundable fee as indicated in the table below, in the form of Demand Draft (DD) on any Scheduled/Nationalized bank payable in favour of Chief Accounts Officer PMU JTFRP. ***The bidding documents and addenda if any can also be downloaded from the website [www.jtfrp.in](http://www.jtfrp.in). The cost of bid document in form of DD should accompany the bid submission failing which the bid will be treated non responsive.***

6. All Bids must be accompanied by a bid security of the amount **specified for the work in the table below**, drawn in favour of Chief Accounts Officer, PMU JTFRP. Bid security will have to be in any one of the forms as specified in the bidding document and shall have to be valid for 45 days beyond the validity of the bid.
7. Bids must be delivered to the following address : **PMU JTFRP office, ERA Commercial Complex, Rambagh Srinagar, J&K.** on or before 1630 hours on **10 – 11 – 2019** and will be publicly opened on **10-11-2019 1700 hours**, in the presence of the bidders designated representatives who wish to attend. If the office happens to be closed on the date of receipt of the bids as specified, the bids will be received and opened on the next working day at the same time and venue. Late Bids will be rejected.
8. A pre-bid meeting will be held on **09-10-2019** at 1100 hours at the office of **Director Technical, PMU JTFRP office, ERA Commercial Complex, Rambagh Srinagar, J&K** to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in ITB Clause 7.4 of 'Instructions to Bidders' of the bidding document. Bidders are advised to obtain the bidding document prior to the pre-bid meeting in order for bidders to have a good understanding of the scope of work under this contract for discussion and clarification at the pre-bid meeting.
9. Other details can be seen in the bidding documents.

10. The address for communication is as under:

- Name & Designation of Officer : Iftikhar Ahmed Kakroo/ Narinder Kalay.
- Official Address : PMU JTFRP office, ERA Commercial Complex, Rambagh Srinagar, J&K / 2<sup>nd</sup> Floor, JKPC Building Railhead Complex Jammu, J&K.
- Email : dirpmujk@gmail.com/dirpnc@gmail.com
- Telephone 0194-2437320, 9419153731, 7006966231, 9419194825

Package No	Name of Work	Bid Security (Rs.)	Cost of Document (Rs.)	Period of Completion
1	2	3	4	5
	Upgradation of : 1. Sangam Khudwani Road & 2. Bijbehara to Kanihama Road.	INR 28 lac	INR 10000/=	15 months, plus DLP of 1 year reckoned from the date of issue of completion certificate.

**Sd/-**  
**Director Technical**

## **PART 1 – Bidding Procedures**

## **Section I. Instructions to Bidders**

*These Instructions to Bidders shall not be part of the Contract Agreement and shall cease to have effect once the Contract is signed.*

# Section 1 - Instructions to Bidders

## Table of Contents

<b>A. General.....</b>	<b>9</b>
1. Scope of Bid.....	9
2. Source of Funds .....	9
3. Corrupt and Fraudulent Practices.....	9
4. Eligible Bidders .....	10
5. Eligible Materials, Equipment and Services .....	12
<b>B. Contents of Bidding Document.....</b>	<b>13</b>
6. Sections of Bidding Document .....	13
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting.....	14
8. Amendment of Bidding Document .....	15
<b>C. Preparation of Bids.....</b>	<b>15</b>
9. Cost of Bidding .....	15
10. Language of Bid.....	15
11. Documents Comprising the Bid.....	15
12. Letter of Bid and Schedules .....	16
13. Alternative Bids .....	16
14. Bid Prices and Discounts .....	16
15. Currencies of Bid and Payment .....	18
16. Documents Comprising the Technical Proposal.....	18
17. Documents Establishing the Qualifications of the Bidder.....	18
18. Period of Validity of Bids .....	19
19. Bid Security .....	19
20. Format and Signing of Bid.....	20
<b>D. Submission and Opening of Bids.....</b>	<b>21</b>
21. Sealing and Marking of Bids .....	21
22. Deadline for Submission of Bids .....	22
23. Late Bids .....	22
24. Withdrawal, Substitution, and Modification of Bids .....	22
25. Bid Opening.....	23
<b>E. Evaluation and Comparison of Bids .....</b>	<b>24</b>
26. Confidentiality .....	24
27. Clarification of Bids.....	24
28. Deviations, Reservations, and Omissions.....	25

29.	Determination of Responsiveness.....	25
30.	Nonconformities, Errors, and Omissions.....	25
31.	Correction of Arithmetical Errors.....	26
32.	Conversion to Single Currency.....	26
33.	Margin of Preference .....	26
34.	Sub-contractors .....	26
35.	Evaluation of Bids.....	27
36.	Comparison of Bids .....	28
37.	Qualification of the Bidder .....	28
38.	Employer’s Right to Accept Any Bid, and to Reject Any or All Bids .....	28
<b>F.</b>	<b>Award of Contract .....</b>	<b>28</b>
39.	Award Criteria .....	28
40.	Notification of Award .....	28
41.	Signing of Contract, Publication of award and Recourse to unsuccessful Bidders .....	29
42.	Performance Security.....	30
43.	Adjudicator .....	30



## Section I - Instructions to Bidders

### A. General

1. **Scope of Bid**
  - 1.1 The Employer, as **indicated in the BDS**, issues this Bidding Document for the procurement of the Works as specified in Section VII (Works' Requirements) & Invitation for Bids (IFB). The name, identification, and number of contracts of this bidding are **specified 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;
    - (c) "day" means calendar day; and
    - (d) "ESHS" means environmental, social (including sexual exploitation and abuse (SEA) and gender based violence (GBV)), health and safety.
2. **Source of Funds**
  - 2.1 The Borrower or the Recipient (hereinafter called "Borrower") **specified in the BDS** has received/applied for financing (hereinafter called "funds") from the International Bank for Reconstruction and Development or the International Development Association (hereinafter called "the Bank") in an amount **specified in the BDS**, towards the cost of the project **specified 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 Payment by the Bank will be made only at the request of the Borrower and upon approval by the Bank, and will be subject, in all respects, to the terms and conditions of the Loan (or other financing) Agreement. The Loan (or other financing) Agreement prohibits a withdrawal from the Loan (or other financing) account for the purpose of any payment to persons or entities, or for any import of goods, if such payment or import, is prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations. No party other than the Borrower shall derive any rights from the Loan (or other financing) Agreement or have any claim to the proceeds of the Loan (or other financing).
3. **Corrupt and**
  - 3.1 The Bank requires compliance with its policy in regard to

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**Fraudulent Practices**

corrupt and fraudulent practices as set forth in Section VI.

- 3.2 In further pursuance of this policy, Bidders shall permit and shall cause their agents (whether declared or not), sub-contractors, sub-consultants, service providers, or suppliers and any personnel thereof, to permit the Bank to inspect all accounts, records and other documents relating to any prequalification process, bid submission, and contract performance (in the case of award), and to have them audited by auditors appointed by the Bank.

**4. Eligible Bidders**

- 4.1 A Bidder may be a firm that is a private entity, a state-owned entity or institution subject to ITB 4.5, or any combination of such entities in the form of a Joint Venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent, unless otherwise **specified in the BDS**. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms. The JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the Bidding process and, in the event the JV is awarded the Contract, during contract execution. This authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all members. Unless **specified in the BDS**, there is no limit on the number of members in a JV. The joint venture agreement shall be registered in the place **specified in BDS** so as to be legally valid and binding on members.

- 4.2 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 have a conflict of interest for the purpose of this bidding process, if the Bidder:

- (a) directly or indirectly controls, is controlled by or is under common control with another Bidder; or
- (b) receives or has received any direct or indirect subsidy from another Bidder; or
- (c) has the same legal representative as another Bidder; or
- (d) has a relationship with another Bidder, directly or through common third parties, that puts it in a position to influence the bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or
- (e) participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which such Bidder is involved. However, this does not limit the inclusion of the

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same subcontractor in more than one bid; or

- (f) any of its affiliates 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) any of its affiliates has been hired (or is proposed to be hired) by the Employer or Borrower as Project Manager (Engineer) for the Contract implementation; or
- (h) would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the BDS ITB 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm; or
- (i) has a close business or family relationship with a professional staff of the Borrower (or of the project implementing agency, or of a recipient of a part of the loan) who: (i) are directly or indirectly involved in the preparation of the bidding documents or specifications of the contract, and/or the bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Bank throughout the procurement process and execution of the contract.

4.3 A Bidder may have the nationality of any country, subject to the restrictions pursuant to ITB 4.7. A Bidder shall be deemed to have the nationality of a country if the Bidder is constituted, incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed sub-contractors or sub-consultants for any part of the Contract including related Services.

4.4 A Bidder that has been sanctioned by the Bank in accordance with the above ITB 3.1, including in accordance with the Bank's Guidelines on Preventing and Combating Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants ("Anti-Corruption Guidelines"), shall be ineligible to be prequalified for, bid for, or be awarded a Bank-financed contract or benefit from a Bank-financed contract, financially or otherwise, during such period of time as the Bank shall have determined. The list

of debarred firms and individuals is available at the electronic address **specified in the BDS**.

- 4.5 Bidders that are Government-owned enterprises or institutions in the Employer's Country may participate only if they can establish that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not dependent agencies of the Employer. To be eligible, a government-owned enterprise or institution shall establish to the Bank's satisfaction, through all relevant documents, including its Charter and other information the Bank may request, that it: (i) is a legal entity separate from the government (ii) does not currently receive substantial subsidies or budget support; (iii) operates like any commercial enterprise, and, inter alia, is not obliged to pass on its surplus to the government, can acquire rights and liabilities, borrow funds and be liable for repayment of its debts, and can be declared bankrupt; and (iv) is not bidding for a contract to be awarded by the department or agency of the government which under their applicable laws or regulations is the reporting or supervisory authority of the enterprise or has the ability to exercise influence or control over the enterprise or institution.
- 4.6 Not used.
- 4.7 Firms and individuals may be ineligible if so indicated in Section V and (a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country, provided that the Bank is satisfied that such exclusion does not preclude effective competition for the supply of goods or the contracting of works or services required; or (b) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country, or any payments to any country, person, or entity in that country.
- 4.8 Bidder shall provide such evidence of eligibility satisfactory to the Employer, as the Employer shall reasonably request

## **5. Eligible Materials, Equipment and Services**

- 5.1 The materials, equipment and services to be supplied under the Contract and financed by the Bank may have their origin in any country subject to the restrictions specified in Section V, Eligible Countries, and all expenditures under the Contract will not contravene such restrictions. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment and services.

## **B. Contents of Bidding Document**

### **6. Sections of Bidding Document**

- 6.1 The Bidding Document consist of Parts 1, 2, and 3, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 8.

#### **PART 1 Bidding Procedures**

Section I - Instructions to Bidders (ITB)  
 Section II - Bid Data Sheet (BDS)  
 Section III - Evaluation and Qualification Criteria  
 Section IV - Bidding Forms  
 Section V - Eligible Countries  
 Section VI - Bank Policy-Corrupt and Fraudulent Practices

#### **PART 2 Work's Requirements**

Section VII – Works' Requirements

#### **PART 3 Conditions of Contract and Contract Forms**

Section VIII - General Conditions of Contract (GCC)  
 Section IX - Particular Conditions of Contract (PCC)  
 Section X - Contract Forms

- 6.2 The Invitation for Bids issued by the Employer is not part of the Bidding Document.
- 6.3 Unless obtained directly from the Employer, the Employer is not responsible for the completeness of the Bidding Documents, responses to requests for clarification, the minutes of the pre-Bid meeting (if any), or Addenda to the Bidding Documents in accordance with ITB 8. In case of any contradiction, documents obtained directly from the Employer shall prevail.
- 6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Documents and to furnish with its bid all information and documentation as required by the Bidding Documents.

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| <p><b>7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting</b></p> | <p>7.1 A prospective Bidder requiring any clarification on the Bidding Document shall contact the Employer in writing at the Employer's address <b>indicated in the BDS</b> 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 <b>specified in the BDS</b>. 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. If so <b>specified in the BDS</b>, the Employer shall also promptly publish its response at the web page identified in the BDS. <i>(where electronic downloading of bid document is permitted, the Employer will upload the addenda on the website and it will be the responsibility of the bidders [who downloaded the bidding documents] to search the website for any addenda)</i>. Should the clarification result in changes to the essential elements of the Bidding Documents, the Employer shall amend the Bidding Documents following the procedure under ITB 8 and ITB 22.2.</p> <p>7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself, on its own risk and responsibility, all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.</p> <p>7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon 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.</p> <p>7.4 If so <b>specified in the BDS</b>, the Bidder's designated representative is invited to attend a pre-bid meeting and/or a Site of Works visit. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.</p> <p>7.5 The Bidder is requested, to submit any questions in writing, to reach the Employer not later than one week before the meeting.</p> <p>7.6 Minutes of the pre-bid meeting, including the text of the questions raised, without identifying the source, and the</p> |
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responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Documents in accordance with ITB 6.3. Any modification to the Bidding Documents 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 Documents 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. The Employer shall also promptly publish the addendum on the Employer's web page in accordance with ITB 7.1.

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

### **C. Preparation of Bids**

**9. Cost of Bidding**

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

**10. Language of Bid**

10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in English. 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 English, 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 the following:

(a) Letter of Bid;

(b) completed Schedules including priced bill of quantities, in accordance with ITB 12 and 14, as **specified in BDS**;

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- (c) Bid Security, in accordance with ITB 19;
  - (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 20.2;
  - (f) documentary evidence in accordance with ITB 17 establishing the Bidder's qualifications to perform the contract, if its Bid is accepted;
  - (g) Technical Proposal in accordance with ITB 16;
  - (h) Construction methodology proposed as detailed in Para 1.1 of Section III Evaluation Criteria;
  - (i) Contractor Registration certificate (as per IFB); and
  - (j) Any other document **required in the BDS**.

11.2 In addition to the requirements under ITB 11.1, bids submitted by a JV (where permitted) shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful bid shall be signed by all members and submitted with the bid, together with a copy of the proposed Agreement.

11.3 The Bidder shall furnish in the Letter of Bid information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid.

## **12. Letter of Bid and Schedules**

12.1 The Letter of Bid, Schedules including the Bill of Quantities, and all documents listed under Clause 11, shall be prepared using the relevant forms in Section IV (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.

## **13. Alternative Bids**

13.1 Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

## **14. Bid Prices and Discounts**

14.1 The prices and discounts (including any price reduction) quoted by the Bidder in the Letter of Bid and in the Schedules shall conform to the requirements specified below.

14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works (both in figures and words), as identified in Section IV, Bidding Forms along with the total bid price (both in figures



and words). 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.** Corrections if any in the bid shall be made by crossing out, initialling, dating and rewriting.

- 14.3 The price to be quoted in the Letter of Bid in accordance with ITB 12.1, shall be the total price of the Bid, excluding any discounts offered.
- 14.4 Discounts, if any, and the methodology for their application shall be quoted in the Letter of Bid, in accordance with ITB 12.1.
- 14.5 Unless otherwise **specified in the BDS** and the Conditions of Contract, the rates and prices quoted by the Bidder shall be fixed
- 14.6 If so indicated in ITB 1.1, bids are invited for individual lots (contracts) or for any combination of lots/contracts (packages). Bidders wishing to offer any price reduction for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the bids for all lots/contracts are opened at the same time.
- 14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as applicable on the deadline for submission of Bids, shall be included in the rates and prices and the total bid price submitted by the Bidder.
- 14.8 Bidders may like to ascertain availability of tax/duty exemption benefits available in India. They are solely responsible for obtaining such benefits which they have considered in their bid and in case of failure to receive such benefits for reasons whatsoever, the Employer will not compensate the bidder (Contractor). The bidder shall furnish alongwith his bid a declaration to this effect in the Declaration Format provided in Section IV of the bidding documents.

Where the bidder has quoted taking into account such benefits, it must give all information required for issue of certificates in terms of the Government of India's relevant Notifications as per the declaration format. In case the bidder has not provided the required information or has indicated to be furnished later on in the Declaration Format, the same shall be construed that the goods/construction equipment for which certificate is required is

Nil.

To the extent the Employer determines the quantities indicated therein are reasonable keeping in view the quantities in bill of quantities, construction program and methodology, the certificates will be issued within 60 days of signing of the contract and no subsequent changes will be permitted. In case of materials pertaining to Variation items and quantities, the certificate shall be issued only on request from the Contractor when in need and duly certified by the Project Manager.

No certificate will be issued for items where no quantity/capacity of equipment is indicated in the statement.

If the bidder has considered the tax/duty exemption for materials/construction equipment to be bought for the work, the bidder shall confirm and certify that the Employer will not be required to undertake any responsibilities of the Government of India Scheme or the said exemptions being available during the contract execution, except issuing the required certificate. The bids which do not conform to the above provisions or any condition by the bidder which makes the bid subject to availability of tax/duty exemption for materials/construction equipment or compensation on withdrawal of any variations to the said exemptions will be treated as non-responsive and rejected.

Any delay in procurement of the construction equipment/machinery/goods as a result of the above shall not be a cause for granting any extension of time.

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| <b>15. Currencies of Bid and Payment</b>                           | 15.1 | The unit rates and prices shall be quoted by the Bidder and shall be paid for, entirely in Indian Rupees.   |
| <b>16. Documents Comprising the Technical Proposal</b>             | 16.1 | The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as per details stipulated in Section IV (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time. |
| <b>17. Documents Establishing the Qualifications of the Bidder</b> | 17.1 | To establish Bidder's eligibility in accordance with ITB 4, Bidders shall complete the Letter of Bid, included in Section IV, Bidding Forms.  |
|  | 17.2 | To establish its qualifications to perform the Contract in accordance with Section III, Evaluation and Qualification Criteria, the Bidder shall provide the complete information as requested in the corresponding information sheets included in Section IV (Bidding Forms).   |

## 18. Period of Validity of Bids

- 18.1 Bids shall remain valid for 90 days or for a period **specified in the BDS** after the bid submission deadline date prescribed by the Employer in accordance with ITB 22.1. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.
- 18.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 19, it shall also be extended for forty five (45) days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its bid.
- 18.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial bid validity, the Contract price shall be determined as follows:
- (a) In the case of fixed price contracts, the Contract price shall be the bid price adjusted by the factor **specified in the BDS**.
  - (b) In the case of adjustable price contracts, no adjustment shall be made.
  - (c) In any case, bid evaluation shall be based on the bid price without taking into consideration the applicable correction from those indicated above.

## 19. Bid Security

- 19.1 Unless otherwise **specified in the BDS**, the Bidder shall furnish as part of its bid, in original form, a bid security for the amount **shown in BDS**, for this particular work.
- 19.2 The bid security shall be a demand guarantee, at the Bidder's option, in any of the following forms:
- (a) an unconditional bank guarantee, issued by a Nationalized/ Scheduled bank located in India;
  - (b) an irrevocable letter of credit issued by a Nationalized or Scheduled bank located in India;
  - (c) a cashier's or certified check; or demand draft from a Nationalized or Scheduled Bank located in India;
  - (d) another security **indicated in the BDS**.

*In case of a bank guarantee, the bid security shall be submitted using the Bid Security form included in the Section IV (Bidding Forms). The form must include the complete*

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name of the Bidder. The bid security shall be valid for forty five (45) days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.

- 19.3 If a Bid Security is specified pursuant to ITB 19.1, any bid not accompanied by a substantially responsive Bid Security shall be rejected by the Employer as non-responsive.
- 19.4 If a bid security is specified pursuant to ITB 19.1, the bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's signing the contract and furnishing of the performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security pursuant to ITB 42.
- 19.5 If a bid security is specified pursuant to ITB 19.1, the bid security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security.
- 19.6 The bid security may be forfeited:
  - (a) if a Bidder withdraws/modifies/substitutes its bid during the period of bid validity specified by the Bidder on the Letter of Bid, or any extension thereto provided by the Bidder in accordance with ITB 18.2 or
  - (b) if the Bidder does not accept the correction of its Bid Price pursuant to ITB 31 or
  - (c) if the successful Bidder fails to:
    - (i) sign the Contract in accordance with ITB 41; or
    - (ii) furnish a performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security in accordance with ITB 42.
- 19.7 The Bid Security of a JV shall be in the name of the JV that submits the bid. If the JV has not been constituted into a legally-enforceable JV, at the time of bidding, the Bid Security shall be in the names of all future members as named in the letter of intent mentioned in ITB 4.1 and ITB 11.2.

## 20. Format and Signing of Bid

- 20.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB 11 and clearly mark it "ORIGINAL". Alternative bids, if permitted in accordance with ITB 13, shall be clearly marked "Alternative" In addition, the Bidder shall submit copies of the bid in the number **specified**

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**in the BDS**, and clearly mark each of them “COPY.” In the event of any discrepancy between the original and the copies, the original shall prevail.

- 20.2 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as **specified in the BDS** and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the bid where entries or amendments have been made shall be signed or initialed by the person signing the bid.
- 20.3 In case the Bidder is a JV, the Bid shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives
- 20.4 Any amendments such as interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the bid.

#### **D. Submission and Opening of Bids**

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

- 21.1 Bidders may always submit their bids by mail or by hand. When so **specified in the BDS**, bidders shall have the option of submitting their bids electronically. Procedures for submission, sealing and marking are as follows:
  - (a) Bidders submitting bids by mail or by hand shall enclose the original and each copy of the Bid including alternatives if permitted in accordance with ITB 13, in separate sealed envelopes, duly marking the envelopes as “ORIGINAL”, “ALTERNATIVE” and “COPY.” These envelopes containing the original and the copies shall then be enclosed in one single envelope. The rest of the procedure shall be in accordance with ITB sub-Clauses 21.2 and 21.3.
  - (b) Bidders submitting bids electronically shall follow the electronic bid submission procedures **specified in the BDS**.
- 21.2 The inner and outer envelopes shall:
  - (a) bear the name and address of the Bidder;
  - (b) be addressed to the Employer as provided in the BDS pursuant to ITB 22.1;
  - (c) bear the specific identification of this bidding process

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indicated in accordance with ITB 1.1; and

- (d) bear a warning not to open before the time and date for bid opening.

21.3 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.

21.4 E-mail, Telex, Cable or Facsimile bids will be rejected as non-responsive.

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

22.1 Bids must be received by the Employer at the address and no later than the date and time **indicated in the BDS**. Bidders submitting bids electronically (when permitted) shall follow the electronic bid submission procedures **specified in the BDS**.

In the event of the specified date for the submission of Bids being declared a holiday for the Employer, the Bids will be received upto the appointed time on the next working day.

22.2 The Employer may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

## **23. Late Bids**

23.1 The Employer shall not consider any bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any bid received by the Employer after the deadline for submission of bids shall be declared late, rejected, and returned unopened to the Bidder.

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

24.1 A Bidder may withdraw, substitute, or modify its bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the bid must accompany the respective written notice. All notices must be:

- (a) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawal notices do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION;" and
- (b) received by the Employer prior to the deadline prescribed for submission of bids, in accordance with ITB 22.

24.2 Bids requested to be withdrawn in accordance with ITB 24.1

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shall be returned unopened to the Bidders.

- 24.3 No bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereof. This will result in the forfeiture of the Bid Security pursuant to ITB 19.6.

## 25. Bid Opening

- 25.1 Except in the cases specified in ITB 23 and 24, the Employer shall publicly open and read out in accordance with ITB 25.3 all bids received by the deadline, at the date, time and place **specified in the BDS** in the presence of Bidders' designated representatives and anyone who chooses to attend. Any specific electronic bid opening procedures required, if electronic bidding is permitted in accordance with ITB 21.1, shall be as **specified in the BDS**.

In the event of the specified date of bid opening being declared a holiday for the Employer, the bids will be opened at the appointed time and location on the next working day.

- 25.2 First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening. Next, envelopes marked "SUBSTITUTION" shall be opened and read out and exchanged with the corresponding bid being substituted, and the substituted bid shall not be opened, but returned to the Bidder. No bid substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at bid opening. Envelopes marked "MODIFICATION" shall be opened and read out with the corresponding bid. No bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at bid opening. Only envelopes that are opened and read out at bid opening shall be considered further.
- 25.3 All other envelopes shall be opened one at a time, reading out: the name of the Bidder and whether there is a modification, the total Bid Price, per lot (contract) if applicable, including any discounts and alternative bids, the presence or absence of a bid security; and any other details as the Employer may consider appropriate. Only discounts and alternatives and modifications read out at bid opening shall be considered for evaluation. The Letter of Bid and the Bill of Quantities are to be initialed by representatives of the Employer attending bid

opening in the manner **specified in the BDS**. The Employer shall neither discuss the merits of any bid nor reject any bid at bid opening (except for late bids, in accordance with ITB 23.1).

- 25.4 The Employer shall prepare a record of the bid opening that shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, substitution, or modification; the Bid Price, per contract if applicable, including any discounts and alternative bids; and the presence or absence of a bid security, 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.

## **E. Evaluation and Comparison of Bids**

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| <b>26. Confidentiality</b>       | <p>26.1 Information relating to the examination, evaluation, comparison, and post-qualification 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 Contract award is communicated to all Bidders in accordance with ITB 40.</p> <p>26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its bid.</p> <p>26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Employer on any matter related to the bidding process, it shall do so in writing.</p>   |
| <b>27. Clarification of Bids</b> | <p>27.1 To assist in the examination, evaluation, and comparison of the bids, and qualification of the Bidders, the Employer may, at its discretion, ask any Bidder for a clarification of its bid, giving a reasonable time for response. 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, including any voluntary increase or decrease in the prices or substance of the 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 31.</p> <p>27.2 If a Bidder does not provide clarifications of its bid by the date and time set in the Employer's request for clarification, its bid</p> |



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may be rejected.

**28. Deviations,  
Reservations,  
and Omissions**

- 28.1 During the evaluation of bids, the following definitions apply:
- (a) “Deviation” is a departure from the requirements specified in the Bidding Document;
  - (b) “Reservation” is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and
  - (c) “Omission” is the failure to submit part or all of the information or documentation required in the Bidding Document.

**29. Determination of  
Responsiveness**

- 29.1 The Employer’s determination of a bid’s responsiveness is to be based on the contents of the bid itself, as defined in ITB 11.
- 29.2 A substantially responsive 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.
- 29.3 The Employer shall examine the technical aspects of the bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section VII (Works’ Requirements) have been met without any material deviation, reservations or omissions.
- 29.4 If a bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation or omission.

**30. Nonconformities,  
Errors, and  
Omissions**

- 30.1 Provided that a bid is substantially responsive, the Employer may waive any non-conformities in the bid which do not constitute a material deviation, reservation or omission.
- 30.2 Provided that a 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 bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price or substance of the bid. Failure of the Bidder to comply with the request may result in the rejection of its bid.

30.3 Provided that a bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component in the manner **specified in the BDS**.

### **31. Correction of Arithmetical Errors**

31.1 Provided that the bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis:

- (a) only for unit price 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;
- (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; and
- (c) 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) and (b) above.

31.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 31.1, shall result in the rejection of the Bid and the Bid Security may be forfeited in accordance with ITB Sub-Clause 19.6.

### **32. Conversion to Single Currency**

32.1 Not used.

### **33. Margin of Preference**

33.1 Not used.

### **34. Sub-contractors**

34.1 Unless otherwise **stated in the BDS**, the Employer does not intend to execute any specific elements of the Works by sub-contractors selected in advance by the Employer.

34.2 The Employer may permit subcontracting for certain specialized works as indicated in Section III. When subcontracting is permitted by the Employer, the specialized sub-contractor's experience shall be considered for evaluation. Section III describes the qualification criteria for sub-

contractors.

- 34.3 Bidders may propose subcontracting up to the percentage of total value of contracts or the volume of works as **specified in the BDS**. Subcontractors proposed by the Bidder shall be fully qualified for their parts of the Works.

### **35. Evaluation of Bids**

- 35.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.
- 35.2 To evaluate a bid, the Employer shall consider the following:
- (a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including Daywork items, where priced competitively;
  - (b) price adjustment for correction of arithmetic errors in accordance with ITB 31.1;
  - (c) price adjustment due to discounts offered in accordance with ITB 14.4;
  - (d) Not Used,
  - (e) price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 30.3;
  - (f) the additional evaluation factors as specified in Section III, Evaluation and Qualification Criteria;
- 35.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.
- 35.4 If this Bidding Document allows Bidders to quote separate prices for different lots (contracts), and to award multiple contracts to a single Bidder, the methodology to determine the lowest evaluated price of the contract combinations, including any discounts offered in the Letter of Bid, is specified in Section III, Evaluation and Qualification Criteria.
- 35.5 If the bid, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses (with breakdown of unit rates) for any or all items of the Bill of Quantities, to demonstrate the internal consistency and justification of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into consideration the schedule of estimated contract payments, the Employer may require that the amount of the

performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

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| <b>36. Comparison of Bids</b>  | 36.1 | The Employer shall compare the evaluated prices of all substantially responsive bids established in accordance with ITB 35.2 to determine the lowest evaluated bid.   |
| <b>37. Qualification of the Bidder</b>                                       | 37.1 | The Employer shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated and substantially responsive bid meets the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.   |
|  | 37.2 | The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1. The determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the bidding document), or any other firm(s) different from the Bidder. |
|  | 37.3 | An affirmative determination of qualification shall be a prerequisite for award of the Contract to the Bidder. A negative determination shall result in disqualification of the bid, in which event the Employer shall proceed to the next lowest evaluated bid to make a similar determination of that Bidder's qualifications to perform satisfactorily.  |
| <b>38. Employer's Right to Accept Any Bid, and to Reject Any or All Bids</b> | 38.1 | 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**

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| <b>39. Award Criteria</b>        | 39.1 | Subject to ITB 37.1, the Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily. |
| <b>40. Notification of Award</b> | 40.1 | Prior to the expiration of the period of bid validity, the Employer shall notify the successful Bidder, in writing, via the Letter of Acceptance included in the Contract Forms, that its bid has been accepted. The Letter of Acceptance shall specify   |

the sum that the Employer will pay the Contractor in consideration of the execution and completion of the Works (hereinafter and in the Conditions of Contract and Contract Forms called “the Contract Price”).

40.2 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

**41. Signing of Contract, Publication of award and Recourse to unsuccessful Bidders**

41.1 The Contract Agreement shall incorporate all agreements between the Employer and the successful Bidder. It shall be kept ready in the office of the Employer for the signature of the Employer and the successful Bidder, within 21 days following the date of Letter of acceptance. Within 21 days of receipt of Letter of acceptance, the successful Bidder shall sign the Agreement and furnish the performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security in accordance with ITB Clause 42 and revised construction methodology. If the successful bidder is a JV, it shall also furnish the JV agreement duly signed by all the members, if it had submitted only a letter of intent to execute the JV agreement along with the bid.

41.2 The Employer within 3 weeks of issue of notification of award shall publish in a national website (<http://tenders.gov.in> or [GoI Central Public Procurement Portal](http://goi.gov.in) <https://eprocure.gov.in/cppp/>) or on the Employer’s website with free access, the results identifying the bid and lot numbers and the following information: (i) name of each bidder who submitted the bid; (ii) bid prices as read out at bid opening; (iii) name and evaluated prices of each bid that was evaluated; (iv) name 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.

41.3 The Employer shall promptly respond in writing to any unsuccessful Bidder who, after publication of contract award, requests the Employer in writing to explain on which grounds its bid was not selected.

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| <b>42. Performance Security</b> | <p>42.1 Within twenty-one (21) days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security in accordance with the conditions of contract, subject to ITB 35.5, using for that purpose the Performance Security and ESHS Performance Security Forms included in Section X (Contract Forms). The performance security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security of a Joint Venture shall be in the name of the Joint Venture specifying the names of all members.</p> <p>42.2 Failure of the successful Bidder to submit the above-mentioned Performance Security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security, or to sign the Contract Agreement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security. In that event the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.</p> <p>42.3 Upon the successful Bidder's signing the Agreement and furnishing of the Performance Security and if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security, pursuant to ITB Clause 42.1, the Employer shall promptly notify the name of the winning bidder to each unsuccessful bidder and shall discharge the Bid Securities of the bidders pursuant to ITB Clause 19.4 and 19.5.</p> |
| <b>43. Adjudicator</b>          | <p>43.1 The Employer proposes the person <b>named in the BDS</b> to be appointed as Adjudicator under the Contract, at the daily rate <b>specified in the BDS</b>, plus reimbursable expenses (actual boarding, lodging, travel and other incidental expenses). If the Bidder disagrees with this proposal, the Bidder should so state in Letter of Bid. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator proposed by the Bidder, the Employer will request the Appointing Authority designated in the Particular Conditions of Contract (PCC) pursuant to Clause 23.1 of the General Conditions of Contract (GCC), to appoint the Adjudicator.</p>  |

## Section II - Bid Data Sheet (BDS)

The following specific data for the Works to be procured shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITB). Whenever there is a conflict, the provisions herein shall prevail over those in ITB.

### A. Introduction

<b>ITB 1.1</b>	<p>The Employer is: The Employer is: Chief Executive Officer J&amp;K ERA/JTFRP</p> <p>ERA Complex Rambagh Srinagar                      <b>AND</b></p> <p>JKPCC Building, 2<sup>nd</sup> Floor, Rail Head Complex, Jammu-180012</p>
<b>ITB 1.1</b>	<p><b>The name of the work is:</b></p> <p><b>Upgradation of :</b></p> <p><b>1. Sangam Khudwani Road &amp;</b></p> <p><b>2. Bijbehara to Kanihama Road.</b></p> <p>The identification number of the work is: <b>Revised/Roads/Kashmir/04</b></p>
<b>ITB 2.1</b>	<p>The Borrower is Government of India.</p> <p>The Sub-Borrower is Government of J&amp;K</p> <p>The Employer is: <b>Chief Executive Officer J&amp;K ERA, ERA Complex, Rambagh Srinagar, J&amp;K.</b></p> <p><b>JTFRP, JKPCC Building, 2<sup>nd</sup> Floor, Rail Head Complex, Jammu-180012 (J&amp;K)</b></p>
<b>ITB 2.1</b>	<p>The name of the Project is: <b><i>Jhelum and Tawi Flood Recovery Project.</i></b></p> <p>Loan or Financing Agreement amount: <b><i>USD 250 Million.</i></b></p>
<b>ITB 4.1</b>	Bids from Joint ventures are acceptable.
	Maximum number of members in the JV shall be: <b><i>One lead member plus two other members</i></b>
	Place where the agreement to form JV to be registered is: anywhere in India
<b>ITB 4.4</b>	A list of debarred firms and individuals is available at the Bank's external website <a href="http://www.worldbank.org/debarr">www.worldbank.org/debarr</a> .

### B. Contents of Bidding Documents

<b>ITB 7.1</b>	For <b><u>clarification purposes</u></b> only, the Employer's address is: Attention: <i>Director Technical</i> <i>ERA Commercial Complex, Rambagh Srinagar, J&amp;K.</i> <b>JKPCC Building, 2<sup>nd</sup> Floor, Rail Head Complex, Jammu-180012 (J&amp;K)</b>
<b>ITB 7.1</b>	<a href="http://www.jtfrp.in">www.jtfrp.in</a>
<b>ITB 7.4</b>	A Pre-Bid meeting <i>shall</i> take place. If a Pre-Bid meeting will take place, it will be at the following date, time and place: <b>Date: 09-10-2019.</b> <b>Time: 11:00 am</b> <b>Place: Office of the Director Technical, PMU, ERA Commercial Complex, Rambagh Srinagar, J&amp;K.</b>

### C. Preparation of Bids

<b>ITB 11.1 (b)</b>	The following schedules shall be submitted with the bid: (a) original bid security in approved form; (b) Bid Processing Fee towards the cost of the document in approved form (c) Original affidavit regarding correctness of information furnished along with their Technical bid. (d) JV agreement in case of bid is submitted as a JV. <i>e) Legally valid Power of Attorney to demonstrate the authority of the signatory to sign the Bid. In the case of Bids submitted by an existing or intended JV, the authorization shall be evidenced by a Power of Attorney signed by legally authorized signatories of all the members.</i>
<b>ITB 11.1 (j)</b>	The Bidder shall submit with its bid the following additional documents: <b><i>[list any additional documents not already listed in ITB 11.1 that must be submitted with the Bid. The list of additional documents should include the following:]</i></b> (i) Contractor Registration certificate as per IFB, if applicable (ii) <b>Code of Conduct (ESHS)</b> The Bidder shall submit its Code of Conduct that will apply to its employees and subcontractors, to ensure compliance with its Environmental, Social, Health and Safety (ESHS) obligations under the contract. <i>[Note: Complete and include the risks to be addressed by the Code in accordance with Section VII-Works' Requirements, e.g. Risks</i>



	<p><i>associated with: labor influx, spread of communicable diseases, sexual harassment, gender based violence, sexual exploitation and abuse, illicit behavior and crime, and maintaining a safe environment etc.]</i></p> <p>In addition, the Bidder shall detail how this Code of Conduct will be implemented. This will include: how it will be introduced into conditions of employment/engagement, what training will be provided, how it will be monitored and how the Contractor proposes to deal with any breaches.</p> <p>The Contractor shall be required to implement the agreed Code of Conduct upon contract award.</p>
<b>ITB 13.1</b>	Alternative bids <b><i>shall not be</i></b> permitted.
<b>ITB 14.5</b>	The prices quoted by the Bidder <b><i>shall</i></b> not be <b><i>subject</i></b> to adjustment during the performance of the Contract.
<b>ITB 18.1</b>	The bid validity period shall be: 120 days.
<b>ITB 18.3 (a)</b>	The factor is 4 % per annum.
<b>ITB 19.1</b>	The Bidder shall furnish a bid security in the amount of <b>INR 28 lacs</b> <b><i>(Twenty Eight Lakh Indian Rupees).</i></b>
<b>ITB 19.2 (d)</b>	<p>Other types of acceptable securities are:</p> <p>Fixed Deposit/Time Deposit certificate issued by a Nationalized or Scheduled Bank located in India for equivalent or higher values are acceptable as bid security provided it is pledged in favour of <i>Chief Accounts Officer JTFRP</i>, and such pledging has been noted and suitably endorsed by the bank issuing the certificate.</p>
<b>ITB 20.1</b>	In addition to the original of the bid, the number of copies is: <b><i>two</i></b>
<b>ITB 20.2</b>	<p>The written confirmation of authorization to sign on behalf of the Bidder shall consist of:</p> <p>(a) <i>Legally valid Power of Attorney is required to demonstrate the authority of the signatory to sign the Bid; and</i></p> <p>(b) <i>In the case of Bids submitted by an existing or intended JV, if permitted as per ITB 4.1, the authorization shall be evidenced by a Power of Attorney signed by legally authorized signatories of all the members</i></p>

### D. Submission and Opening of Bids

<b>ITB 21.1 &amp; 22.1</b>	Electronic bidding is not permitted; bidders <b>shall not have</b> the option of submitting their bids electronically.
<b>ITB 22.1</b>	<p>For <b><u>bid submission purposes</u></b> only, the Employer's address is Attention: Director Technical</p> <ul style="list-style-type: none"> <li>PMU JTFRP office, ERA Commercial Complex, Rambagh Srinagar, J&amp;K.</li> </ul> <p>Country: INDIA</p> <p><b>The deadline for bid submission is:</b></p> <p><b>Date: 10-11-2019</b></p> <p><b>Time: 1630 hours</b></p> <p><b>Electronic bidding is not permitted.</b></p>
<b>ITB 25.1</b>	The bid opening shall take place at: PMU JTFRP office, ERA Commercial Complex, Rambagh Srinagar, J&K.
<b>ITB 25.1</b>	Electronic bidding is not permitted, bids <b>shall not be opened</b> electronically.

### E. Evaluation and Comparison of Bids

<b>ITB 25.3</b>	The Letter of Bid and Priced Bill of Quantities shall be initialed by representatives of the Employer conducting Bid opening: <i>Each Bid shall be numbered, any modification to the unit or total price shall be initialed by the Representative of the Employer.</i>
<b>ITB 30.3</b>	The adjustment shall be based on the highest price of the item or component as quoted in other substantially responsive Bids, subject to a maximum of the estimated price of the item. If the price of the item or component cannot be derived from the price of other substantially responsive Bids, the Employer shall use its best estimate.
<b>ITB 34.1</b>	At this time the Employer does not intend to execute certain specific parts of the Works by sub-contractors selected in advance.
<b>ITB 34.3</b>	<p>(A) After award of the Contract, the subcontracting of any part of the work, except for those subcontractors and sub consultants nominated in the Bid, shall require the prior written consent of the Client. Notwithstanding such consent, the Bidder shall remain responsible for the acts, defaults, and neglects of all subcontractors and sub consultants during Contract implementation.</p> <p>(B) Contractor's proposed subcontracting: Maximum percentage of subcontracting permitted is: <i>30% of the total contract amount</i></p>

	<p>(C) Bidders planning to subcontract more than 10% of total volume of work shall specify, in the Bid Submission Form, the activity (ies) or parts of the works to be subcontracted along with complete details of the sub-contractors and their qualification and experience. The qualification and experience of the sub-contractors must meet the minimum criteria for the relevant work to be sub-contracted failing which such sub-contractors will not be permitted to participate.</p> <p>(D) Sub-contractors' qualification and experience will not be considered for evaluation of the Bidder. The Bidder on its own (without taking into account the qualification and experience of the sub-contractor) should meet the qualification criteria.</p>
<b>ITB 42.1 and 42.2</b>	The successful Bidder shall also be required to submit performance security equal to 5% of accepted contract amount and an Environmental, Social, Health and Safety (ESHS) Performance Security equal to 1% of accepted contract amount.
<b>ITB 43.1</b>	The Adjudicator/Dispute Review Expert proposed by the Employer <b><u>shall be decided at the time of signing the Contract agreement</u></b> . The daily fee for this proposed Adjudicator/Dispute Review Expert shall be: INR 5000.

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## Section III - Evaluation and Qualification Criteria

### 1. Evaluation

After determining the lowest-evaluated bid in accordance with ITB 35.2(a) – (e), the client shall carry out the post qualification of the Bidder in accordance with ITB 37.1 – 37.3, using only the specified Qualification Criteria.

In addition to the criteria listed in ITB 35.2 (a) – (e) the following criteria shall apply:

#### 1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include:

(i) an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, material sourcing and Quality Control/Assurance in sufficient detail and fully in accordance with the requirements stipulated in Section VII (Works' Requirements).

For this purpose, the Bidder should also submit:

a detailed note outlining its proposed methodology and program of construction including compliance with the Environmental, Social, Health and Safety (ESHS) obligations under this contract, backed with equipment planning and deployment, materials and manpower planning and deployment, duly supported with broad calculations and quality control system/assurance procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.

(ii) an assessment of the details of subcontracting elements of works amounting to more than 10% of the bid price; for each element proposed to be sub contracted furnish details whether the identified Sub-contractor possesses the required qualifications and experiences to execute that element satisfactorily. [*Work should not be split into small parts and sub-contracted*].

#### 1.2 Multiple Contracts if permitted under ITB 35.4, will be evaluated as under.

If works are grouped in multiple contracts pursuant to Sub-Clause 35.4 of the Instructions to Bidders, the Employer will evaluate and compare Bids on the basis of a contract, or a combination of contracts, or as a total of contracts in order to arrive at the least cost combination for the Employer by taking into account discounts offered by Bidders in case of award of multiple contracts. If a bidder submits several successful (lowest evaluated substantially responsive) bids, the evaluation will also include an assessment of the Bidder's capacity to meet the aggregated requirements regarding:

- Experience
- Financial situation
- Current contract commitments,
- Cash flow capacity,
- Equipment to be allocated, and
- Personnel to be fielded.
  - Bid Capacity



## Qualification

Eligibility and Qualification Criteria			Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture where permitted		Submission Requirements
				All Parties Combined	Each Member	

### 2.1 Eligibility

2.1.1	<b>Nationality</b>	Nationality in accordance with ITB Sub-Clause 4.3.	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Forms ELI –1.1 and ELI-1.2 With attachments
2.1.2	<b>Conflict of Interest</b>	No conflicts of interest in ITB Sub-Clause 4.2.	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Letter of Bid
2.1.3	<b>Bank eligibility</b>	Not having been declared ineligible by the Bank, as described in ITB Sub-Clause 4.4.& 4.7.	Must meet requirement	Existing JV must meet requirement	Must meet requirement	N / A	Letter of Bid
2.1.4	<b>Government Owned Entity</b>	Applicant required to meet conditions of ITB-A Sub-Clause 4.5. The entity should not be a dependent agency of the borrower or sub-borrower or Employer.	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Forms ELI -1.1 and 1.2 with attachments
2.1.5	<b>United Nations resolution or Borrower's country law</b>	Not having been excluded as a result of prohibition in the Borrower's country laws or official regulations against commercial relations with the Bidder's country, or by an act of compliance with UN Security Council resolution, both in accordance with ITB 4.7 and Section V.	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Forms ELI -1.1 and 1.2 with attachments

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture where permitted			Submission Requirements
				All Parties Combined	Each Member	One Member	

### Historical Contract Non-Performance

2.2.1	<b>History of Non-Performing Contracts</b>	Non-performance of a contract <sup>2</sup> did not occur as a result of contractor default since 1 <sup>st</sup> January 2014.	Must meet requirement by itself or as member to past or existing JV	N / A	Must meet requirement by itself or as member to past or existing JV	N / A	Form CON - 2
2.2.2	<b>Suspension due to withdrawal of the Bid within Bid validity</b>	Not under suspension due to withdrawal of the Bid pursuant ITB 19.6.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
2.2.3	<b>Pending Litigation</b>	Bidder's financial position and prospective long term profitability sound according to criteria established in 2.3.1 below and assuming that all pending litigation will be resolved against the Bidder	Must meet requirement by itself or as member to past or existing JV	N / A	Must meet requirement by itself or as member to past or existing JV	N / A	Form CON - 2

<sup>2</sup> Non-performance, as decided by the Employer, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Non-performance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Non-performance 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.



Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture where permitted			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.2.4	Litigation History	No consistent history of court/arbitral award decisions against the Bidder <sup>3</sup> since 1 <sup>st</sup> January 2014	Must meet requirement by itself or as member to past or existing JV	Must meet requirement	Must meet requirement by itself or as member to past or existing JV	N/A	Form CON - 2
2.2.5	Declaration: Environmental, Social, Health, and Safety (ESHS) past performance	Declare any civil work contracts that have been suspended or terminated and/or performance security called by an employer for reasons related to the non-compliance of any environmental, or social, (including sexual exploitation and abuse (SEA) and gender based violence (GBV)), or health or safety requirements or regulations in the past five years <sup>4</sup> .	Must make the declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration.	N/A	Each must make the declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration.	N/A	Form CON-3 ESHS Performance Declaration

Qualification Criteria			Compliance Requirements		Documentation
No.	Subject	Requirement	Single Entity	Joint Venture where permitted	Submission Requirements

<sup>3</sup>The Bidder shall provide accurate information on the letter of Bid about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of court/arbitral awards against the Bidder or any member of a joint venture may result in disqualifying the Bidder.

				<b>All Parties Combined</b>	<b>Each Member</b>	<b>One Member</b>	
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### 2.3 Financial Situation and Performance

2.3.1	<b>Financial Capabilities</b>	<p>(a) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as <b>INR 07 Crores</b> for the subject contract(s) net of the Bidders other commitments</p> <p>(b) The Bidders shall also demonstrate, to the satisfaction of the Employer, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments</p> <p>(c) The audited balance sheets or, if not required by the laws of the Bidder's country, other financial statements acceptable to</p>	<p>(a) Must meet requirement</p> <p>(b) ) Must meet requirement</p> <p>(c) Must meet requirement</p>	<p>(a) Must meet the requirement</p> <p>(b) ) Must meet requirement</p> <p>N/A</p>	<p>(a) Must meet at least 25% of the requirement as a minimum</p> <p>N/A</p> <p>(c) Must meet requirement</p>	<p>(a) Must meet at least 50% of the requirement as a minimum</p> <p>N/A</p> <p>N/A</p>	Form FIN - 3.1 with attachments
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Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture where permitted			Submission Requirements
				All Parties Combined	Each Member	One Member	
		the Employer, for the last <i>five</i> years shall be submitted and must demonstrate the current soundness of the Bidder's financial position and indicate its prospective long-term profitability.					
2.3.2	<b>Annual Construction Turnover</b>	Achieved in at least two financial years (in the last five years) a minimum annual financial turnover <sup>5</sup> in civil engineering construction work of <b>INR 30 Crores [Thirty Crore Rupees]</b> calculated as total certified payments received for contracts in progress or completed,	Must meet requirement	Must meet requirement	Must meet twenty five percent (25%) of the requirement	Must meet fifty percent (50%) of the requirement	Form FIN - 3.2
Qualification Criteria			Compliance Requirements				Documentation
No.	Subject	Requirement	Single Entity	Joint Venture where permitted			Submission Requirements

<sup>5</sup> At price level. Financial turnover of previous years shall be given weightage @5% per year based on rupees value to bring them to the price level of the financial year in which bids are received.

				<b>All Parties Combined</b>	<b>Each Member</b>	<b>One Member</b>	
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## 2.4 Experience

<b>2.4.1</b>	<b>General Construction Experience</b>	Experience under construction contracts for similar works such as those pertaining to CONSTRUCTION OF ROADS / BRIDGES in the role of contractor, JV member, subcontractor, or management contractor for at least the last five [5] years prior to the bid submission deadline.	Must meet requirement	N/A	Must meet requirement of having executed works of similar nature	N/A	Form EXP – 4.1
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Qualification Criteria			Compliance Requirements			Documentation	
No.	Subject	Requirement	Single Entity	Joint Venture where permitted			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4.2 (a)	Specific Construction Experience	Bidder should have successfully completed as a prime contractor, JV member <sup>6</sup> , management contractor or sub-contractor, minimum One (1) civil contract substantially completed within the last five (5) years (FY2014-2015.to FY 2018-19), with a value <sup>7</sup> of at least INR 15 Crores involving Construction, Upgradation of Roads preferably Flexible Pavement.	Must meet requirement	Must meet requirement	Must meet requirement for one contract of 25% value	Must meet requirement	Form EXP 4.2(a). The contractor should have borne responsibility for execution of works to the extent he claims experience. A contractor should not claim experience for the works he has never executed.
<i>In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated</i>							

<sup>6</sup> For contracts under which the Bidder participated as a joint venture member or sub-contractor, only the Bidder's share, by value, shall be considered to meet this requirement.

<sup>7</sup> At 2018-2019 .price level. Cost of completed works of previous years shall be given weightage @5% per year based on rupees value to bring them to the price level of the financial year in which bids are received.



Qualification Criteria			Compliance Requirements			Documentation	
No.	Subject	Requirement	Single Entity	Joint Venture where permitted			Submission Requirements
				All Parties Combined	Each Member	One Member	
	requirement; - record of poor performance such as abandoning the works, not properly completion or financial failures etc. - consistent history of litigation or arbitration awards against the bidder or any member or the joint venture.						

## 2.5 Personnel

The Bidder must demonstrate that it will have the personnel for the key positions that meet the following requirements. The Contractor shall require the Employer's consent to substitute or replace the Key Personnel (reference the Particular Conditions of Contract 9.1).

S. No	Designation of Personnel (Position)	No.	Minimum Qualification with minimum experience
1.	Project Manager	1	B.E Civil +10Years Exp in construction of roads
2.	Site Engineer	2	B.E Civil +5Years Exp in construction of roads
3	Highway/Pavement Engineer	1	B.E Civil + 5 Years Exp. in construction of roads Or Dip. Civil + 10 Years Exp. in construction of roads
4	Quantity Surveyor	1	B.E Civil. + 7 Years Exp. In Quantity Surveying of Road Projects Or Dip. Civil.+ 10 Years Exp. In Quantity Surveying of Road Projects
5.	Soil & Material Engineer	1	B.E Civil. + 7 Years Exp. In relevant field Or Dip. Civil.+ 10 Years Exp. In relevant field
6.	Survey Engineer	1	B.E Civil+7 years Exp. In relevant field Or Dip. Civil + 10 years Exp. In relevant field
7	Environment, Health and Safety Expert	1	Masters Degree in Environmental Science with minimum 7 years of experience in Environmental management of multilateral funded projects.

The Bidder must not have in his employment:

- [i] A near relations (defined as first blood relations, and their spouses, of the bidder or the bidder's spouse) of persons of Jhelum Tawi Flood Recovery Project / JKERA.



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- [ii] Without Employers permission, any person who retired as gazetted officer within the last one year.

The Bidder shall provide details of the proposed personnel and their experience records in the relevant Forms included in Section IV, Bidding Forms.

## **2.6 Equipment**

The Bidder must demonstrate that it will have access to the key Contractor's equipment listed hereafter:

<b>Sr. No.</b>	<b>Type of Equipment</b>	<b>Minimum Nos. of Equipment</b>
1.	Motor Grader	02
2.	Dozer	03
3.	Front end loader	03
4.	Smooth wheeled roller (with automatic water sprayer)	02
5.	Vibratory Roller	04
6.	Hot mix plant with electronic Controls (Minimum 50-60 TPH Capacity)	01
7.	Paver Finisher with Electronic Sensor	01
8.	Tippers	06
9.	Water Tanker	04
10.	Bitumen Sprayer	02
11.	Tandem Roller	03
12.	Wet Mix Plant having suitable capacity.	01
13.	Wet Mix Paver.	03
14.	Air Compressor	06

The Bidder shall provide further details of proposed items of equipment using the relevant Form in Section IV.

## **Section IV - Bidding Forms**

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## Letter of Bid

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

*Note: All italicized text is for use in preparing these forms and shall be deleted from the final products.*

Date: \_\_\_\_\_

Invitation for Bid No.: \_\_\_\_\_

To: *(Insert 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 meet the eligibility requirements and have no conflict of interest in accordance with ITB 4;
- (c) We offer to execute in conformity with the Bidding Documents the following Works:  
\_\_\_\_\_;
- (d) The total price of our Bid, excluding any discounts offered in item (e) below is:
  - In case of only one lot, total price of the Bid *[insert the total price of the bid in words and figures];*
  - In case of multiple lots, total price of each lot *[insert the total price of each lot in words and figures];*
  - In case of multiple lots, total price of all lots (sum of all lots) *[insert the total price of all lots in words and figures];*
- (e) The discounts offered and the methodology for their application are:
  - (i) The discounts offered are: *[Specify in detail each discount offered.]*
  - (ii) The exact method of calculations to determine the net price after application of discounts is shown below: *[Specify in detail the method that shall be used to apply the discounts]* \_\_\_\_\_;
- (f) Our bid shall be valid for a period of \_\_\_\_\_ *[insert validity period as specified in ITB 18.1.]* days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

- (g) We accept the appointment of *[insert name proposed in Bid Data Sheet]* as the Adjudicator

***[or]***

We do not accept the appoint of *[insert name proposed in Bid Data Sheet]* as the Adjudicator, and propose instead that *[insert name]* be appointed<sup>8</sup> as Adjudicator, whose daily fees and biographical data are attached;

- (h) If our bid is accepted, we commit to obtain a performance security *[and an Environmental, Social, Health and Safety (ESHS) Performance Security, **Delete if not applicable**]* in accordance with the Bidding Document;
- (i) We are not participating, as a Bidder, in more than one bid in this bidding process in accordance with ITB 4.2,
- (j) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible by the Bank, under the Employer's country laws or official regulations or by an act of compliance with a decision of the United Nations Security Council (ITB 4.7);
- (k) We are not a government owned entity / We are a government owned entity but meet the requirements of ITB 4.5<sup>9</sup>;
- (l) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract:<sup>10</sup> *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount of each such commission or gratuity]*

Name of Recipient	Address	Reason	Amount

- (m) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.
- (n) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed;

<sup>8</sup> In case appointment of Adjudicator was proposed from the list provided by an Institution in ITB 43, the replacement should also be proposed from the list of same institution.

<sup>9</sup> *Use one of the two options as appropriate.*

<sup>10</sup> *If none has been paid or is to be paid, indicate "none".*

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- (o) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive; and
- (p) If awarded the contract, the person named below shall act as Contractor's Representative: \_\_\_\_\_

Name of the Bidder\* *[insert complete name of person signing the Bid]*

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 joint venture specify the name of the Joint Venture as Bidder

\*\*: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid Schedules.

\_\_\_\_\_

\_\_\_\_\_

# Bill of Quantities

## PREAMBLE TO THE BILL OF QUANTITIES

### **1.0 General**

- 1.1 The bill of quantities shall be read in conjunction with the Instruction to Bidder, General and Conditions of Contract, Specifications and Drawings.
- 1.2 The Contractor shall be deemed to have visited the site and read and examined the Bid Documents before completing the Bill of Quantities and filling the 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 bid documents.
- 1.3 The Contractor shall be deemed to be fully conversant with and to have made full allowance in his Bid 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 Bid.
- 1.4 General directions and descriptions of scope of work and materials given in the Specification or shown in 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.
- 1.5 The Bill of Quantities is an estimate of the quantities of work involved and is to be used as a basis for pricing of the Bid and for valuation of the work executed, in conjunction with instructions to Bidders, General and Condition of contract, Technical specifications and Drawings
- 1.6 The quantities shown in the Bill of Quantities are approximate only and may be subject to variation. The quantities shown should not be considered as limiting or defining the extent of work to be done and material to be supplied by the Contractor. The contractor shall ascertain the actual quantities of materials required before placing orders.
- 1.7 Quantities given in the Bill of quantities for the various items are approximate only and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work carried out, as measured by the Engineer and valued at the rates of prices quoted in the Bills of Quantities where applicable, and otherwise at such rates for prices as may be fixed within the terms of the contract. Variations in the quantities of work in the Schedule shall not vitiate the contract.
- 1.8 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. The rates for extra items of works will be as per rates decided under Contract Conditions.
- 1.9 The rates quoted in the schedule shall be 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, supervision, materials, erection, maintenance, insurance, profit, taxes and duties together with all general risks liabilities and obligations set out or implied in the Contract.
- 1.10 It is to be expressly understood that the measured work is to be taken net (not withstanding 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.

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- 1.11 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. For supply or transportation of sand etc., deduction for bulkage/voids will be done as per provisions in IS codes /CPWD specifications.
  - 1.12. The unit rate should be entered against each item in the Bill of Quantities and shall be written in figures. Any item left un-priced will be deemed to be included for elsewhere in the Bill of Quantities or the Schedule and hence the rate for that item will be taken as NIL.
  - 1.13. In case any discrepancy is found between the quoted rates and the amounts, the unit rates will be taken as correct.
  - 1.14. Provisional sums included and so designated in the BOQ shall be expended in whole or in part at the discretion and direction of the Engineer in accordance with the conditions of contract.

## **2.0 Earthworks**

- 2.1 The unit of measurement for earthworks where measured separately shall be Cubic Meters for all types of soils including hard rock.
- 2.2 The rates for excavation shall include for all plant, materials and labour required for excavation irrespective of depth 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, dewatering, any additional excavation necessary to provide working space, refilling to any over excavation with materials as required by the specification or shown on the drawings, multiple handling and stack piling materials required for filling anywhere on the site, backfilling with materials as required by the specification or shown on the drawing( including the cost of outside material) compaction. Disposal of surplus earth is included in excavation item.

## **3.0 Dewatering**

- 3.1 The rates for all items in Bill of Quantities shall be deemed to include all charges on account of dewatering, diversions, ring bund, protection bunds of any kind etc and all such hidden arrangements/items that are not listed and are necessary for execution of all BOQ items, to entire satisfaction of engineer in charge.
- 3.2 Nothing extra shall be paid on account of dewatering of any kind which the contractor has to carry out during the execution of works, the rate of dewatering of all kinds such as but not limited to, rainfall, snowfall, springs, wells, underground, sub-surface or surface water, water from broken PHE Lines, sewer lines, drains or any other utility, stagnant water of any kind , flood water, is deemed to be included

## **4.0 Approach to Work Site**

Provision for access and approach to all construction sites is the responsibility of contractor and no payment will be made on this account.

## **5.0 Safety**

The contract rates shall be deemed to include all costs of compliance with safety requirements in the Specifications. The rates for all items given in BOQ shall be deemed to include all costs on account of traffic diversions and all such hidden assessment/items which are not listed to entire satisfaction of Engineers In charge.

### **Note:**

**Following points shall be kept in view while filling up the BOQ in financial bid.**

1. *Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities*
2. *Unit rates and prices shall be quoted by the bidder in Indian Rupees*
3. *Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern as explained in*
4. *Where there is a discrepancy between the rate in figures and words, the rates in words will govern.*



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# **Bill of Quantities**

<b>Bill no:-1:Dismantling</b>						
<b>Sl. No</b>	<b>Description</b>	<b>Unit</b>	<b>Quantity</b>	<b>Rate in Figures (INR)</b>	<b>Rate in Words (INR)</b>	<b>Amount (INR)</b>
1.0	Clearing jungle including uprooting of rank vegetation, grass, brushwood, trees and saplings of girth upto 30cm measured at height of 1m above ground level and removal of rubbish upto a distance of 50m outside the periphery of the area cleared as per MoRTH clause no 201	Sqm	57577.41			
1.2	Dismantling of flexible non-bituminous pavements and disposal of dismantled materials up to a desired lead of metres, stacking serviceable and unserviceable materials separately as per MoRTH clause no 202	Cum	2678.92			
<b>Bill no:-2 : Earth work</b>						
2.0	Excavation for roadwork in soil with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead as per MoRTH clause no 301					
	Ordinary Soil	Cum	50072.62			
2.1	Removal of unserviceable soil including excavation, loading and disposal upto <b>within all lifts and lead</b> but excluding replacement by suitable soil which shall be paid separately	Cum	40065.75			
2.2	Construction of embankment with approved material obtained from borrow pits <b>with all lifts and leads</b> , transporting to site, spreading, grading to required slope and compacting to meet requirement of as per MoRTH clause 305.	Cum	1061.44			
2.3	Construction of embankment with approved materials deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table as per MoRTH clause 305.	Cum	15479.96			

2.4	Construction of earthen shoulders with approved material obtained from borrow pits <b>with all lifts &amp; leads</b> , transporting to site, spreading, grading to required slope and compacted to meet requirement of as per MoRTH clause 305					
	Rolling with vibratory roller	Cum	<b>11614.24</b>			
<b>Bill no:-3 : Pavement Work</b>						
3.1	Construction of subgrade with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of as per MoRTH clause 305	Cum	<b>44599.20</b>			
3.2	Construction of <b>granular sub-base</b> by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per MoRTH clause 401	Cum	<b>11166.06</b>			
3.3	Providing, laying, spreading and compacting graded stone aggregate to water bound macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub-base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	Cum	<b>5650.40</b>			
3.4	Providing and applying Prime coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying Prime at the rate of <b>0.7</b> kg/sqm using mechanical means as per MoRTH clause 502	Sqm	<b>58686.64</b>			
3.5	Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of <b>0.25</b> kg per sqm on the prepared bituminous/granular surface cleaned with mechanical broom as per MoRTH clause 503	Sqm	<b>117373.28</b>			

3.6	Providing and laying <b>seal coat</b> of premixed fine aggregate(passing 2.36 mm and retained on 180 micron sieve) with bitumen using 128 kg of bitumen of grade 80/100 bitumen ' .per cum of fine aggregate and 0.60 cum of fine aggregate per 100 sqm of road surface including rolling and finishing with road all complete	Sqm	58686.64			
3.7	Providing and laying 2.5 cm <b>premix carpet</b> surfacing withwith 2.25cu.m. and 1.12 cu.m of stone chippings of 13.2 mm and 11.2 size respectively per 100 sq.m. and 52kg. and 56 kg. of hot bitumen per cu.m. of stone chippings of 13.2 mm and 11.2 mm size respectively including a tack coat with hot straight run bitumen including consolidation with road roller of 6 to 9 tonne capacity etc. complete (tack coat to be paid for separately)	Sqm	58686.64			
3.8	Providing and laying <b>Bituminous Macadam</b> on prepared surface with specified graded crushed stone aggregate for profile corrective base/binder course including loading of aggregate with F. E. loader, hot mixing of stone aggregates in hot mix plant, transporting the mixed material by tippers to paver and laying the mixed material with paver finisher fitted with electronic sensing device to the required level and grade and rolling with road rollers,as per MORTH specification to achieve the desired density and compaction but excluding the cost of primer/tack coat.	Cum	2934.33			
<b>Bill no:-4:Culvert</b>						
4.1	Earthwork in excavation of foundation for structures including pipe culverts in all types of soil including lead & lifts complete as per drawings and MORT&H specifications clauses 304 & 2903.	Cum	1061.72			
4.2	Back filling behind abutments, wing walls and return walls with selelcted granular material of approved quality with all leads and lifts complete as per drg. and MORT&H specifications clauses 305 & 2907.	Cum	50.21			
4.3	Filter media behind abutments, wing walls, & return walls, including all material, labour, equipment carriage etc. all complete as per drawing and Technical Specification Clauses 305, 309 & 2504.	Cum	29.39			

4.4	Providing & Laying Plain Cement Concrete levelling course in open foundation including centering and shuttering but excluding reinforcement all complete as per drg. and MORT&H specifications sections 1500, 1700 and 2100.					
	M-15 grade	Cum	<b>44.08</b>			
4.5	Providing & Laying Reinforced Cement Concrete in open foundation including centering and shuttering but excluding reinforcement all complete as per drg. and MORT&H specifications sections 1500, 1700 and 2100.					
	M-25 grade	Cum	<b>168.84</b>			
4.6	Cement Concrete / Reinforced Cement Concrete in sub-structure including form work but excluding reinforcement complete as per drg. and MORT&H specifications sections 1500, 1700 and 2200.					
	M-25 grade	Cum	<b>138.15</b>			
4.7	Reinforced Cement Concrete in super-structure including centring and shuttering but excluding reinforcement complete as per drg. and MORT&H specifications sections 1500, 1700 and 2300.					
	M-25 grade	Cum	<b>39.38</b>			
	Foundation	MT	<b>4.05</b>			
	Sub-structure	MT	<b>4.84</b>			
	Superstructure	MT	<b>3.94</b>			
4.8	Providing & fixing Bitumen impregnated fibre board expansion joints complete as per drg. and Technical specifications	M	<b>14.00</b>			
4.9	Providing weep holes in brick masonry / plain / reinforced concrete abutment, wing walls / return wall with 100mm dia AC pipe, extending through the full width of structure with slope of IV:20H towards draining face complete as per drg. and MORT&H specifications clause 2706.	Nr.	<b>49.00</b>			
4.10	Providing, laying & jointing RCC NP4 pipe including testing complete as per drg. & MORT&H specifications section 2900.					
	1200mm dia	M	<b>87.75</b>			
4.11	Rigid apron 150mm thick flat stone embedded in 300mm thick M-15 grade concrete as per drawing and technical specification Clause 2505.	Cum	<b>271.87</b>			

4.12	Providing & laying stone boulder apron complete as per drg. & MORT&H specifications section 2500.	Cum	<b>198.72</b>			
4.13	Providing & laying filter material underneath stone boulder pitching on slopes complete as per drg. and MORT&H specifications section 2500.	Cum	<b>30.16</b>			
4.14	Providing & laying stone boulder pitching on slopes complete as per drg. and MORT&H specifications section 2500.	Cum	<b>60.32</b>			
4.15	Providing & laying stone pitching on slopes for pipe culvert complete as per drg	Cum	<b>149.27</b>			
4.16	Providing & laying selected granular material for pipe bedding as per drg. and MORT&H specifications section 2900.	Cum	<b>107.98</b>			
4.17	plain cement concrete M-20 grade for head wall of culvert including centering and shuttering complete as per drawing and technical specification section 1500, 1700, 2100 and 2200.	Cum	<b>343.07</b>			
4.18	Providing and laying 12 mm thick mastic asphalt wearing course on top of deck slab excluding prime coat with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 100 deg. C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 515.)	Sq.m.	<b>32.50</b>			
4.19	Drainage Spouts complete as per drawing and Technical specification	Nos	<b>3.00</b>			
4.20	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification	Cum	<b>5.40</b>			
4.21	Reinforced cement concrete approach slab including reinforcement and formwork complete as per drawing and Technical specification	Cum	<b>15.75</b>			
	Plain Cement Concrete	cum	<b>7.81</b>			
	Pipe	m	<b>52.00</b>			
	Brick / Stone Structures	cum	<b>65.54</b>			

<b>Bill no:-05:Drain</b>						
5.1	Earthwork in excavation of foundation for structures including all types of soil including lead & lifts complete as per drawings and MORT&H specifications clauses 304 & 2903.	cum	<b>1296.00</b>			
5.2	Providing & Laying Plain Cement Concrete M-15 levelling course in open foundation including centering and shuttering but excluding reinforcement all complete as per drg. and MORT&H specifications sections 1500, 1700 and 2100.	cum	<b>748.00</b>			
<b>Bill no:-06:Traffic Signs, Marking and Appurtenances</b>						
6.1	Retro- reflectorised Traffic signs (Providing and fixing of retro-reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing)					
( i )	90 cm equilateral triangle (Give Way)	each	<b>13.00</b>			
( ii )	60 cm equilateral triangle	each	<b>63.00</b>			
( iii )	90 cm circular(Speed Limit at sharp bend)	each	<b>24.00</b>			
( iv )	90cm x 30cm rectangular (Object hazard)	each	<b>100.00</b>			
( v )	60 cm x 45 cm rectangular (Place identification)	each	<b>22.00</b>			
(vi )	60 cm x 50 cm rectangular Chevron ( at sharp bend)	each	<b>1.00</b>			

6.2	Direction and Place Identification signs upto 0.9 sqm size board. (Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of encapsulated lens type reflective sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick with area not exceeding 0.9 sqm supported on a mild steel single angle iron post 75 x 75 x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing)	sqm	<b>2.16</b>			
6.3	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface (Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.)	sqm	<b>2813.65</b>			
6.4	Kilometre Stone (Reinforced cement concrete M15 grade kilometre stone of standard design as per IRC:8-1980, fixing in position including painting and printing etc)					
	5th kilometre stone (precast)	each	<b>1.00</b>			
	Ordinary Kilometer stone (Precast)	each	<b>12.00</b>			
	200 mt stone (Precast)	each	<b>136.00</b>			
6.5	Road Delineators (Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and confirming to IRC-79 and the drawings.)	each	<b>852.00</b>			
6.6	Boundary pillar (Reinforced cement concrete M15 grade boundary pillars of standard design as per IRC:25-1967, fixed in position including finishing and lettering but excluding painting)	each	<b>134.00</b>			



6.7	Road Markers/Road Stud with Lense Reflector (Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973)	each	1449.00			
<b>Bill no:-07:Protection work</b>						
7.1	Earthwork in excavation of foundation for structures including pipe culverts in all types of soil including lead & lifts complete as per drawings and MORT&H specifications clauses 304 & 2903.	Cum	5674.70			
7.2	Filter media behind abutments, wing walls, & return walls, including all material, labour, equipment carriage etc. all complete as per drawing and Technical Specification Clauses 305, 309 & 2504.	Cum	1158.00			
7.3	Providing & Laying Plain Cement Concrete levelling course in open foundation including centering and shuttering but excluding reinforcement all complete as per drg. and MORT&H specifications sections 1500, 1700 and 2100.	Cum	8620.98			
7.4	Weep hole provided	Nos	3723.00			
<b>Bill No 8: Environment and Social Management Plan.</b>						
8.1	<b>SITE SAFETY MEASURES:</b> Providing 2 mt. high corrugated GI sheet (min. thickness 0.63 mm) barricading fixed with GI hooks and nuts on frame made of MS pipes having diameter not less than 40 mm. Spacing of vertical pipes shall not be less than 3 m (average) and minimum two horizontal pipes shall be provided. Rate shall be inclusive of cost of providing all materials and fixing arrangements, including excavation, transportation to site, fixing, backfilling, removal of the complete barricading after construction work is over and rehabilitation of the site etc., with all incidental charges, leads, lifts and all taxes and duties as applicable and as specified by Engineer-in-charge. Material of barricading shall be the property of contractor	Rmtr	500			

	after completion the work. Barricading shall be maintained throughout the construction period. It should be installed in a manner so that one cannot crawl underneath it, should be sturdy enough to bear normal wear and tear at the construction site, should not topple off and hurt someone and should be strong enough to withstand the elements, including high wind conditions.					
8.2	Provision, installation and maintenance of cautionary/warning signage, including diversion boards as per IRC specifications (SP:55, 2014) on the main road and along the access, including cost of boards and other materials required for fixing, with all incidental charges leads, lifts and all taxes as applicable from time to time and as specified by Engineer-in-charge	No	2			
8.3	Cost towards first aid and emergency response arrangements in the camp and worksite (including fire and electrical safety provisions)	Job	1			
8.4	Cost towards periodic health check-ups once in three months for all construction workers	Job	1			
8.5	Wet type portable toilet (MS fabricated) 2 seats (1 for men and 1 for women with separate entrances), fitted with 2000 liters capacity overhead tank and 500 liters capacity bottom tank, fitted with Indian type of pot with other facilities such as tap, lighting and ventilation; and sludge tank of capacity 1000L, and stationed at a suitable place in or around 50 meters from work front. Includes cost of water, cost for emptying of bottom tank through mobile suction machine, attendant cost for looking after cleaning and operation of the toilets, all materials and labour charges, all incidental charges, leads, lifts and all taxes as applicable from time to time and as specified by Engineer-in-charge.	No	2			
8.6	Dry type portable toilet (MS fabricated) (bio digester) of approved design with 2 seats (one for men and one for women). Includes cost of water, cost for emptying of bottom tank through mobile suction machine, attendant cost for looking after cleaning and operation of the toilets, all materials and labour charges, all incidental charges, leads, lifts and all taxes as applicable from time to time and as specified by Engineer-in-charge.	No	2			
8.7	Providing of mobile drinking water counter/kiosk, fabricated from stainless steel with 300 liters capacity, with two taps and with bottom tank (300 litre holding capacity) to collect waste water and stationed at a suitable place within operational area, with one common attendant for both mobile toilet and drinking water kiosk. Cost includes charges for emptying bottom tank through suction machine, shifting cost of the kiosk from one operational area to another area, attendant cost for looking after cleaning and operation, all materials and all labour charges, all incidental charges, leads, lifts and all taxes	No	2			

	as applicable from time to time and as specified by Engineer-in-charge					
8.8	<b>OTHER ENVIRONMENT, HEALTH AND SAFETY MEASURES:</b> Information dissemination about type and schedule of civil works, utility shifting/damage/emergency repairs, complaint handling and all such issues that affect public/near-by residents Road users close to the work zone. Dissemination modes to include display of banners/notices, distribution of handbills, organization of meetings and other appropriate means at least once in a month for the entire project duration.	Months	9			
8.9	Provision of Project Information Board in sheet steel and all supports, including fixing and maintenance during the entire project. Minimum board size should be 3 meters x 2 meters, with necessary information in English and local language written in black paint with white back ground. The board details and the required information will be furnished by the Engineer. The complete design, including logo and information to be displayed shall be approved by the Engineer	No	2			
8.10	Cost of environmental monitoring (air, water and noise) during entire construction period in line with parameters and frequency specified in the EMP. Ambient Air Quality- 15000/Sample , Water Sample - 8000/ Sample Ambient Noise Level- 3000/sample (Sampling can be done only during day hours because of security reasons ((12 Hourly Ambient Air Quality Monitoring for PM2.5 PM10,SO2, Nox and CO) - Noise Levels (dB) for Day and Night, Water Monitoring -Parameters specified in EMP).(Once in Quarter (AAQ) , Once in an Month (AAN) , As Specified in EMP (Water Monitoring)	Job	1			
8.11	Construction of silt traps at the discharge points of channels into to fresh water bodies across the project road as per the Standard Details provided.	Rmt	500			
8.12	Providing of red fluorescent with white reflective sleeve traffic cone made of low density polyethylene(LDPE) material with a square base of 390x390x35mm and a height of 770mm, 4Kg in weight, placed at 1.5m interval, all as per BS 873 including cost of all materials, labour, loading, unloading, lead, lift, transporting etc complete Technical Specification section & IRC SP 55-2001.	No	20			
8.13	Providing Caution Tapes of High quality PVC tape tube type to Enclose construction area as per Technical Specification or as directed by the Engineer.	Rmt	1000			
	<b>Total Bid Cost in Figures (INR)</b> <b>A</b>					
	<b>Total Bid Cost in Words (INR)</b>					

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	<b>Provisional Sum B</b>					1,00,00,000
	<b>Total Cost including provisional sum (A+B)</b>					

**Note:**

1. *The rates quoted by the bidder for each item should be inclusive of all kinds of carriage (mechanical / head load) ,for all leads and lifts. Nothing extra will be paid on account of these items.*
2. *A Provisional Sum of INR 1 Crore is reserved for the miscellaneous works not included in the BOQ. The bidder shall not quote for the Provisional Sum in BOQ . Any expense out of the Provisional Sum shall be towards the cost of Shifting Utilities and other unforeseen items not covered in the BoQ, subject to prior approval of the project manager both in terms of quantity and scope of work.*
3. *Item for which no rate or price has been entered in will not be paid for by the Employer when executed and shall be deemed to be free of cost and covered by the other rates and prices in the Bill of Quantities*
4. *Unit rates and prices shall be quoted by the bidder in Indian Rupees*
5. *Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by quantity, the unit rate quoted shall govern.*
6. *Where there is a discrepancy between the rate in figures and words, the rates in words will govern.*

## Form of Bid Security - Bank Guarantee

*[Guarantor letterhead or SWIFT identifier code]*

Bid Guarantee No.....*[insert guarantee reference number]*

Date.....*[insert date of issue of the guarantee]*

WHEREAS, \_\_\_\_\_ *[name of Bidder]*<sup>11</sup> (hereinafter called "the Bidder") has submitted his Bid dated \_\_\_\_\_ *[date]* or will submit his Bid for the construction of \_\_\_\_\_ *[name of Contract]* (hereinafter called "the Bid") under Invitations for Bids No.....*[insert number]* (hereinafter called "the IFB")

KNOW ALL PEOPLE by these presents that We \_\_\_\_\_ *[name of bank]* of \_\_\_\_\_ *[name of country]* having our registered office at \_\_\_\_\_ (hereinafter called "the Bank") are bound unto \_\_\_\_\_ *[name of Employer]* (hereinafter called "the Employer") in the sum of \_\_\_\_\_<sup>12</sup> for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

THE CONDITIONS of this obligation are:

- (1) If after Bid opening the Bidder (a) withdraws his bid during the period of Bid validity specified in the Letter of Bid; or (b) does not accept the correction of the Bid Price pursuant to ITB 31;

or

- (2) If the Bidder having been notified of the acceptance of his bid by the Employer during the period of Bid validity:
  - (a) fails or refuses to execute the Contract Agreement in accordance with the Instructions to Bidders, if required; or
  - (b) fails or refuses to furnish the Performance Security, and if required, the Environmental, Social, Health and Safety (ESHS) Performance Security, in accordance with the Instruction to Bidders.

<sup>11</sup> Insert name of the Bidder, which in the case of a joint venture shall be (a) the name of the joint venture that submits the bid if the JV has been constituted into a legally enforceable JV, or (b) the names of all future members of the JV as named in the letter of intent to execute the JV Agreement submitted by the bidder along with its bid.

<sup>12</sup> The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 19.1 of the Instructions to Bidders.

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we undertake to pay to the Employer upto the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the four conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force upto and including the date \_\_\_\_\_<sup>13</sup> days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE \_\_\_\_\_ SIGNATURE \_\_\_\_\_ OF \_\_\_\_\_ THE \_\_\_\_\_ BANK  
\_\_\_\_\_

WITNESS \_\_\_\_\_ SEAL \_\_\_\_\_

\_\_\_\_\_  
[signature, name, and address]

***Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.***

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<sup>13</sup> 45 days after the end of the validity period of the Bid.

# **Technical Proposal**

## **Technical Proposal Forms**

- **Site Organization**
- **Method Statement**
- **Mobilization Schedule**
- **Construction Schedule**
- **Environmental, Social, Health, and Safety Management (ESHS) Strategies and Implementation Plans**
- **Code of Conduct (ESHS)**
- **Equipment**
- **Personnel**
- **Sub-contracting elements or works which in aggregate adds to more than 10% of Bid price (*for each the qualifications and experiences on the identified subcontractor in the relevant field should be given.*)**
- ***Note: Work should not be split into small parts and sub-contracted; but sub-contracting specialized elements of works is acceptable.***
- **Others**



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## **Technical Proposal – Site Organization**

*[Insert Site Organization information]*

## **Technical Proposal – Method Statement**

*[insert method Statement – A detailed note should be submitted outlining bidders proposed methodology and program of construction including Environmental, Social, Health and Safety Management Strategies and Implementation Plans (ESHS-MSIP), backed with equipment, materials and manpower planning and deployment, duly supported with broad calculations and quality control system/assurance procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated review of completion as per mile stones]*

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## **Technical Proposal – Mobilization Schedule**

*[Insert Mobilization Schedule]*

## **Technical Proposal – Construction Schedule**

*[Insert Construction Schedule]*

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## **Technical Proposal – Sub Contracting**

*[Insert proposal of sub-contracting elements of works amounting to more than 10% of the bid price for each element and indicate the name of the sub-contractor, its qualifications and experiences to execute that element satisfactorily]*

## **ESHS Management Strategies and Implementation Plans**

### **(ESHS-MSIP)**

The Bidder shall submit comprehensive and concise Environmental, Social, Health and Safety Management Strategies and Implementation Plans (ESHS-MSIP) as required by ITB 11.1 (j) of the Bid Data Sheet. These strategies and plans shall describe in detail the actions, materials, equipment, management processes etc. that will be implemented by the Contractor, and its subcontractors.

In developing these strategies and plans, the Bidder shall have regard to the ESHS provisions of the contract including those as may be more fully described in the Works Requirements described in Section VII.

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## **Code of Conduct: Environmental, Social, Health and Safety (ESHS)**

The Bidder shall submit the Code of Conduct that will apply to the Contractor's employees and subcontractors as required by ITB 11.1 (j) of the Bid Data Sheet. The Code of Conduct shall ensure compliance with the ESHS provisions of the contract, including those as may be more fully described in the Works Requirements described in Section VII.

In addition, the Bidder shall submit an outline of how this Code of Conduct will be implemented. This will include: how it will be introduced into conditions of employment/engagement, what training will be provided, how it will be monitored and how the Contractor proposes to deal with any breaches.

## Forms for Personnel

### Form PER – 1: Proposed Personnel

Bidders should provide the names of suitably qualified personnel to meet the specified requirements for each of the positions listed in Section III (Evaluation and Qualification Criteria). The data on their experience should be supplied using the Form below for each candidate.

S. No.	Position	Name	Qualification	Years of Experience	Years of Experience in proposed position			
					Road works	Building* works	Others*	Total
	[Environmental Specialist#]							
	[Health and Safety Specialist#]							
	[Social Specialist#]							

(\* Modify this as appropriate to suit the works for which bids are invited,  
# As listed in Section III)



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## Form PER – 2: Resume of Proposed Personnel

The Bidder shall provide all the information requested below. Fields with asterisk (\*) shall be used for evaluation.

<b>Position*</b>		
<b>Personnel information</b>	<b>Name *</b>	<b>Date of birth</b>
	<b>Professional qualifications</b>	
<b>Present employment</b>	<b>Name of Employer</b>	
	<b>Address of Employer</b>	
	<b>Telephone</b>	<b>Contact (manager / personnel officer)</b>
	<b>Fax</b>	<b>E-mail</b>
	<b>Job title</b>	<b>Years with present Employer</b>

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

<b>From*</b>	<b>To*</b>	<b>Company, Project, Position, and Relevant Technical and Management Experience*</b>

### Declaration

I, the undersigned Key Personnel, certify that to the best of my knowledge and belief, the information contained in this Form PER-2 correctly describes myself, my qualifications and my experience.

I confirm that I am available as certified in the following table and throughout the expected time schedule for this position as provided in the Bid:

<b>Commitment</b>	<b>Details</b>
<b>Commitment to duration of contract:</b>	<i>[insert period (start and end dates) for which this Key Personnel is available to work on this contract]</i>
<b>Time commitment:</b>	<i>[insert the number of days/week/months/ that this Key Personnel will be engaged]</i>

I understand that any misrepresentation or omission in this Form may:

- (a) be taken into consideration during Bid evaluation;
- (b) my disqualification from participating in the Bid;
- (c) my dismissal from the contract.

**Name of Key Personnel:** *[insert name]*

Signature: \_\_\_\_\_

Date: (day month year): \_\_\_\_\_

**Countersignature of authorized representative of the Bidder:**

Signature: \_\_\_\_\_

Date: (day month year): \_\_\_\_\_

The bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III (Evaluation and Qualification Criteria). The Bidder shall provide all the information requested below.

[illegible]

## Form SC-Sub Contracting

### SCHEDULE OF SUBCONTRACTORS

Item	Element of work	Approximate value of sub-contract	% of bid price	Name and address of sub-contractor	Qualification and experience of sub-contractor on similar works of the elements executed

**The Bidder shall enter in this schedule a list of the major sections and appropriate value of the work for which he proposes to use subcontractors *[for those costing more than 10% of the bid price for each element]*, together with the names, addresses and experiences of the proposed subcontractors.**

**The capability of the sub-contractor will also be assessed (on the same lines as for the main Contractor) before according approval to him.**

***(Work should not be split into small parts and sub-contracted; but, sub-contracting specialized elements of works is acceptable).***

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## **Bidder's Qualification**

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

## **Form-ELI -1.1: Bidder Information Form**

Date: *[insert day, month, year]*

NCB No. and title: *[insert NCB number and title]*

Page *[insert page number]* of *[insert total number]* pages

<b>1.1 Bidder Information</b>			
Bidder's legal name			
In case of JV, legal name of each member			
Bidder's country of constitution			
Bidder's year of constitution			
Bidder's legal address in country of constitution			
Bidder's authorized representative  (name, address, telephone numbers, fax numbers, e-mail address)			
<p>Attached are copies of the following original documents.</p> <ol style="list-style-type: none"> <li>1. In case of single entity, articles of incorporation or constitution of the legal entity names above, in accordance with ITB 4.1 and 4.3.</li> <li>2. Authorization to represent the firm or JV named in above, in accordance with ITB 20.2.</li> <li>3. In case of JV, letter of intent to form JV or JV agreement: in accordance with ITB 4.1 read with BDS</li> <li>4. In case of government-owned entity, documents establishing legal and financial authority and compliance with the principles of commercial law in accordance with ITB 4.5 read with Sub-clause 2.1.4 of Qualification Criteria.</li> <li>5. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.</li> </ol>			

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## **Form-ELI -1.2: JV Information Form**

(Where permitted as per BDS ITB 4.1)

*Each member of a JV must fill in this form*

Date: *[insert day, month, year]*

NCB No. and title: *[insert NCB number and title]*

Page *[insert page number]* of *[insert total number]* pages

<b>JV/Specialist Subcontractor Information</b>			
Bidder's legal name			
JV Member's legal name			
JV Member's country of constitution			
JV Member's year of constitution			
JV Member's legal address in country of constitution			
JV Member's authorized representative information (name, address, telephone numbers, fax numbers, e-mail address)			
Attached are copies of the following original documents.  <ol style="list-style-type: none"><li>1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 read with BDS.</li><li>2. Authorization to represent the firm names above, in accordance with ITB 20.2.</li><li>3. In the case of government-owned entity, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB Sub-Clause 4.5 read with Sub-Clause 2.1.4 of Qualification Criteria.</li><li>4. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.</li></ol>			

**Form ELI -1.2 A****Specialized Subcontractor's Information Form**  
**(to be completed for each Specialized Subcontractor)**Date: *[insert day, month, year]*NCB No. and title: *[insert NCB number and title]*Page *[insert page number]* of *[insert total number]* pages

Bidder's legal name:

Specialized Subcontractor's legal name:
Specialized Subcontractor's country of registration:
Specialized Subcontractor's year of constitution:
Specialized Subcontractor's legal address in country of constitution:
Specialized Subcontractor's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
Attached are copies of original documents of <input type="checkbox"/> Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITB 4.4. <input type="checkbox"/> Authorization to represent the Specialized Subcontractor.



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**DETAILS OF PARTICIPATION IN THE JOINT VENTURE**

<b>PARTICIPATION DETAILS</b>	<b>FIRM 'A' (Lead Member)</b>	<b>FIRM 'B'</b>	<b>FIRM 'C'</b>
Financial			
Name of the Banker(s)			
Planning			
Construction Equipment			
Key Personnel			
Execution of Work (Give details on proposed contribution of each)			

The Joint Venture should indicate the details of participation as above.

## Form CON – 2

### Historical Contract Non-Performance, Pending Litigation and Litigation History

*[The following table shall be filled in for the Bidder and for each member of a Joint Venture]*

*Bidder's Name: [insert full name] Date: [insert day, month, year]*

*Joint Venture Party Name: [insert full name]*

*NCB No. and title: [insert NCB number and title]*

*Page [insert page number] of [insert total number] pages*

Non-Performed Contracts in accordance with Section III, Qualification Criteria and Requirements			
<input type="checkbox"/> Contract non-performance did not occur during the ( <i>number</i> ) years specified in Section III, Qualification Criteria and Requirements, Sub-Factor 2.2.1.			
<input type="checkbox"/> Contract(s) not performed during the ( <i>number</i> ) of years specified in Section III, Qualification Criteria and Requirements, requirement 2.2.1			
Year	Non-performed portion of contract	Contract Identification	Total Contract Amount (in Indian Rupees)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for non-performance: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
Pending Litigation, in accordance with Section III, Qualification Criteria and Requirements			
<input type="checkbox"/> No pending litigation in accordance with Section III, Qualification Criteria and Requirements, Sub-Factor 2.2.3.			
<input type="checkbox"/> Pending litigation in accordance with Section III, Qualification Criteria and Requirements, Sub-Factor 2.2.3 as indicated below.			

Year of dispute	Amount in dispute (Rupees)	Contract Identification	Total Contract Amount (Rupees)
<i>[insert year]</i>	<i>[insert amount]</i>	Contract Identification: <i>[indicate complete contract name, number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate "Employer" or "Contractor"]</i>  Status of dispute: <i>[Indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]</i>	<i>[insert amount]</i>
Litigation History in accordance with Section III, Evaluation and Qualification Criteria			
<input type="checkbox"/> No litigation history in accordance with Section III, Qualification Criteria and Requirements, Sub-Factor 2.2.4. <input type="checkbox"/> Litigation history in accordance with Section III, Qualification Criteria and Requirements, Sub-Factor 2.2.4 as indicated below.			
Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (Rupees)
<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate "Employer" or "Contractor"]</i> Reason(s) for Litigation and award decision <i>[indicate main reason(s)]</i> Status of dispute: <i>[Indicate if it is being treated by the Adjudicator, under Arbitration or being dealt with by the Judiciary]</i>	<i>[insert amount]</i>

## Form CON – 3: Environmental, Social, Health, and Safety Performance Declaration

*[The following table shall be filled in for the Bidder, each member of a Joint Venture and each Specialized Subcontractor]*

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Joint Venture Member's or Specialized Subcontractor's Name: \_\_\_\_\_

NCB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

<b>Environmental, Social, Health, and Safety Performance Declaration</b> in accordance with Section III, Qualification Criteria, and Requirements			
<input type="checkbox"/> <b>No suspension or termination of contract:</b> An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental, Social, Health, or Safety (ESHS) performance since the date specified in Section III, Qualification Criteria, and Requirements, Sub-Factor 2.2.5.			
<input type="checkbox"/> <b>Declaration of suspension or termination of contract:</b> The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental, Social, Health, or Safety (ESHS) performance since the date specified in Section III, Qualification Criteria, and Requirements, Sub-Factor 2.2.5. Details are described below:			
Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (Rs.)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate main reason(s) e.g. for GBV/ SEA breaches]</i>	<i>[insert amount]</i>
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate</i>	<i>[insert amount]</i>

		<i>main reason(s)</i>	
...	...	<i>[list all applicable contracts]</i>	...
<b>Performance Security called by an employer(s) for reasons related to ESHS performance</b>			
Year	Contract Identification		Total Contract Amount (Rs.)
<i>[insert year]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for calling of performance security: <i>[indicate main reason(s) e.g. for GBV/ SEA breaches]</i>		<i>[insert amount]</i>

## Financial Situation

### FORMAT 3.1 Historical Financial Performances

Bidder's Legal Name: \_\_\_\_\_ Date: \_\_\_\_\_  
 JV Member Legal Name: \_\_\_\_\_ Bidding No.: \_\_\_\_\_  
 Page \_\_\_\_\_ of \_\_\_\_\_ pages

To be completed by the Bidder and by each member of a Joint Venture

<b>SUMMARY OF FINANCIAL STATEMENTS</b>								
<b>Name of bidder/JV Member:</b>								
<b>(Equivalent Rs. Million)</b>								
	S. No.	Financial Information in Rupee equivalent with exchange rate at the end of concerned year	Actuals for Previous five years excluding the current financial year					Ref. of Page Nos. of Balance Sheets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1.	Total Assets						
	2.	Total Turnover						
	3.	Current Assets						
	4.	Current Assets + Loan & Advances						
	5.	Total Liabilities						
	6.	Current Liabilities						
	7.	Current liabilities & provision						
	8.	Profit before Interest and Tax						
	9.	Profit before Tax						
	10.	Profit after Tax						
	11.	Shareholder's Funds (Net Worth)=(Paid up equity +Reserves)-(revaluation reserves + Miscellaneous expenditure not written off) Depreciation						
	12.	Current Ration (2)/(5)						
	13.	Net cash accruals= Profit after Tax + depreciation						
	14.							

This information should be extracted from the Annual Financial Statements/ Balance sheets, which should be enclosed. Year 1 will be the latest year for which audited financial statements are available. Year 2 shall be the year immediately preceding year 1 and year 3 shall be the year immediately preceding Year 2.

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## 2. Financial documents

The Bidder and its parties shall provide copies of the balance sheets and/or financial statements for *[number]* years pursuant Section III, Qualifications Criteria and Requirements, Sub-factor 2.3.1.

The financial statements shall:

- (a) reflect the financial situation of the *Bidder* or member to a JV, and not sister or parent companies.
- 1. (b) be audited by a certified Chartered Accountant.
- 2. (c) be complete, including all notes to the financial statements.
- (d) Correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).
- ☐ Attached are copies of financial statements (balance sheets, including all related notes, and income statements) for the *[number]* years required above; and complying with the requirements (If the most recent set of financial statements is for a period earlier than 12 months from the date of bid, the reason for this should be justified)
- ☐ Attached is a copy of certificate given from the commercial bank assuring cash flow (working capital for contraction) in the format attached.

## FORM FIN – 3.1(A)

### FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CASH FLOW

[To be given from a Nationalized or Scheduled Bank in India]

#### Clause 2.3.1(b) of Section II – Qualification Criteria

#### (1) AVAILABILITY OF CASH FLOW (WORKING CAPITAL)

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

If the contract for the works, namely \_\_\_\_\_ [funded by the World Bank] is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. \_\_\_\_\_ to meet their capital requirements for executing the above contract.

-- Sd. --

Name of Bank Manager

Senior Bank Manager

Address of the Bank

**\* Change the text as follows for Joint venture:**

*This is to certify that M/s. .... who has formed a JV 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 ..... [funded by the World Bank] is awarded to the above Joint Venture, we shall be able to provide overdraft/credit facilities to the extent of Rs. .... to meet the working capital requirements for executing the above contract.*

*[This should be given by the JV members in proportion to their financial participation.]*



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## Form FIN - 3.2

### Annual Construction Turnover

*[The following table shall be filled in for the Bidder and for each member of a Joint Venture]*

*Bidder's/Joint Venture Member's Legal Name: [insert full name]*

*Date: [insert day, month, year]*

*JV Party Legal Name: [insert full name]*

*NCB No. and title: [insert NCB number and title]*

*Page [insert page number] of [insert total number] pages*

Annual turnover data (construction only)*		
Year	Amount in Rupees	
<i>[indicate year]</i>	<i>[insert amount]</i>	

\* *Annual construction turnover calculated as total certified payments received for work in progress or completed, for 5 years. Specified in Section III, Qualification Criteria and Requirements, Sub-Factor 2.3.2. This should be certified by a Chartered Accountant.*

## JOINT VENTURE

<b>Names of all members of a joint venture</b>
<b>1. Member in charge</b>
<b>2. Member</b>
<b>3. Member</b>

**Total value of annual construction turnover, in terms of work billed to clients, in Rupees**

Annual Turnover Data (construction only; in Rupees *)							
Member	Form 2 page no.	Year 1	Year 2	Year 3	Year 4	Year 5	Average
<b>1. Member in charge</b>							
<b>2. Member</b>							
<b>3. Member</b>							
<b>TOTALS</b>							

**\* To be certified by a chartered accountant**

### 1. Name and address of Bankers to the Joint Venture

Provide details regarding financial responsibility and participation (percentage share in the total) of each firm in the Joint Venture. Attach a Memorandum of Understanding for the Proposed Agreement of joint Venture which should lay down responsibility regarding work and financial arrangements in respect of each of the firm in the Joint Venture (Refer also ITB Clause 4.1).

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## Form EXP - 4.1

### General Construction Experience

*[The following table shall be filled in for the Bidder and for each member of a Joint Venture]*

*Bidder's/Joint Venture Member's Legal Name: [insert full name]*

*Date: [insert day, month, year]*

*JV Party Legal Name: [insert full name]*

*NCB No. and title: [insert NCB number]*

*Page [insert page number] of [insert total number] pages*

*[Identify contracts that demonstrate continuous construction work over the past [5] years pursuant to Section III, Qualification Criteria and Requirements, Sub-Factor 2.4.1. List contracts chronologically, according to their commencement (starting) dates.]*

Starting Month / Year	Ending Month / Year	Contract Identification	Role of Bidder
<i>[indicate month/year ]</i>	<i>[indicate month/year]</i>	Contract name: <i>[insert full name]</i> Brief Description of the Works performed by the Bidder: <i>[describe works performed briefly]</i> Amount of contract: <i>[insert amount in Rupees]</i> Name of Employer: <i>[indicate full name]</i> Address: <i>[indicate street/number/town or city/country]</i>	<i>[insert "Contractor" or "Subcontractor" or "Contract Manager"]</i>
		Contract name: <i>[insert full name]</i> Brief Description of the Works performed by the Bidder: <i>[describe works performed briefly]</i> Amount of contract: <i>[insert amount in Rupees]</i> Name of Employer: <i>[indicate full name]</i> Address: <i>[indicate street/number/town or city/country]</i>	<i>[insert "Contractor" or "Subcontractor" or "Contract Manager"]</i>
		Contract name: <i>[insert full name]</i> Brief Description of the Works performed by the Bidder: <i>[describe works performed briefly]</i> Amount of contract: <i>[insert amount in Rupees]</i> Name of Employer: <i>[indicate full name]</i> Address: <i>[indicate street/number/town or city/country]</i>	<i>[insert "Contractor" or "Subcontractor" or "Contract Manager"]</i>

## Form EXP - 4.2(a)

### Similar Construction Experience

*[The following table shall be filled in for contracts performed by the Bidder, each member of a Joint Venture, and specialist sub-contractors]*

*Bidder's/Joint Venture Member's Legal Name: [insert full name]*

*Date: [insert day, month, year]*

*JV Party Name: [insert full name]*

*NCB No. and title: [insert NCB number and title]*

*Page [insert page number] of [insert total number] pages*

**(A) Work performed as prime Contractor or Sub-Contractor or Management Contractor** *(in the same name and style)* on construction works of a similar nature and volume over the last five years<sup>14</sup>. *[Attach certificate from the Engineer-in-charge.]*

Project Name	Name of Employer	Description of work	Contract No.	Value of contract	Date of Issue of Work Order	Stipulated Date of Completion	Actual Date of Completion	Remarks explaining reasons for Delay, if any

<sup>14</sup> Immediately preceding the financial year in which bids are received.

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## Form EXP - 4.2(b)

### Construction Experience in Key Activities

Bidder's/ Joint Venture Member's Legal Name: *[insert full name]* Date: *[insert day, month, year]*

*JV Party Name: [insert full name]*

Nominated Sub-contractor's Legal Name<sup>15</sup>

*NCB No. and title: [insert NCB number and title]*

*Page [insert page number] of [insert total number] pages*

**(B) Quantities of work executed as prime contractor or Sub-Contractor** (in the same name and style) in the last five years:<sup>16</sup>

Year	Name of the Work	Name of the Employer *	Quantity of Work performed (cum) @				Remarks * (indicate contract agreement Ref for each year)
			Cement Concrete	Masonry	Earth Work	Piling	
20...20...							
20...20...							
20...20...							
20...20...							
20...20...							

**@ the items or work for which date is requested should tally with that specified in Qualification Criteria**

**\* Attach certificates from Engineer in-charge**

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<sup>15</sup> If applicable

<sup>16</sup> Immediately preceding the financial year in which bids are received.

### Form for Current Contract Commitments/Works in Progress

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

(A) Existing commitments and on-going works:

Description of Work	Place & State	Contract No. & Date	Name and Address of Employer	Value of Contract (Rs. equivalent in million)	Stipulated period of completion	Value of works <sup>17</sup> remaining to be completed (Rs. equivalent in million)	Anticipated date of completion	Average Monthly Invoicing Over Last Six Months (Rs./month) Equivalent in millions)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

<sup>17</sup> Attach certificate(s) from the Engineer(s)-in-Charge.

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(B) Works for which bids already submitted and likely to be awarded – expected additional commitment.

Description of Work	Place & State	Name and Address of Employer	Estimated value of Works (Rs. equivalent in million)	Stipulated period of completion	Date when decision is expected	Remarks, if any
(1)	(2)	(3)	(4)	(5)	(6)	(7)

## **Section V - Eligible Countries**

### **Eligibility for the Provision of Goods, Works and Services in Bank-Financed Procurement**

1. In reference to ITB 4.7, and 5.1, for the information of the Bidders, at the present time firms, goods and services from the following countries are excluded from this bidding process:

Under ITB 4.7 (a) and 5.1 : *None*

Under ITB 4.7 (b) and 5.1 : *None*



## Section VI. Bank Policy - Corrupt and Fraudulent Practices

(Section VI shall not be modified)

### Guidelines for Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, dated January 2011:

#### “Fraud and Corruption:

1.16 It is the Bank’s policy to require that Borrowers (including beneficiaries of Bank loans), bidders, suppliers, contractors and their agents (whether declared or not), sub-contractors, sub-consultants, service providers or suppliers, and any personnel thereof, observe the highest standard of ethics during the procurement and execution of Bank-financed contracts.<sup>18</sup> In pursuance of this policy, the Bank:

- (a) defines, for the purposes of this provision, the terms set forth below as follows:
  - (i) “corrupt practice” is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;<sup>19</sup>
  - (ii) “fraudulent practice” is 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;<sup>20</sup>
  - (iii) “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;<sup>21</sup>
  - (iv) “coercive practice” is 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;<sup>22</sup>
  - (v) “obstructive practice” is
    - (aa) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or
    - (bb) acts intended to materially impede the exercise of the Bank’s inspection and audit rights provided for under paragraph 1.16(e) below.

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<sup>18</sup>In this context, any action to influence the procurement process or contract execution for undue advantage is improper.

<sup>19</sup> For the purpose of this sub-paragraph, “*another party*” refers to a public official acting in relation to the procurement process or contract execution. In this context, “*public official*” includes World Bank staff and employees of other organizations taking or reviewing procurement decisions.

<sup>20</sup> For the purpose of this sub-paragraph, “*party*” refers to a public official; the terms “benefit” and “obligation” relate to the procurement process or contract execution; and the “act or omission” is intended to influence the procurement process or contract execution.

<sup>21</sup> For the purpose of this sub-paragraph, “*parties*” refers to participants in the procurement process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish bid prices at artificial, non-competitive levels, or are privy to each other’s bid prices or other conditions.

<sup>22</sup> For the purpose of this sub-paragraph, “*party*” refers to a participant in the procurement process or contract execution.

- (b) will reject a proposal for award if it determines that the bidder recommended for award, or any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
- (c) will declare misprocurement and cancel the portion of the loan allocated to a contract if it determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement or the implementation of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- (d) will sanction a firm or individual, at any time, in accordance with the prevailing Bank's sanctions procedures,<sup>23</sup> including by publicly declaring such firm or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Bank-financed contract; and (ii) to be a nominated<sup>24</sup>;
- (e) will require that a clause be included in bidding documents and in contracts financed by a Bank loan, requiring bidders, suppliers and contractors, and their sub-contractors, agents, personnel, consultants, service providers, or suppliers, to permit the Bank to inspect all accounts, records, and other documents relating to the submission of bids and contract performance, and to have them audited by auditors appointed by the Bank."

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<sup>23</sup> A firm or individual may be declared ineligible to be awarded a Bank financed contract upon: (i) completion of the Bank's sanctions proceedings as per its sanctions procedures, including, inter alia, cross-debarment as agreed with other International Financial Institutions, including Multilateral Development Banks, and through the application the World Bank Group corporate administrative procurement sanctions procedures for fraud and corruption; and (ii) as a result of temporary suspension or early temporary suspension in connection with an ongoing sanctions proceeding. See footnote 14 and paragraph 8 of Appendix 1 of these Guidelines.

<sup>24</sup> A nominated sub-contractor, consultant, manufacturer or supplier, or service provider (different names are used depending on the particular bidding document) is one which has either been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

## **PART 2 – Works Requirements**

### **Section VII – Works’ Requirements**

## Specifications

### 1.1 Project Road Description

#### 1. Bijbehara Kanihama Road:

Road starts from old NH and ends on Karihama NH. Categorically, it is a Single lane rural road passing on mostly Plain & Rolling terrain, having moderate intensity of commercial vehicles. After 3+600 km it is passing through rolling terrain. From 4+000 Km, project road follows earthen foot track. Apart from that, there is small link road having length 1.053 Km, take off from 1.510 Km of Main Road, move towards south direction and give connectivity to Bijbehara. Project Roads also give connectivity to Hayar, Waghama, Hassain Pora Tavela villages having population more than 1000.. Average existing carriageway width is 2.5 m which is also lesser than a Single lane road (3 m). In that case widening is required and due to constraint of ROW, we propose concentric widening. Based on the traffic study during preparation of DPR lane configuration has been finalized. Embankment Height of the road is zero as most of the stretches are passing through built up zones. The road has no history about regular submergence. Existing BT surface is mostly dilapidated; moreover from pavement composition study it has been found that thicknesses of Base & Sub-base are less than the design thickness. As a result, New Construction proposed for the entire stretch. CC drain required at built up locations and from 8.2 km to 10 km where road is passing through Orchard Garden.

#### 2. Sangam Khudwani Road :

Categorically, it is a single lane VR falling under plain terrain, having low to low intensity of commercial vehicles. Project road starts from NH-44 and ends on Sophia-Gulmarg-Wanpoh-Anantanag MDR. Length of the Road 11.481 Km, but project stretch restricted up to Km 4.750 (near crossing of Irrigation Canal) as rest of the stretch i.e from Km 4.750 to Km 11.481 to be develop under PMGSY Scheme. From Km 0.000 to Km 4.750, Project Road passing through open area. An Irrigation canal goes parallel on LHS of the road from Km 2.030 to Km.3.000. Existing Pavement consists of GSB, WBM. Premix Carpet has been used as BT Surface where overlay executed time to time. Embankment Height of the road is negligible. Average existing carriageway width is 2.70 m which is also lesser than a Single lane road (3 m). In that case Reconstruction is required and due to constraint of ROW, carriageway propose for 3.75 m only with Granular Hard Shoulder on either side of the project road. There is no subsequent history found about regular submergence as Anantanag district is located on upstream side of River Jheelam. For the betterment, embankment height required to raise

upto 1.5 m from OGL but due to location villages on both side along the road create difficulties and villagers have different and opposite opinions in this regard. However, embankment may raise upto 600 mm at different stretches. Road is passing along the river Bishow at different stretches and necessary protection work required at those locations. Existing BT surface is fully dilapidated, Reconstruction proposed in addition with provision of replacement of poor Pipe culverts.

#### **Specification and Standards**

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### **MoRTH clause no 201, CLEARING AND Dismantling**

#### **201.1 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 loads and lifts. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.

#### **201.2 Preservation of Property/Amenities**

Roadside trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all road facilities within or adjacent to the highway which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own cost, suitable safeguards approved by the Engineer for this purpose. 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.

#### **201.3 Methods, Tools and Equipment**

Only such methods, tools and equipment as are approved by the Engineer and which will not *affect* any property to be preserved shall be adopted for the Work. If the area has thick vegetation/roots/trees, a crawler or pneumatic tyred dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc., falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the bottom of the subgrade. Also, all vegetation such as roots, under-growth, grass and other deleterious matter unsuitable for incorporation in the embankment subgrade shall be removed between fill lines to the satisfaction of the Engineer. All branches of trees extending above the roadway shall be trimmed as directed by the Engineer. All excavations below the general

ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding area. Ant-hills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several metres, shall be suitably treated.

#### **201.4 Disposal of Materials**

All materials arising from clearing and grubbing operations shall be taken over and shall be disposed of by the Contractor at suitable disposal sites with all loads and lifts. The disposal shall be in accordance with local, State and Central regulations

#### **201.5 Measurements for Payment**

Clearing and grubbing for road embankment, drains and cross-drainage structures shall be measured on area basis in terms of hectares. Cutting of trees upto 300 mm in girth and removal of their stumps, including removal of stumps upto 300 mm in girth left over after trees have been cut by any other agency, and trimming of branches of trees extending above the roadway and backfilling to the required compaction shall be considered incidental to the clearing and grubbing operations. Clearing and grubbing of borrow areas shall be deemed to be a part of works preparatory to embankment construction and shall be deemed to have

been included in the rates quoted for the embankment construction item and no separate payment shall be made for the same.

Ground levels shall be taken prior to and after clearing and grubbing. Levels taken prior to clearing and grubbing shall be the base level and will be accordingly used for assessing the depth of clearing and grubbing and computation of quantity of any unsuitable material which is required to be removed. The levels taken subsequent to clearing and grubbing shall be the base level for computation of earthwork for embankment. Cutting of trees, excluding removal of stumps and roots of trees of girth above 300 mm shall be measured in terms of number according to the girth sizes given below :- i) Above 300 mm to 600 mm

ii) Above 600 mm to 900 mm

iii) Above 900 mm to 1800 mm

iv) Above 1800 mm

For the purpose of cutting of trees and removal of roots and stumps, the girth shall be measured at a height of 1 m above ground or at the top of the stump if the height of the stump is less than one metre from the ground.

#### **201.6 Rates**

**201.6.1** The Contract unit rates for the various items of clearing and grubbing shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work. These will also include removal of stumps of trees less than 300 mm girth excavation and backfilling to required density, where necessary, and handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads. Clearing and grubbing done in excess of 150 mm by the Contractor shall be made good by the Contractor at his own cost as per Clause 301.3.3 to the satisfaction of the Engineer prior to taking up earthwork. Where clearing and grubbing is to be done to a level beyond 150 mm, due to site considerations, as directed by the Engineer, the extra quantity shall be measured and paid separately.

**201.6.2** The Contract unit rate for cutting trees of girth above 300 mm shall include

handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads.

**201.6.3** The Contract unit rate for removal of stumps and roots of trees girth above 300 mm shall include excavation and backfilling with suitable material to required compaction, handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads.

**201.6.4** The Contract unit rate is deemed to include credit towards value of usable materials, salvage value of unusable materials and off-set price of cut trees and stumps belonging to the Forest Department. The off-set price of cut trees and stumps belonging to the Forest Department shall be deducted from the amount due to the Contractor and deposited with the State Forest Department. In case the cut trees and stumps are required to be deposited with the Forest Department the Contractor shall do so and no deduction towards the off-set price shall be effected. The offset price shall be as per guidelines / estimates of the State Forest Department.

**201.6.5** Where a Contract does not include separate items of clearing and grubbing, the same shall be considered incidental to the earthwork items and the Contract unit prices for the same shall be considered as including clearing and grubbing operations.

## **MoRTH clause no 202, DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/PAVEMENTS**

This work shall consist of dismantling and removing existing culverts, bridges, pavements, kerbs and other structures like guard-rails, fences, utility services, manholes, catch basins, inlets, etc., from the right of way which in the opinion of the Engineer interfere with the construction of road or are not suitable to remain in place, disposing of the surplus/unsuitable materials and backfilling to after the required compaction as directed by the Engineer. Existing culverts, bridges, pavements and other structures which are within the highway and which are designated for removal, shall be removed upto the limit and extent specified in the drawings or as indicated by the Engineer. 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.

**202.3 Dismantling Pavements and Other Structures,** In removing pavements, kerbs, gutters, and other structures like guard-rails, fences, manholes, catch basins, inlets, etc., where portions of the existing construction are to be left in the finished work, the same shall be removed to an existing joint or cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and connections with the new work as directed by the Engineer.

All concrete pavements, base courses in carriageway and shoulders etc., designated for removal shall be broken to pieces whose volume shall not exceed 0.02 cu.m and used with the approval of the Engineer or disposed of.

### **202.6 Measurements for Payment**

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

- i) Dismantling brick/stone masonry/ cu.m concrete (plain and reinforced)

- ii) Dismantling flexible and cement cU.m concrete pavement
- iii) Dismantling steel structures tonne
- iv) Dismantling timber structures cU.m
- v) Dismantling pipes, guard rails, kerbs, linear mgutters and fencing
- vi) Utility services No.

### **202.7 Rates**

The Contract unit rates for the various items of dismantling shall be paid in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads.

## **301. EXCAVATION FOR ROADWAY AND DRAINS**

**301.1 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.

### **301.2 Classification of Excavated Material**

Classification: All materials involved in excavation shall be classified by the Engineer in the following manner:

#### **a) Soil :**

This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, blackcotton soil, soft shale or loose moorum, a mixture of these and similar material which yields to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging equipment. Removal of gravel or any other modular material having dimension in anyone direction not exceeding 75 mm shall be deemed to be covered under this category.

#### **b) Ordinary Rock (not requiring blasting) This shall include:**

i) rock types such as laterites, shales and conglomerates, varieties of limestone and sandstone etc., which may be quarried or split with crow bars, also including any rock which in dry state may be hard, requiring blasting but which, when wet, becomes soft and manageable by means other than blasting;

ii) macadam surfaces such as water bound and bitumen bound; soling of roads, cement concrete pavement, cobble stone, etc. compacted moorum or stabilized soil requiring use of pick axe or shovel or both.

iii) lime concrete, stone masonry and brick work in lime/cement mortar below ground level, reinforced cement concrete which may be broken up with crow bars or picks and stone masonry in cement mortar below ground level; and

iv) boulders which do not require blasting found lying loose on the surface or embedded in river bed, soil, talus, slope wash and terrace material of dissimilar origin

#### **c) Hard Rock (requiring blasting)**

This shall comprise:

i) any rock or cement concrete for the excavation of which the use of mechanical plant and/or blasting is required,



ii) reinforced cement concrete below ground level and in bridge ROB/RUB/flyover piers and abutments,

iii) boulders requiring blasting.

d) Hard Rock (using controlled blasting) :

Hard rock requiring blasting as described under (c) but where controlled blasting is to be carried out in locations where built-up area, huts, and are situated at within 200 m of the blast site.

e) Hard Rock (blasting prohibited)

Hard rock requiring blasting as described under (d) but where blasting is prohibited for any reason like people living within 20 m of blast sites etc. and excavation has to be carried out by chiselling, wedging or any other agreed method.

f) Marshy soil

This shall include soils like soft clays and peats excavated below the original ground level of marshes and swamps and soils excavated from other areas requiring continuous pumping or bailing out of water.

**301.2.1 Classification:** All materials involved in excavation shall be classified by the Engineer in the following manner:

**a) Soil :**

This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, black cotton soil, soft shale or loose moorum, a mixture of these and similar material which yields to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging equipment. Removal of gravel or any other modular material having dimension in any one direction not exceeding 75 mm shall be deemed to be covered under this category.

**Authority for Classification**

The classification of excavation shall be decided by the Engineer and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer.

### **301.3 Construction Operations**

#### **301.3.1 Setting Out**

After the site has been cleared as per Clause 201, the limits of excavation shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer. Clause 109 shall be applicable for the setting out operations.

#### **301.3.2 Stripping and Storing Topsoil**

When so directed by the Engineer, the topsoil existing over the sites of excavation shall be stripped to specified depths and stockpiled at designated locations for re-use in covering embankment slopes, cut slopes, berms and other disturbed areas where re-vegetation is desired in accordance with Clause 305.3.3. Prior to stripping the topsoil, all trees, shrubs etc. shall be removed along with their roots, with approval of the Engineer.

#### **301.3.3 Excavation-General**

All excavations shall be carried out in conformity with the directions laid here-in-under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available from excavation are satisfactorily utilized as deemed fit or as approved by the Engineer.

While planning or executing excavations, the Contractor shall take all adequate precautions against soil erosion, water pollution etc. as per Clause 306, and take appropriate drainage

measures to keep the site free of water in accordance with Clause 311.

The excavations shall conform to the lines, grades, side slopes and levels shown on the drawings or as directed by the Engineer. The Contractor shall not excavate outside the limits of excavation. Subject to the permitted tolerances, any excess depth/width excavated beyond the specified levels/dimensions on the drawings shall be made good at the cost of the Contractor with suitable material of characteristics similar to that removed and compacted to the requirements of Clause 305.

All debris and loose material on the slopes of cuttings shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in cut slopes, these shall be excavated to approved depth on instructions of the Engineer and the resulting cavities filled with suitable material and thoroughly compacted in an appropriate manner.

After excavation, the sides of excavated area shall be trimmed and the area contoured to minimize erosion and ponding, allowing for natural drainage to take place.

#### **301.3.4 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 the commencement of work.

#### **301.3.8 Excavation for Surface/Sub-Surface Drains**

Where the Contract provides for construction of surface/sub-surface drains, the same shall be done as per Clause 309. Excavation for these drains shall be carried out in proper sequence with other works as approved by the Engineer.

#### **301.3.9 Slides**

If slips, slides, over-breaks or subsidence occur in cuttings during the process of construction, they shall be removed at the cost of the Contractor as ordered by the Engineer. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or give rise to recurrent slides after construction. If finished slopes slide into the roadway subsequently, such slides shall be removed and paid for at the Contract rate for the class of excavation involved, provided the slides are not due to any negligence on the part of the Contractor. The classification of the debris material from the slips, slides etc. shall conform to its condition at the time of removal and payment made accordingly regardless of its condition earlier.

#### **301.3.10 Dewatering**

If water is met with in the excavations due to springs, seepage, rain or other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry whenever so required or directed by the Engineer. Care shall be taken to discharge the drained water into suitable outlets 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 to the original condition at his own cost or compensate for the damage.

#### **301.3.11 Use and Disposal of Excavated Materials**

All the excavated materials shall either be reused with the approval of the Engineer or disposed off with all loads and lifts as directed by the Engineer.

#### **301.3.12 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 due 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.

#### **301.4 Plying of Construction Traffic**

Construction traffic shall not use the cut formation and finished subgrade without the prior permission of the Engineer. Any damage arising out of such use shall be made good by the Contractor at his own cost.

#### **301.5 Preservation of Property**

The Contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing roadside trees, drains, sewers, sub-surface drains, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which, in the opinion of the Engineer, shall be continued in use without any change. Safety measures taken by the Contractor in this respect, shall be got approved from the Engineer. However, if any, of these objects is damaged by reason of the Contractor's negligence, it shall be replaced or restored to the original condition at his cost. If the Contractor fails to do so, within the required time as directed by the Engineer or if, in the opinion of the Engineer, the actions initiated by the Contractor to replace/restore the damaged objects are not satisfactory, the Engineer shall arrange the replacement/restoration directly through any other agency at the risk and cost of the Contractor after issuing prior notice to the effect.

#### **301.6 Preparation of Cut Formation**

The cut formation, which serves as a sub-grade, shall be prepared to receive the sub-base/base course as directed by the Engineer.

Where the material in the subgrade has a density less than specified in Table 300-1, the same shall be loosened to a depth of 500 mm and compacted in layers in accordance with the requirements of Clause 305 adding fresh material, if any required, to maintain the formation level as shown on the drawings. Any unsuitable material encountered in the subgrade level shall be removed as directed by the Engineer, replaced with suitable material and compacted in accordance with Clause 305.

In rocky formations, the surface irregularities shall be corrected and the levels brought up to the specified elevation with granular base material as directed by the Engineer, laid and compacted in accordance with the respective Specifications for these materials. The unsuitable material shall be disposed of in accordance with Clause 301.3.11. After satisfying the density requirements, the cut formation shall be prepared to receive the sub-base/base course in accordance with Clauses 310 and 311.

#### **301.7 Finishing Operations**

Finishing operations shall include the work of properly shaping and dressing all excavated surfaces.

When completed, no point on the slopes shall vary from the designated slopes by more than 150 mm measured at right angles to the slope, except where excavation is in rock (ordinary

or hard) where no point shall vary more than 300 mm from the designated slope. In no case shall any portion of the slope encroach on the roadway.

The finished cut formation shall satisfy the surface tolerances described in Clause 902.

Where directed, the topsoil removed and conserved (Clauses 301.3.2 and 305.3.3) shall be spread over cut slopes, shoulders and other disturbed areas. Slopes may be roughened and moistened slightly, prior to the application of topsoil, in order to provide satisfactory bond. The depth of topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 100 mm.

### **301.8 Measurements for Payment**

Excavation for roadway shall be measured by taking cross-sections at suitable intervals before the excavation starts (after clearing and grubbing/stripping etc. as the case may be) and after its completion and computing the volumes in cu.m by the method of average end areas for each class of material encountered. Where it is not feasible to compute volumes by this method because of erratic location of isolated deposits, the volumes shall be computed by other accepted methods.

At the option of the Engineer, the Contractor shall leave depth indicators during excavations of such shape and size and in such positions as directed so as to indicate the original ground level as accurately as possible. The Contractor shall see that these remain intact till the final measurements are taken.

For rock excavation, the overburden shall be removed first so that necessary cross-sections could be taken for measurement. Where cross-sectional measurements could not be taken due to irregular configuration or where the rock is admixed with other classes of materials, the volumes shall be computed on the basis of measurement of stacks of excavated rubble allowing a deduction of 35% therefrom. When volume is calculated on the basis of measurement of stacks of the excavated material other than rock, a deduction of 16% of stacked volume shall be allowed.

Works involved in the preparation of cut formation shall be measured in units indicated below:

- i) Loosening and recompacting the loosened material at subgrade .... cu.m
- ii) Loosening and removal of unsuitable material and replacing with suitable ... cu.m material and compacting to required density
- iii) Preparing rocky subgrade ... sq.m
- iv) Stripping including storing and reapplication of topsoil ... cu.m

### **301.9 Rates**

**301.9.1** The Contract unit rates for the items of roadway and drain excavation shall be payment in full for carrying out the operations required for the individual items including full compensation for:

- i) setting out;
- ii) transporting the excavated materials for use or disposal with all leads and lifts by giving suitable credit towards the cost of re-usable material and salvage value of unusable material;
- iii) trimming bottoms and slopes of excavation;
- iv) dewatering;
- v) keeping the work free of water as per Clause 311;
- vi) arranging disposal sites; and

vii) all labour, materials, tools, equipment., safety measures, testing and incidentals necessary to complete the work to Specifications.

Where presplitting of rock is prescribed it shall be governed by Clause 303.5.

**301.9.2** The Contract unit rate for loosening and recompacting the loosened materials at subgrade shall include full compensation for loosening to the specified depth, including breaking clods, spreading in layers, watering where necessary and compacting to the requirements.

**301.9.3** Clauses 301.9.1 and 305.8 shall apply as regards Contract unit rate for item of removal of unsuitable material and replacement with suitable material respectively.

**301.9.4** The Contract unit rate for item of preparing rocky sub-grade as per Clause **301.6** shall be full compensation for providing, laying and compacting granular base material for correcting surface irregularities including all materials, labour and incidentals necessary to complete the work and all leads and lifts.

Earthwork, Erosion Control and Drainage Section 300

**301.9.5** The Contract unit rate for the items of stripping and storing topsoil and of reapplication of topsoil shall include full compensation for all the necessary operations including all lifts and leads.

## **304 EXCAVATION FOR STRUCTURES**

### **304.1 Scope**

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.

### **304.2 Classification of Excavation**

All materials involved in excavation shall be classified in accordance with Clause **301.2**.

### **304.3 Construction Operations**

#### **304.3.1 Setting Out**

After the site has been cleared according to Clause 201, the limits of excavation shall be set out true to lines, curves and slopes to Clause 301.3.1.

#### **304.3.2 Excavation**

Excavation shall be taken to the width of the lowest step of the footing including additional width as required for construction operation. The sides shall be left plumb where the nature of soil allows it. Where the nature of soil or the depth of the trench and season of the year do not permit vertical sides, the Contractor at his own cost shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of personnel and works and to the satisfaction of the Engineer.

The depth to which the excavation is to be carried out shall be as shown on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer. Propping shall be undertaken when any foundation or stressed zone from an adjoining structure is within a line of 1 vertical to 2 horizontal from the bottom of the excavation.

Where blasting is to be resorted-to, the same shall be carried out in accordance with Clause 302 and all precautions indicated therein observed. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as controlled blasting, providing rubber mat cover to prevent flying of debris etc. shall be taken to prevent any damage.

#### **304.3.3 Dewatering and Protection**

Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures such as bailing, pumping, constructing diversion channels, drainage channels, bunds, depression of water level by well-point system, cofferdams and other necessary works to keep the foundation trenches dry when so required and to protect the green concrete/ masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and other details thereof shall be left to the choice of the Contractor but subject to the approval of the Engineer. Approval of the Engineer shall, however, not relieve the Contractor of the responsibility for the adequacy of dewatering and protection arrangements for the quality and safety of the works.

Where cofferdams are required, these shall be carried to adequate depths and heights, be safely designed and constructed and be made as watertight as is necessary for facilitating construction to be carried out inside them. The interior dimensions of the cofferdams shall be such as to give sufficient clearance for the construction and inspection and to permit installation of pumping equipments, etc., inside the enclosed area.

If it is determined beforehand that the foundations cannot be laid dry or the situation is found that the percolation is too heavy for keeping the foundation dry, the foundation concrete shall be laid under water by tremie pipe only. In case of flowing water or artesian springs, the flow shall be stopped or reduced as far as possible at the time of placing the concrete.

Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete and for a period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a watertight wall or other similar means.

At the discretion of the Contractor, cement grouting or other approved methods may be used to prevent or reduce seepage and to protect the excavation area.

The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.

#### **304.3.4 Preparation of Foundation**

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 at the cost of the Contractor. Ordinary filling shall not be permitted to bring the foundation to the design level as shown in the drawing.

When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level or stepped as directed by the Engineer. All seams shall be cleaned out and filled with cement mortar or grout to the satisfaction of the

Engineer. In the case of excavation in rock, annular space around footing shall be filled with lean concrete M 15 upto the top level of rock.

If the depth of fill required is more than 1.5 m in soft rock or 0.6 m in hard rock above the foundation level, the filling upto this level shall be done with M-15 concrete and portion above shall be filled by concrete or by boulders grouted with cement.

When foundation piles are used, the excavation for pile cap shall be done after driving/casting of all piles forming the group. After pile driving operations in a given pit are completed, all loose and displaced materials therein shall be removed to the level of the bottom of the pile cap.

#### **304.3.5 Slips and Slip-Outs**

If there are any slips or slip-outs in the excavation, these shall be removed by the Contractor at his own cost.

#### **304.3.6 Public Safety**

Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, 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.

#### **304.3.7 Backfilling**

Backfilling shall be done with approved material after concrete or masonry is fully set and carried out in such a way as not to cause undue thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface in layers not exceeding 150 mm compacted thickness. The compaction shall be done with the help of suitable equipment such as trench compactor, mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve the maximum dry density.

#### **304.3.8 Disposal of Surplus Excavated Materials**

Clause 301.3.11 shall apply.

#### **304.4 Measurements for Payment**

Excavation for structures shall be measured in cu.m for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer. Excavation over increased width, cutting of slopes, production/support to the existing structures shoring, shuttering and planking shall be deemed as incidental to the main work and shall not be measured and paid separately.

Preparation of rock foundation shall be measured in square metres.

#### **304.5 Rates**

**304.5.1** The Contract unit rate for the items of excavation for structures shall be payment in full for carrying out the required operations including full compensation for:

- i) setting out;
- ii) transporting the excavated materials for use or disposal with all leads and lifts;
- iii) construction of necessary cofferdams, cribs/sheeting, shoring and bracing and their subsequent removal;
- iv) removal of all logs, stumps, grubs and other deleterious matter and obstructions, for placing the foundations including trimming of bottoms of excavations;
- v) foundation sealing, dewatering including pumping when no separate provision for it is made in the Contract;

- vi) backfilling, clearing up the site and disposal of all surplus material with all leads and lifts or as otherwise specified; and
- vii) all labour, materials, tools, equipment, safety measures, diversion of traffic and incidentals necessary to complete the work to Specifications.

**304.5.2** The Contract unit rate for preparation of rock foundation shall be full compensation for cutting, trimming and cleaning the foundation surface and filling/sealing of all seams with cement grout or mortar including all materials, labour and incidentals required for completing the work.

### **MoRTH clause 305. EMABANKMENT CONSTRUCTION**

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.

#### **Physical Requirements**

**305.2.1.1** 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 O1, 01, 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.

**305.2.1.2** Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 percent when tested as per IS:2720 - Part 40) shall not be used as a fill material. Where an expansive clay having "free swelling index" *value* less than 50 percent is used as a fill material, subgrade and top 500 mm portion of the embankment just below sub-grade shall be non-expansive in nature.

#### **63 Section 300 Earthwork, Erosion Control and Drainage**

**305.2.1.3** Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as S03) per litre when tested in accordance with BS:1377, Part 3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm distance (or any other distance described in the Contract), of permanent works constructed out of concrete, cement bound materials or other cementitious material. Materials with a total sulphate content (expressed as S03) exceeding 0.5 percent by mass, when tested in accordance with BS:1377, Part 3 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.



**305.2.1.4** The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when placed in the embankment and 50 mm when placed in the sub-grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle size in such cases, however, shall not be more than two-thirds of the compacted layer thickness.

**305.2.1.6** The material to be used in subgrade shall conform to the design CBR value at the specified dry density and moisture content of the test specimen. In case the available material fails to meet the requirement of CBR, use of stabilization methods in accordance with Clauses 403 and 404 or by any stabilization method approved by the Engineer or by the IRC Accreditation Committee shall be followed.

**305.2.1.7** The material to be used in high embankment construction shall satisfy the specified requirements of strength parameters.

#### **305.2.2.2 Borrow Materials**

The arrangement for the source of supply of the material for embankment and sub-grade and compliance with the guidelines, and 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. Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not

exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width of a minimum of 10m. 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. 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 siting of temporary buildings or structures.

To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points, to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure. Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out

Earthwork, Erosion Control and Drainage Section 300 independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless

permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and sub-grade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer. The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS:2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC:78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2504 unless otherwise specified in the Contract. Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

### **305.7 Sub-grade Strength**

**305.7.1** It shall be ensured prior to actual execution that the material to be used in the sub-grade satisfies the requirements of design CBR.

**305.7.2** Sub-grade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed subgrade shall be determined on remoulded samples, compacted to the field density at the field moisture content and tested for soaked/unsoaked condition as specified in the Contract.

### **305.8 Measurements for Payment**

**305.8.1** Earth embankment/sub-grade construction shall be measured separately by taking cross sections at intervals given in Sub-Section 113.3 after completion of clearing and grubbing and after completion of embankment/sub-grade. The volume of earthwork shall be computed in cubic metres by the method of average end areas.

**305.8.2** The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net quantities of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cU.m of suitable material brought to site from road and drainage excavation forms one cU.m of compacted fill and all bulking or shrinkage shall be ignored.

**305.8.3** The embankment constructed with fly ash will be measured in cU.m, separately for the fly ash portions and for the soil cover and intervening layers of soil, unless otherwise specified in the Contract.

**305.8.4** Construction of embankment under water shall be measured in cU.m.

**305.8.5** Construction of high embankment with specified material and in specified manner shall be measured in cU.m.

**305.8.6** in cU.m.

Stripping including storing and reapplication of top soil shall be measured

**305.8.7** Work involving loosening and recompacting of ground supporting embankment/sub-grade shall be measured in cU.m.

**305.8.8** Removal of unsuitable material at embankment/sub-grade foundation and replacement with suitable material shall be measured in cU.m.

**305.8.9** Scarifying existing granular/bituminous road surface shall be measured in square metres.

**305.8.10** Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.

305.8.11 Filter medium and backfill material behind abutments, wing walls and other retaining structures shall be measured as finished work in position in cU.m.

### **305.9 Rates**

**305.9.1** The Contract unit rates for the items of embankment and sub-grade construction shall be payment in full for carrying out the required operations including full compensation for:

- i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract; ii) Setting out; iii) Compacting ground supporting embankment/sub-grade except where removal and replacement of suitable material or loosening and recompacting is involved; iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and sub-grade as applicable; v) Cost of watering or drying of material in borrow areas and/or embankment and sub-grade during construction as required; vi) Spreading in layers, bringing to appropriate moisture and compacting to Specification requirements; vii) Shaping and dressing top and slopes of the embankment and subgrade including rounding of corners; viii) Restricted working at sites of structures; ix) Working on narrow width of embankment and sub-grade; x) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and sub-grade site with all leads and lifts unless otherwise provided for in the Contract; xi) All labour, materials, tools, equipment and incidentals necessary to complete the work to the Specifications; xii) Dewatering; and
- xiii) Keeping the embankment/completed formation free of water as per Clause 311.
- xiv) Transporting unsuitable excavated material for disposal with all leads and lifts.

**305.9.2** Clause 301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil including reapplication of topsoil.

**305.9.3** Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompacting the embankment/sub-grade foundation.

**305.9.4** Clauses 309.1.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material, respectively.

**305.9.5** The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals, necessary to complete the work. This will also comprise of handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

**305.9.6** Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.

**305.9.7** The Contract unit rate for providing and laying filter material shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

**305.9.8** The Contract unit rate for providing and compacting backfill material behind abutments and retaining walls shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

**305.9.9** Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.

**305.9.10** Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer.

## **306 SOIL EROSION AND SEDIMENTATION CONTROL**

### **306.1 Description**

This work shall consist of measures as shown on drawings or as directed by the Engineer to control soil erosion, sedimentation and water pollution, through use of berms, dikes, sediment basins, fibre mats, mulches, grasses, slope drains, and other devices.

### **306.2 Materials**

All materials shall meet commercial grade standards and shall be approved by the Engineer before being used in the work

### **306.3 Construction Operations**

Prior to the start of the relevant construction, the Contractor shall submit to the Engineer for approval his schedules for carrying out temporary and permanent erosion/sedimentation control works as are applicable for the items of clearing and grubbing, roadway and drainage excavation, embankment/sub-grade construction, bridges and other structures across water courses, pavement courses and shoulders. He shall also submit for approval his proposed method of erosion/sedimentation control on service road and borrow pits and his plan for disposal of waste materials. Work shall not be started until the erosion/sedimentation control schedules and methods of operations for the applicable construction have been approved by the Engineer.

The surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations shall be limited to the extent practicable. The Contractor shall provide immediate permanent or temporary erosion, slope protection and sedimentation control measures to prevent soil erosion and sedimentation that will adversely affect construction operations, damage adjacent properties, or cause contamination of nearby streams or other water courses, lakes, reservoirs etc. Such work may involve the construction of temporary berms, dikes, sediment basins, slope drains and use of temporary mulches, fabrics, mats seeding, or other control devices or methods as necessary to control erosion and sedimentation. Cut and fill slopes shall be seeded and turfed as shown on the drawings.

The Contractor shall be required to incorporate all permanent erosion and sedimentation control features into the project at the earliest practicable time as outlined in his accepted schedule to minimize the need for temporary erosion and sedimentation control measures.

Temporary erosion/sedimentation and pollution control measures shall be used to control the phenomenon of erosion, sedimentation and pollution that may develop during normal construction practices, but may neither be foreseen during design stage nor associated with permanent control features on the Project.

Where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion or

sedimentation control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion or sedimentation control measures may be required between successive construction stages. Under no conditions shall a large surface area of erodible earth material be exposed at one time by clearing and grubbing or excavation without prior approval of the Engineer.

The Engineer may limit the area of excavation, borrow and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding and other such permanent erosion, sedimentation and pollution control measures, in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion/sedimentation control measures shall be taken immediately to the extent feasible and justified.

In the event temporary erosion, sedimentation and pollution control measures become necessary due to the Contractor's negligence, carelessness or failure to install permanent controls as a part of the work as scheduled or ordered by the Engineer, these shall be carried out at the Contractor's own cost. Temporary erosion, sedimentation and pollution control work required, which is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, will be performed as ordered by the Engineer.

Temporary erosion, sedimentation and pollution control may include construction work outside the right-of-way where such work is necessary as a result of road construction such as borrow pit operations, service roads and equipment storage sites.

The temporary erosion, sedimentation and pollution control features installed by the Contractor shall be acceptably maintained by him till these are needed, unless otherwise agreed by the Engineer.

#### **306.4 Measurement for Payment**

The soil erosion, sedimentation and pollution control works shall be measured in terms of units specified in the Bill of Quantities for the respective items.

#### **306.5 Rates**

The Contract unit rate for different items of soil erosion, sedimentation and pollution control works shall be payment in full for carrying out all required operations including full compensation for all labour, materials, tools, equipment and incidentals to complete the works to the Specifications.

### **307 TURFING WITH SODS**

#### **307.1 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.

#### **307.2 Materials**

The sod shall consist of dense, well-rooted growth of permanent and desirable grasses, indigenous to the locality where it is to be used, and shall be practically free from weeds or other undesirable matter. At the time the sod is cut, the grass on the sod shall have a length of approximately 50 mm and the sod shall have been freed of debris.

Thickness of the sod shall be as uniform as possible, with some 50-80 mm or so of soil covering the grass roots depending on the nature of the sod, so that practically all the dense

root system of the grasses is retained in the sod strip. The sods shall be cut in rectangular strips of uniform width, not less than about 250 mm x 300 mm in size but not so large that it is inconvenient to handle and transport these without damage. During wet weather, the sod shall be allowed to dry sufficiently to prevent tearing during handling and during dry weather shall be watered before lifting to ensure its vitality and prevent the dropping of the soil in handling.

### **307.3 Construction Operations**

#### **307.3.1 Preparation of the Earth Bed**

The area to be sodded shall have been previously constructed to the required slope and cross-section. Soil on the area shall be loosened, freed of all stones larger than 50 mm size, sticks, stumps and any undesirable foreign matter, and brought to a reasonably fine granular texture to a depth of not less than 25 mm for receiving the sod.

Where required, topsoil shall be spread over the slopes. Prior to placing the topsoil, the slopes shall be scarified to a depth which, after settlement, will provide the required nominal depth shown on the drawings. Spreading shall not be done when the ground is excessively wet.

Following soil preparation and topsoiling, where required, fertilizer and ground limestone when specified shall be spread uniformly at the rate indicated on the drawings. After spreading, the materials shall be incorporated in the soil by using disc harrow or other means to the depths shown on the drawings.

#### **307.3.2 Placing the Sods**

The prepared sod bed shall be moistened to the loosened depth, if not already sufficiently moist, and the sod shall be placed thereon within approximately 24 hours after the same had been cut. Each sod strip shall be laid edge to edge and such that the joints caused by abutting ends are staggered. Every strip, after it is snugly placed against the strips already in position, shall be lightly tamped with suitable wooden or metal tampers so as to eliminate air pockets and to press it into the underlying soil.

On side slopes steeper than 2 (horizontal) to 1 (vertical), the laying of sods shall be started from bottom upwards. At points where water may flow over a sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over this followed by its thorough compaction.

#### **307.3.3 Staking the Sods**

Where the side slope is 2 (horizontal) to 1 (vertical) or steeper and the distance along the slope is more than 2 m, the sods shall be staked with pegs or nails spaced approximately 500 to 1000 mm along the longitudinal axis of the sods strips. Stakes shall be driven approximately plumb through the sods to be almost flush with them.

#### **307.3.4 Top Dressing**

After the sods have been laid in position, the surface shall be cleaned of loose sod, excess soil and other foreign material. Thereafter, a thin layer of topsoil shall be scattered over the surface of top dressing and the area thoroughly moistened by sprinkling with water.

#### **307.3.5 Watering and Maintenance**

The sods shall be watered by the Contractor for a period of at least four weeks after laying. Watering shall be so done as to avoid erosion and prevent damage to sodded areas by wheels of water tanks.

The Contractor shall erect necessary warning signs and barriers, repair or replace sodded areas failing to show uniform growth of grass or damaged by his operations and shall otherwise maintain the sod at his cost until final acceptance.

#### **307.4 Measurements for Payment**

Turfing with sods shall be measured as finished work in square metres.

#### **307.5 Rate**

The Contract unit rate for turfing with sods shall mean paying in full for carrying out all the required operations explained above including compensation for

- i) furnishing all the materials to be incorporated in the Works with all leads and lifts; and
- ii) all labour, tools, equipment and incidentals to complete the work in accordance with these Specifications.
- iii) The Contract unit rate for application of topsoil shall be as per Clause 301.9.5.
- iv) 308 SEEDING AND MULCHING

#### **308.1 Scope**

This shall consist of preparing slopes, placing topsoil, furnishing all seeds, commercial or organic fertilizers and mulching materials, providing jute netting, coir netting, or polymer netting and placing and incorporating the same on embankment slopes or other locations designated by the Engineer or shown in the Contract documents.

#### **308.2 Materials**

##### **308.2.1 Seeds**

The seeds shall be of approved quality and type suitable for the soil on which these are to be applied, and shall give acceptable purity and germination to requirements set down by the Engineer.

Fertilizers shall consist of standard commercial materials and conform to the grade specified. Organic manure shall be fully putrified organic matter such as cow dung.

Mulching materials shall consist of straw, hay, wood shavings, or sawdust and shall be delivered in dry condition suitable for placing with a mulch blower. They shall be reasonably free of weed seed and such foreign materials as may detract from their effectiveness as a mulch or be injurious to the plant growth.

##### **308.2.2 Topsoil**

Topsoil shall not be obtained from an area known to have noxious weeds growing in it. If treated with herbicide or sterilents, it shall be got tested by appropriate agricultural authority to determine the residual in the soil. Topsoil shall not contain less than 2 percent and more than 12 percent organic matter.

##### **308.2.3 Bituminous Emulsion**

A suitable grade of bituminous emulsion used as a tie down for mulch shall be as described in the Contract document or as desired by the Engineer. Emulsified bitumen shall not contain any solvent or diluting agent toxic to plant life.

##### **308.2.4 Netting**

Jute netting shall be undyed jute yarn woven into a uniform open weave with approximate 25 mm square openings.

Geonetting shall be made of uniformly extruded rectangular mesh having mesh opening of 20 mm x 20 mm. The colour may be black or green. It shall weigh not less than 3.8 kg per 1000 sqm.

308.2.5 A layer of biodegradable mulching material sandwiched between two layers of polymer netting or non-woven coconut fibre coir netting can also be used.

### **308.3 Seeding Operations**

#### **308.3.1 Seed-Bed Preparation**

The area to be seeded shall be brought to the required slope and cross-section by filling, reshaping eroded areas and refinishing slopes, medians etc. Topsoil shall be evenly spread over the specified areas to the depth shown on the drawings, unless otherwise approved by the Engineer. The seed-bed preparation shall consist of eliminating all live plants by suitable means using agricultural implements. All stones 150 mm and larger shall be removed. The soil shall be excavated on the contour to a depth of 100 mm. All clods larger than 25 mm in diameter shall be crushed and packed. Where necessary, water shall then be applied. All topsoil shall be compacted unless otherwise specified or approved by the Engineer. Compaction shall be by slope compactor, cleated tractor or similar equipment approved by the Engineer. Equipment shall be so designed and constructed as to produce a uniform rough textured surface ready for seeding and mulching and which will bond the topsoil to the underlying material. The entire area shall be covered by a minimum of 4 passes of the roller or approved equipment.

#### **308.3.2 Fertilizer Application**

Fertilizer to the required quantities shall be spread and thoroughly incorporated into the soil surface as a part of the seed-bed preparation.

#### **308.3.3 Planting of Seeds**

All seeds shall be planted uniformly at the approved rate. Immediately after sowing, the area shall be raked, dragged or otherwise treated so as to cover the seeds to a depth of 6 mm.

The operation of seed sowing shall not be performed when the ground is muddy or when the soil or weather conditions would otherwise prevent proper soil preparation and subsequent operations.

#### **308.3.4 Soil Moisture and Watering Requirements**

Soil moisture shall exist throughout the zone from 25 mm to at least 125 mm below the surface at the time of planting.

Watering of the seeded areas shall be carried out as determined by the Engineer.

### **308.4 Mulching, Applying Bituminous Emulsion and Jute Netting/Geonetting/ Netting of Coir**

Within 24 hours of seeding, mulching material mixed with organic manure shall be placed so as to form a continuous, unbroken cover of approximate uniform thickness of 25 mm using an acceptable mechanical blower. Mulching material shall be held in place and made resistant to being blown away by suitable means approved by the Engineer. When called for in the Contract documents, mulch material shall be anchored in place with bituminous emulsion applied at the rate of 2300 litres per hectare. Any mulch disturbed or displaced following application shall be removed, reseeded and remulched as specified. Jute netting/geonetting or netting of coir shall be unrolled and placed parallel to the flow of water immediately following the bringing, to finished grade, the area specified on the drawings or the placing of seed and fertilizer. Where more than one strip is required to cover the given areas, they shall overlap a minimum of 100 mm. Jute netting/Geonetting /coir netting shall be held in place by approved wire staples, pins, spikes or wooden stakes driven vertically into the soil.

### **308.5 Maintenance**

The Contractor shall maintain all seeded and mulched areas until final acceptance. Maintenance shall include protection of traffic by approved warning signs or barricades and repairing any areas damaged following the seeding and mulching operations. If mulched areas become damaged, the area shall be reshaped and then seeded and mulched again as originally specified.

### **308.6 Measurements of Payment**

Seeding and mulching shall be measured as finished work in square metres.

### **308.7 Rate**

The Contract unit rate for seeding and mulching shall be payment in full for carrying out all the required operations including full compensation for all materials, labour, tools and incidentals.

## **309 SURFACE/SUB-SURFACE DRAINS**



### **309.1 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.

### **309.2 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.

Where so indicated, drains shall be lined or turfed with suitable materials in accordance with details shown on the drawings.

All works on drain construction shall be planned and executed in proper sequence with other works as approved by the Engineer, with a view to ensuring adequate drainage for the area and minimizing erosion/sedimentation.

### **309.3 Sub-Surface Drains**

#### **309.3.1 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.

#### **309.3.2 Materials**

##### **309.3.2.1 Pipe**

Perforated pipes for the drains may be metal/asbestos cement/cement concrete/Poly Vinyl Chloride (PVC)/Poly Propylene (PP)/Poly Ethylene (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 0 85 size of the material surrounding the pipe, subject to being minimum 3 mm and maximum 6 mm. 0 85 stands for the size of the sieve that allows 85 percent of the material to pass through it.

##### **309.3.2.2 Backfill Material**

Backfill material shall consist of sound, tough, hard, durable particles of free draining sand/gravel material or crushed stone and shall be free of organic material, clay balls or other deleterious matter. Unless the Contract specifies any particular gradings for the backfill material or requires these to be designed on inverted filter criteria for filtration and permeability to the approval of the Engineer, the backfill material shall be provided on the following lines:

- i) Where the soil met with in the trench is of fine grained type (e.g., silt, clay or a mixture thereof), the backfill material shall conform to Class I grading set out in-Table 300-3;
- ii) Where the soil met with in the trench is of coarse silt to medium sand or sandy type, the backfill material shall correspond to Class II grading of Table 300-3; and
- iii) Where soil met with in the trench is gravelly sand, the backfill material shall correspond to Class III grading of Table 300-3.

Geosynthetics for use with subsurface drain shall conform to the requirements as per Section 700.

#### **309.3.3 Trench Excavation**

Trench for sub-surface drain shall be excavated to the specified lines, grades and dimensions shown in the drawings provided that width of trench at pipe level shall not be less than 450 mm. The

excavation shall begin at the outlet end of the drain and proceed towards the upper end. Where unsuitable material is met with at the trench bed, the same shall be removed to such depth as directed by the Engineer and backfilled with approved material which shall be thoroughly compacted to the specified degree.

### 309.3.4 Laying of Pipe and Backfilling

Laying of pipe in the trench shall be started at the outlet end and proceed towards the upper end, true to the lines and grades specified

**Table 300-3 : Grading Requirements for Filter Material Percent Passing by Weight**

Sieve Designation	Class I	Class II	Class III
53 mm	-	-	100
45 mm	-	-	97-100
26.5 mm	-	100	-
22.4 mm	-	95-100	58-100
11.2 mm	100	48-100	20-60
5.6 mm	92-100	28-54	4-32
2.8 mm	83-100	20-35	0-10
1.4 mm	59-96	-	0-5
710 micron	35-80	6-18	-
355 micron	14-40	2-9	-
180 micron	3-15	-	-
90 micron	0-5	0-4	0-3

Before placing the pipe, backfill material of the required grading(s) shall be laid for full width of the trench bed and compacted to a minimum thickness of 150 mm or as shown on the drawings. The thickness of the backfill material on the sides of the pipe shall be as shown on the drawings subject to a minimum of 150 mm. The pipe shall then be embedded firmly on the bed.

Perforated pipes, unless otherwise specified, shall be placed with their perforations down to minimize clogging. The pipe sections shall be joined securely with appropriate coupling fittings or bands.

Non-perforated pipes shall be laid with joints as close as possible with the open joints wrapped with suitable pervious material (like suitable Geosynthetics of not less than 150 mm width) to permit entry of water but prevent fines entering the pipes. In the case of non-perforated pipes with bell end, the bell shall face upgrade.

Upgrade end sections of the pipe installation shall be tightly closed by means of concrete plugs or plugs fabricated from the same material as the pipe and securely held in place to prevent entry of soil materials.

After the pipe installation has been completed and approved, backfill material of the required grading (s) (see Clause 309.3.2.2) shall be placed over the pipe to the required level in horizontal layers not exceeding 150 mm in thickness and thoroughly compacted. The minimum thickness of material above the top of the pipe shall be 300 mm

Unless otherwise provided, sub-surface drains not located below the road pavement shall be sealed at the top by means of 150 mm thick layer of compacted clay so as to prevent percolation of surface water.

### **309.3.5 Use of Geosynthetics in Laying of Pipe and Backfilling**

After excavating the trench for subsurface drain, the filter fabric shall be placed, the pipe installed and the trench backfilled with permeable material according to dimensions and details shown on the drawings. Surfaces to receive filter fabric prior to placing shall be free of loose or extraneous material and sharp objects that may damage the filter fabric during installation. Adjacent rolls of the fabric shall be overlapped a minimum of 450 mm. The preceding roll shall overlap the following roll in the direction the material is being spread.

Damage to the fabric resulting from Contractor's vehicles, equipment or operations shall be replaced or repaired by the Contractor at his Cost.

### **309.3.6 Drain Outlet**

The outlet for a sub-surface drain shall not be under water or plugged with debris but should be a free outlet discharging into a stream, culvert or open ditch. The bottom of the pipe shall be kept above high water level in the ditch and the end protected with a grate or screen. For a length of 500 mm from the outlet end, the trench for pipe shall not be provided with granular material but backfilled with excavated soil and thoroughly compacted so as to stop water directly percolating from the backfill material around the pipe. The pipe in this section shall not have any perforations.

### **309.3.7 Aggregate Drains**

Aggregate drains shall be placed within the verge/shoulders after completion of the pavement. Depth, thickness and spacing of the aggregate drains shall be as shown on the drawings.

Trenches for aggregate drains shall be excavated to a minimum width of 300 mm and to the depth shown on the drawings or ordered by the Engineer. The bottom of the trench shall be sloped to drain and shall be free from loose particles of soil. The trench shall be excavated so as to expose clearly the granular pavement courses to be drained.

Aggregate for the drains shall be durable gravel, stone or slag and shall be free from vegetable matter and other deleterious substances. The grading requirements are given in Table 300-4. Grading to be adopted shall be indicated in the drawings.

### **309.4 Measurements for Payment**

Measurement for surface and sub-surface drains shall be per running metre length of the drain.

### **309.5 Rates**

The Contract unit rates for surface and sub-surface drains shall be payment in full for all items such as excavation, dressing the sides and bottom; providing lining, turfing, pitching, masonry, concrete and plastering; providing, laying and jointing pipes including wrapping with geosynthetic fabric; providing, laying and compacting backfill around the pipe, granular bedding; providing, fixing and painting of cover etc. including full compensation for all materials, labour, tools, equipment and other incidentals to complete the work as shown on drawings with all leads and lifts including removal of unsuitable material. Provision of inlets, gratings, sumps, outlet pipes, bedding, disbursers etc. wherever required shall be incidental to construction of drain.

## **310 PREPARATION AND SURFACE TREATMENT OF FORMATION**

Preparation and surface treatment of the formation, shall be carried out only after completion of any specified sub-grade drainage and unless otherwise agreed by the Engineer, immediately prior to laying the sub-base or the road base where no sub-base is required. The sequence of operations shall be as follows:

a) Full formation, after reinstatement of any soft areas to the required Specifications shall be well cleaned and freed of all mud and slurry.

b) The surface shall be compacted to the required density by a smooth wheeled roller of 80 to 100 kN weight after spraying requisite amount of water, if required.

c) the formation shall be finished to the requirements of Clause 305.3.9.

The entire work of surface treatment of formation shall be deemed as incidental to the work of sub-base/base course to be provided for the same.

### **311 WORKS TO BE KEPT FREE OF WATER**

**311.1** The Contractor shall arrange for the rapid dispersal of water collected/ accumulated on the earthwork or completed formation during construction or on the existing roadway or which enters the earthwork or any other item of work from any source, and where practicable, the water shall be discharged into the permanent outfall of the drainage system. The arrangements shall be made in respect of all earthwork including excavation for pipe trenches, foundations or cuttings.

**311.2** The Contractor shall provide, where necessary, temporary water courses, ditches, drains, pumping or other means for maintaining the earthwork free from water. Such provisions shall include carrying out the work of forming the cut sections and embankments in such manner that their surfaces have at all times a prescribed crossfall and, where practicable, a sufficient longitudinal gradient to enable them to shed water and prevent ponding.

The works involved in keeping the earthwork or any other item of works free of water shall be deemed as incidental to the respective item of work and as such no separate payment shall be made for the same.

### **312 WATER COURSES AT CULVERTS**

**312.1** Excavation carried out in the diversion, enlargement, deepening or straightening water courses at culverts, where necessary, shall include the operations such as clearing, grubbing, removal of vegetation, trimming of slopes, grading of beds, disposal of excavated materials, pumping, timbering etc. necessary for dealing with the flow of water.

**312.2** The beds and sloping sides of water courses shall, where shown on the drawings, be protected against the action of water by rubble paving to form a flat or curved surface as indicated. The protection shall consist of large smooth faced stones or of blocks of precast concrete. Stones for rubble paving shall be roughly dressed square. No stone shall be less than 225 mm in depth nor less than 0.02 cu.m in volume and no rounded boulders shall be used. After completion of construction of culverts, temporary diversion of water course, if any, shall be closed and water course restored for flow through the culvert as per the direction of the Engineer.

#### **312.3 Measurements for Payment**

The work for water courses at culverts as stated above shall be measured in terms of units specified in the Bill of Quantities for respective items. The temporary diversion of channel to facilitate construction of culverts, its closure and restoration to original water course shall be considered incidental to the work of construction of culverts and no extra payment shall be made for the same.

#### **312.4 Rates**

The Contract unit rates for different items of water courses at culverts shall be payment in full for carrying out all required operations including full compensation for all cost of

materials, labour, tools, equipment and other incidentals to complete the work to the Specifications.

### **313 ROCKFILL EMBANKMENT**

#### **313.1 Scope**

The work covers embankment constructed with pieces of rock and shall be in accordance with the lines, grades and cross-sections as shown in drawings or as directed by the Engineer.

There shall be a minimum of 500 mm thick earthen cushion over the rockfill. The construction of earth fill subgrade does not form part of scope of this work.

#### **313.2 Materials**

The size of rock pieces used in rockfill embankments shall be such that they can be deposited in layers so as to suit the conditions evaluated in the field compaction trials or as directed by the Engineer. The rockfill shall consist of hard, durable and inert material, preferably maximum size not exceeding 300 mm and percent finer than 125 mm not exceeding 10 percent.

Argillaceous rocks (clay, shales etc.), un burnt colliery stock and chalk shall not be used in rockfill.

The rock fragments and blinding material required for filling the voids shall also satisfy the above requirements.

#### **313.3 Spreading and Compaction**

The material shall be tipped, spread and levelled in layers extending to the full width of embankment by a suitable dozer. Fragments of rock shall then be spread on the top of layer to the required extent and layer compacted by minimum of 5 passes of vibratory roller having static weight 8-10 tonnes. The compacted thickness of each layer shall not exceed 500 mm. After compaction of each layer, the surface voids shall be filled with broken fragments. Next layer, where required, shall be placed in the same manner, above the earlier compacted layer.

The top layer of rockfill, on which normal earth fill will rest shall be thoroughly blinded with suitable granular material to seal its surface.

#### **313.4 Measurements for Payment**

Measurement shall be made by taking cross-sections at intervals in the original position before the work starts and after its completion and computing the volume in cu.m by the method of average end areas.

#### **313.5 Rate**

The Contract unit rate shall be paid in full for carrying out all the above operations including cost of rockfill, broken fragments and blinding material and shall provide full compensation for all items as per clause 305.8.

### **MoRTH clause 401. GRANULAR SUB-BASE**

#### **401.1 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 subbase hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

Sieve Designation	Percent Passing by Weight	
	Type A	Type B
63 mm	-	100
37.5 mm	100	85- 100
19 mm	-	0 - 20
9.5 mm	45 - 100	0 - 5
3.35 mm	25 - 80	-
600 micron	8 - 45	-
150 micron	0 - 10	-
75 micron	0 - 5	-

## 401.2 Materials

**401.2.1** 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 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.

**401.2.2** If the water absorption of the aggregates determined as per IS:2386 (Part 3) is greater than 2 percent, the aggregates shall be tested for Wet Aggregate Impact Value (AIV) (IS:5640). Soft aggregates like Kankar, brick ballast and laterite shall also be tested for Wet AIV (IS:5640)

**Table 400-1 : Grading for Granular Sub-base Materials**

IS Sieve Designation	Percent by Weight Passing the IS Sieve					
	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	-	100	-
53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55 -90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	-	-	35-65	55-75
4.75 mm	25 - 55	40-65	10-30	15-35	25-50	30-55
2.36 mm	20- 40	30-50	-	-	10-20	10-25
0.85 mm	-	-	-	-	2-10	-
0.425 mm	10-15	10- 15	-	-	0-5	0-8
0.075 mm	<5	< 5	< 5	< 5	-	0-3

**Table 400-2 : Physical Requirements for Materials for Granular Sub-base**

Aggregate Impact Value (AIV)	IS:2386 (Part 4) or IS:5640	40 maximum
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

### **401.3 Construction Operations**

#### **401.3.1 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.

#### **401.3.2 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. 80 as to ensure homogenous and uniform mix. The required water content shall be determined in accordance with IS:2720 (Part 8). The mix shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation, or other means as approved by the Engineer.

Moisture content of the mix shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted so that, at the time of compaction, it is from 1 to 2 percent below the optimum moisture content. Immediately after spreading the mix, rolling shall be done by an approved roller. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed

towards the upper edge longitudinally for portions having unidirectional crossfall or on superelevation. For carriageway having crossfall on both sides, rolling shall commence at the edges and progress towards the crown.

Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. During rolling, the grade and crossfall (camber) shall be checked and any high spots or depressions which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour. Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS:2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from *movement* under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise *defective* areas shall be made good to the full thickness of layer and re-compacted.

#### **401.4 Surface Finish and Quality Control of Work**

The surface finish of construction shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

#### **401.5 Arrangements for Traffic**

During the period of construction, arrangements for the traffic shall be provided and maintained

in accordance with Clause 112.

#### **401.6 Measurements for Payment**

Granular sub-base shall be measured as finished work in position in cubic metres.

The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

#### **401.7 Rate**

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

- i) making arrangements for traffic to Clause 112 except for initial treatment to *verges*, shoulders and construction of diversions;
- ii) supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts;
- iii) all labour, tools, equipment and incidentals to complete the work to the Specifications;
- iv) carrying out the work in part widths of road where directed; and carrying out the required tests for quality control.

### **406 WET MIX MACADAM SUB-BASE/BASE**

#### **406.1 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-basel 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 upto 200 mm with the approval of the Engineer.

#### **406.2 Materials**

##### **406.2.1 Aggregates**

##### **406.2.1.1 Physical Requirements**

Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 percent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-12. If the water absorption value of the coarse aggregate is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS:2386 (Part-5).



**Physical Requirements of Coarse Aggregates for Wet Mix Macadam for Sub-base/Base Courses Test Method Requirements**

Sl.No		
1	Los Angeles Abrasion value	IS:2386 (Part-4) 40 percent (Max.)
2	Aggregate Impact value	IS:2386 (Part-4) or 30 percent (Max.) IS:5640
3	Combined Flakiness and Elongation	IS:2386 (Part-1) 35 percent (Max.)' indices (Total)

**Grading Requirements**

The aggregates shall conform to the grading given in Table 400-13.

**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

Material finer than 425 micron shall have Plasticity Index (PI) not exceeding 6.

The final gradation approved within these limits shall be graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

**406.3 Construction Operations**

**406.3.1 Preparation of Base**

Clause 404.3.1 shall apply.

**406.3.2 Provision of Lateral Confinement of Aggregates**

While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 404.3.3.

**406.3.3 Preparation of Mix**

Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/ positive mixing arrangement like pugmill or pan type mixer of concrete batching plant. The plant shall have following features:

- i) For feeding aggregates- three/ four bin feeders with variable speed motor
- ii) Vibrating screen for removal of oversize aggregates
- iii) Conveyor Belt

- iv) Controlled system for addition of water
- v) Forced/positive mixing arrangement like pug-mill or pan type mixer
- vi) Centralized control panel for sequential operation of various devices and precise process control
- vii) Safety devices

Optimum moisture for mixing shall be determined in accordance with IS:2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

### **133 Section 400 Sub-Bases, Bases (Non-Bituminous) and Shoulders**

406.3.4 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. The mix may be spread by a paver finisher. The paver finisher shall be self-propelled of adequate capacity with following features:

- i) Loading hoppers and suitable distribution system, so as to provide a smooth uninterrupted material flow for different layer thicknesses from the tipper to the screed.
- ii) Hydraulically operated telescopic screed for paving width upto to 8.5 m and fixed screed beyond this. The screed shall have tamping and vibrating arrangement for initial compaction of the layer.
- iii) Automatic levelling control system with electronic sensing device to maintain mat thickness and cross slope of mat during laying procedure.

In exceptional cases where it is not possible for the paver to be utilized, mechanical means like motor grader may be used with the prior approval of the Engineer. The motor grader shall be capable of spreading the material uniformly all over the surface.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials. The Engineer may permit manual mixing and laying of wet mix macadam where small quantity of wet mix macadam is to be executed. Manual mixing/laying in inaccessible/ remote locations and in situations where use of machinery is not feasible can also be permitted. Where manual mixing/laying is intended to be used, the same shall be done with the approval of the Engineer.

### **406.3.5 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 upto 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

#### Bases (Non-Bituminous) and Shoulders Section 400

for adjusting the frequency and amplitude. An appropriate frequency and amplitude may be selected. The speed of the roller shall not exceed 5 km/h.

In portions having unidirectional cross fall/superelevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the center line of the road, uniformly over-lapping each preceding track by at least one-third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop. In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the center parallel to the center line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled. Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good. Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted. Rolling should not be done when the sub-grade is soft or yielding or when it causes a wavelike motion in the sub-base/base course or sub-grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 m straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and crossfall. In no case shall the use of unmixed material be permitted to make up the depressions. Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material as determined by the method outlined in IS:2720 (Part-8).

After completion, the surface of any finished layer shall be well-closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material.

#### **406.3.6 Setting and Drying**

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and re compacted.

#### **406.4 Opening to Traffic**

No vehicular traffic shall be allowed on the finished wet mix macadam surface. Construction equipment may be allowed with the approval of the Engineer.

#### **406.5 Surface Finish and Quality Control of Work**

##### **406.5.1 Surface Evenness**

The surface finish of construction shall conform to the requirements of Clause 902.

##### **406.5.2 Quality Control**

Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

#### **406.6 Rectification of Surface Irregularity**

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to sub-grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, re-shaped with added premixed material or removed and replaced with fresh premixed material as applicable and recompactd in accordance with Clause 406.3. The area treated

in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

#### **406.7 Arrangement for Traffic**

During the period of construction, arrangements for traffic shall be done as per Clause 112.

#### **406.8 Measurements for Payment**

Wet mix macadam shall be measured as finished work in position in cubic metres.

#### **406.9 Rate**

The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7.

### **502 PRIME COAT OVER GRANULAR BASE**

#### **502.1 Scope**

This work shall consist of the application of a single coat of low viscosity liquid bituminous material to a porous granular surface preparatory to the superimposition of bituminous treatment or mix. The work shall be carried out on a previously prepared granular/ stabilized surface to Clause 501.8.

#### **502.2 Materials**

**502.2.1** The primer shall be cationic bitumen emulsion SS1 grade conforming to IS:8887 or medium curing cutback bitumen conforming to IS:217 or as specified in the Contract.

**502.2.2** Quantity of SS 1 grade bitumen emulsion for various types of granular surface shall be as given in Table 500-3.

Table 500-3 : Quantity of Bitumen Emulsion for Various Types of Granular Surfaces

Type of Surface	Rate of Spray (kg/sq.m)
WMMIWBM	0.7-1.0
Stabilized soil bases/Crusher Run Macadam	0.9-1.2

**502.2.3** Cutback for primer shall not be prepared at the site. Type and quantity of cutback bitumen for various type of granular surface shall be as given in Table 500-4

Table 500-4 : Type and Quantity of Cutback Bitumen for Various Types of Granular Surface

Type of Surface	Type of Cutback	Rate of Spray (kg/sq.m)
WMM/WBM	MC 30	0.6-0.9
Stabilized soil bases/ Crusher Run Macadam	MC 70	0.9-1.2

**502.2.4** The correct quantity of primer shall be decided by the Engineer and shall be such that it can be absorbed by the surface without causing run-off of excessive primer and to achieve desired penetration of about 8-10 mm.

**502.4.1** Equipment The primer shall be applied by a self-propelled or towed bitumen pressure sprayer equipped for spraying the material uniformly at specified rates and temperatures. Hand spraying shall not be allowed except in small areas, inaccessible to the distributor, or in narrow strips where primer shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

#### **502.4.2 Preparation of Road Surface**

The granular surface to be primed shall be swept clean by power brooms or mechanical sweepers and made free from dust. All loose material and other foreign material shall be removed completely. If soil/ moorum binder has been used in the WBM surface, part of this

should be brushed and removed to a depth of about 2 mm so as to achieve good penetration.

#### **502.4.3 Application of Bituminous Primer**

After preparation of the road surface as per Clause 502.4.2, the primer shall be sprayed uniformly at the specified rate. The method for application of the primer will depend on the type of equipment to be used, size of nozzles, pressure at the spray bar and speed of forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified. No heating or dilution of SS1 bitumen emulsion and shall be permitted at site. Temperature of cutback bitumen shall be high enough to permit the primer to be sprayed effectively through the jets of the spray and to cover the surface uniformly.

#### **502.4.4 Curing of Primer and Opening to Traffic**

A primed surface shall be allowed to cure for at least 24 hours or such other higher period as is found to be necessary to allow all the moisture/volatiles to evaporate before any subsequent surface treatment or mix is laid. Any unabsorbed primer shall first be blotted with a light application of sand, using the minimum quantity possible. A primed surface shall not be opened to traffic other than that necessary to lay the next course.

#### **502.5 Quality Control of Work**

For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

#### **502.7 Measurement for Payment**

Prime coat shall be measured in terms of surface area of application in square metres.

#### **502.8 Rate**

The contract unit rate for prime coat shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 (i) to (v) and as applicable to the work specified in these Specifications. Payment shall be made on the basis of the provision of prime coat at an application rate of quantity at 0.6 kg per square metre or at the rate specified in the Contract, with adjustment, plus or minus, for the variation between this quantity and the actual quantity approved by the Engineer after the preliminary trials referred to in Clause 502.4.3.

#### **503 TACK COAT**

**503.1 Scope** The work shall consist of the application of a single coat of low viscosity liquid bituminous material to existing bituminous, cement concrete or primed granular surface preparatory to the superimposition of a bituminous mix, when specified in the Contract or as instructed by the Engineer. The work shall be carried out on a previously prepared surface in accordance with Clause 501.8.

#### **503.2 Materials**

The binder used for tack coat shall be either Cationic bitumen emulsion (RS 1) complying with IS:8887 or suitable low viscosity paving bitumen of VG 10 grade conforming to IS:73. The use of cutback bitumen RC:70 as per IS:217 shall be restricted only for sites at sub-zero temperatures or for emergency applications as directed by the Engineer. The type and grade of binder for tack coat shall be as specified in the Contract or as directed by the Engineer.

#### **503.4 Construction**

##### **503.4.1 Equipment**

The tack coat shall be applied by a self-propelled or towed bitumen pressure sprayer, equipped

for spraying the material uniformly at a specified rate. Hand spraying shall not be permitted except in small areas, inaccessible to the distributor, or narrow strips, shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.

#### **503.4.2 Preparation of Base**

The surface on which the tack coat is to be applied shall be clean and free from dust, dirt, and any extraneous material, and be otherwise prepared in accordance with the requirements of Clause 501.B. The granular or stabilized surfaces shall be primed as per Clause 502. Immediately before the application of the tack coat, the surface shall be swept clean with a mechanical broom, and high pressure air jet, or by other means as directed by the

Engineer.

#### **503.4.3 Application of Tack Coat**

The application of tack coat shall be at the rate specified in Table 500-5, and it shall be applied uniformly. If rate of application of Tack Coat is not specified in the contract, then it shall be the rate specified in Table 500-5. No dilution or heating at site of RS1 bitumen emulsion shall be permitted. Paving bitumen if used for tack coat shall be heated to appropriate temperature in bitumen boilers to achieve viscosity less than 2 poise. The normal range of spraying temperature for a bituminous emulsion shall be 20°C to 70°C and for cutback, 50°C to 100°C. The method of application of tack coat will depend on the type of equipment to be used, size

of nozzles, pressure at the spray bar, and speed or forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.

**Table 500-5 : Rate of Application of Tack Coat**

<b>Type of Surface</b>	<b>Rate of Spray of Binder in Kg per sq. m</b>
Bituminous surfaces	0.20 - 0.30
Granular surfaces treated with primer	0.25 - 0.30
Cement concrete pavement	0.30 - 0.35

#### **503.4.4 Curing of Tack Coat**

The tack coat shall be left to cure until all the volatiles have evaporated before any subsequent construction is started. No plant or vehicles shall be allowed on the tack coat other than those essential for the construction.

**503.5 Quality Control of Work** For control of the quality of materials and the works carried out, the relevant provisions of Section 900 shall apply.

**503.6 Arrangements for Traffic** During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

**503.7 Measurement for Payment** Tack coat shall be measured in terms of surface area of application in square metres.

**503.8 Rate**  
The contract unit rate for tack coat shall be payment in full for carrying out the required operations including for all components listed in Clause 401.8 (i) to (v) and as applicable to the work specified in these Specifications. The rate shall cover the provision of tack coat, at 0.2 kg per square metre or at the rate specified in the Contract, with the provision that the

variation between this quantity and actual quantity of bitumen used will be assessed and the payment adjusted accordingly.

## **505 DENSE BITUMINOUS MACADAM**

### **505.1 Scope**

The specification describes the design and construction procedure for Dense Bituminous Macadam, (DBM), for use mainly, but not exclusively, in base/binder and profile corrective courses. The work shall consist of construction in a single or multiple layers of DBM on a previously prepared base or sub-base. The thickness of a single layer shall be 50 mm to 100 mm.

### **505.2 Materials**

#### **505.2.1 -Bitumen**

The bitumen shall be viscosity grade paving bitumen complying with the Indian Standard Specification IS:73, modified bitumen complying with Clause 501.2.1 or as otherwise specified in the Contract.

The type and grade of bitumen to be used shall be specified in the Contract. 174

Bases and Surface Courses (Bituminous) Section 500

#### **505.2.2 Coarse Aggregates**

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the Contractor's selected source of aggregates has poor affinity for bitumen, the Contractor shall produce test results that with the use of anti-stripping agents, the stripping value is improved to satisfy the specification requirements. The Engineer may approve such a source and as a condition for

the approval of that source, the bitumen shall be treated with an approved anti-stripping agent, as per the manufacturer's recommendations, at the cost of the Contractor. The aggregates shall satisfy the requirements specified in Table 500-8.

Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

#### **505.2.3 Fine Aggregates**

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of the two, passing the 2.36 mm sieve and retained on the 75 micron sieve. These shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter. Natural sand shall not be allowed in binder courses. However, natural sand upto 50 percent of the fine aggregate may be allowed in base courses. The fine aggregate shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37). The plasticity index of the fraction passing the

0.425 mm sieve shall not exceed 4, when tested in accordance with IS:2720 (Part 5).

#### **505.2.4 Filler**

Filter shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer. The filler shall be graded within the limits indicated in Table 500-9.

The filler shall be free from organic impurities and have a plasticity Index not greater

than 4. The Plasticity Index requirement shall not apply if filler is cement or lime. Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8, then 2 percent by total weight of aggregate, of hydrated lime shall be used and percentage of fine aggregate reduced accordingly.

### 505.2.5 Aggregate Grading and Binder Content

**505.2.5.1** When tested in accordance with IS:2386 Part 1 (wet sieving method), the combined grading of the coarse and fine aggregates and filler for the particular mixture shall fall within the limits given in Table 500-10 for grading 1 or 2 as specified in the Contract. To avoid gap grading, the combined aggregate gradation shall not vary from the lower limit on one sieve to higher limit on the adjacent sieve.

Table 500-8 : Physical Requirements for Coarse Aggregate for Dense Bituminous Macadam

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis		IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices*	Max 35%	IS:2386 Part IV
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 35% Max 27%	IS:2386 Part IV
Durability	Soundness either :Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Water Absorption	Water Absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength**	Min. 80%	AASHTO 283

Table: Composition of Dense Graded Bituminous Macadam

Grading		
Nominal aggregate size*	37.5mm	26.5 mm
Layer thickness	75-100 mm	50-75 mm
IS Sieve <sub>1</sub> (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	95 -100	100
26.5	63-93	90-100
19		71-95
13.2	55-75	56-80
9.5		
4.75	38-54	38-54
2.36	28-42	38-54
1.18		
0.6		
0.3	7 -21	7 -21



0.15		
0.075	2-8	2-8
Bitumen content % by mass of total mix	Min 4.0"	Min 4.5**

“\*” The nominal maximum particle size is the largest specified sieve size upon which any of the aggregate is retained.

“\*\*” Corresponds to specific gravity of aggregates being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately.

Further the region where highest daily mean air temperature is 3DoC or lower and lowest daily air temperature is - 1 DOC or lower, the bitumen content may be increased by 0.5 percent.

**505.2.5.2 Bitumen content indicated in Table** is the minimum quantity. The quantity shall be determined in accordance with Clause 505.3.

### **505.3 Mix Design**

The bitumen content required shall be determined following the Marshall mix design procedure contained in Asphalt Institute Manual MS-2.

The Fines to Bitumen (FIB) ratio by weight of total mix shall range from 0.6 to 1.2.

#### **505.3.1 Requirements for the Mix**

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out shown under this clause of MoRTH Specification

#### **505.3.2 Binder Content**

The binder content shall be optimized to achieve the requirements of the mix set out in the clause 500.3.1 of MoRTH

The binder content shall be selected to obtain 4 percent air voids in the mix design. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2.

Where maximum size of the aggregate is more than 26.5 mm, the modified Marshall method using 150 mm diameter specimen described in MS-2 and ASTM D 5581 shall be used. This method requires modified equipment and procedures. When the modified Marshall test is used, the specified minimum stability values in shall be multiplied by 2.25, and the minimum flow shall be 3 mm.

#### **505.3.3 Job Mix Formula**

The Contractor shall submit to the Engineer for approval at least 21 days before the start the work, the job mix formula proposed for use in the works, together with the following details:

- i) Source and location of all materials;
- ii) Proportions of all materials expressed as follows:
  - a) Binder type, and percentage by weight of total mix;
  - b) Coarse aggregate/Fine aggregate/Mineral filler as percentage by weight of total aggregate including mineral filler;
- iii) A single definite percentage passing each sieve for the mixed aggregate;
- iv) The individual gradings of the individual aggregate fraction, and the proportion of each in the combined grading;
- v) The results of mix design such as maximum specific gravity of loose

mix (Gmm), compacted specimen densities, Marshall stability, flow, air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test;

vi) Where the mixer is a batch mixer, the individual weights of each type of aggregate, and binder per batch;

vii) Test results of physical characteristics of aggregates to be used;

viii) Mixing temperature and compacting temperature.

While establishing the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical and strength requirements of these Specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the Engineer.

The approved job mix formula shall remain effective unless and until a revised Job Mix Formula is approved. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded by the Contractor to the Engineer for approval before the placing of the material.

#### **505.8 Measurement for Payment**

Dense Graded Bituminous Materials shall be measured as finished work either in cubic metres, tonnes or by the square metre at a specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

#### **505.9 Rate**

The contract unit rate for Dense Graded Bituminous Macadam shall be payment in full for carrying out all the required operations as specified and shall include, to all components listed in Clause 501.8.8.2. The rate shall include the provision of bitumen, at 4 percent and 4.5 percent by weight of the total mixture for grading 1 and grading 2 respectively. The variation in actual percentage of bitumen used shall be assessed and the payment adjusted plus or minus accordingly.

### **507 BITUMINOUS CONCRETE**

#### **507.1 Scope**

This work shall consist of construction of Bituminous Concrete, for use in wearing and profile corrective courses. This work shall consist of construction in a single layer of bituminous concrete on a previously prepared bituminous bound surface. A single layer shall be 30 mm/40 mm/50 mm thick.

#### **507.2 Materials**

##### **507.2.1 Bitumen**

The bitumen shall conform to Clause 504.2.1.

##### **507.2.2 Coarse Aggregates**

The coarse aggregates shall be generally as specified in Clause 504.2.2, except that the aggregates shall satisfy the physical requirements of Table 500-16 and where crushed gravel is proposed for use as aggregate, not less than 95 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

#### **Physical Requirements for Coarse Aggregate for Bituminous Concrete**

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Property	Test	Specification	Method of Test
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Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices*	Max 35%	IS:2386 Part IV
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 35% Max 27%	IS:2386 Part IV
Durability	Soundness either :Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Polishing	Polishing	Min 55	BS:812-114
Water Absorption	Water Absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength**	Min. 80%	AASHTO 283

“\*” If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the requirement.

### 507.2.3 Fine Aggregates

The fine aggregates shall be all as specified in Clause 505.2.3.

### 507.2.4 Filler

Filler shall be as specified in Clause 505.2.4.

### 507.2.5 Aggregate Grading and Binder Content

When tested in accordance with IS:2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and filler shall fall within the limits shown in Table 500-17. The grading shall be as specified in the Contract.

Table 500-17 : Composition of Bituminous Concrete Pavement Layers

Grading		
Nominal aggregate size*	37.5mm	26.5 mm
Layer thickness	75-100 mm	50-75 mm
IS Sieve <sub>1</sub> (mm)	Cumulative % by weight of total aggregate passing	
45		
37.5		
26.5	100	
19	90 -100	100
13.2	59-79	90-100
9.5	<b>52-72</b>	<b>70-88</b>
4.75	35-55	53-71
2.36	<b>28-44</b>	<b>42-58</b>
1.18	20-34	<b>34-48</b>
0.6	15-27	<b>26-38</b>
0.3	<b>10-20</b>	18-28

0.15	<b>5-13</b>	<b>12-20</b>
0.075	2-8	4-10
Bitumen content % by mass of total mix	<b>Min-5.2*</b>	Min 5.4**

*Notes:*

- The nominal maximum particle size is the largest specified sieve size up on which any of the aggregate is retained.

\*\* Corresponds to specific gravity of aggregate being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is - 1 °C or lower, the bitumen content may be increased by 0.5 percent

### **507.3 Mix Design**

#### **507.3.1 Requirements for the Mix**

Clause 505.3.1 shall apply.

#### **507.3.2 , Binder Content**

Clause 505.3.2 shall apply.

#### **507.3.3 Job Mix Formula**

Clause 505.3.3 shall apply.

#### **507.3.4 Plant Trials - Permissible Variation in Job Mix Formula**

The requirements for plant trials shall be as specified in Clause 505.3.4, and permissible limits for variation as given in Table 500-18.

## **304 EXCAVATION FOR STRUCTURES**

### **304.1 Scope**

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.

### **304.3 Construction Operations**

#### **304.3.1 Setting Out**

After the site has been cleared according to Clause 201, the limits of excavation shall be set out true to lines, curves and slopes to Clause 301.3.1.

#### **304.3.2 Excavation**

Excavation shall be taken to the width of the lowest step of the footing including additional width as required for construction operation. The sides shall be left plumb where the nature of soil allows it. Where the nature of soil or the depth of the trench and season of the year do not permit vertical sides, the Contractor at his own cost shall put up necessary shoring,

strutting and planking or cut slopes to a safer angle or both with due regard to the safety of personnel and works and to the satisfaction of the Engineer.

The depth to which the excavation is to be carried out shall be as shown on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer. Propping shall be undertaken when any foundation or stressed zone from an adjoining structure is within a line of 1 vertical to 2 horizontal from the bottom of the excavation.

Where blasting is to be resorted-to, the same shall be carried out in accordance with Clause 302 and all precautions indicated therein observed. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as controlled blasting, providing rubber mat cover to prevent flying of debris etc. shall be taken to prevent any damage.

#### **304.3.3 Dewatering and Protection**

Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures such as bailing, pumping, constructing diversion channels, drainage channels, bunds, depression of water level by well-point system, cofferdams and other necessary works to keep the foundation trenches dry when so required and to protect the green concrete/ masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and other details thereof shall be left to the choice of the Contractor but subject to the approval of the Engineer. Approval of the Engineer shall, however, not relieve the Contractor of the responsibility for the adequacy of dewatering and protection arrangements for the quality and safety of the works.

Where cofferdams are required, these shall be carried to adequate depths and heights, be safely designed and constructed and be made as watertight as is necessary for facilitating construction to be carried out inside them. The interior dimensions of the cofferdams shall be such as to give sufficient clearance for the construction and inspection and to permit installation of pumping equipments, etc., inside the enclosed area.

If it is determined beforehand that the foundations cannot be laid dry or the situation is found that the percolation is too heavy for keeping the foundation dry, the foundation concrete shall be laid under water by tremie pipe only. In case of flowing water or artesian springs, the flow shall be stopped or reduced as far as possible at the time of placing the concrete.

Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete and for a period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a watertight wall or other similar means.

At the discretion of the Contractor, cement grouting or other approved methods may be used to prevent or reduce seepage and to protect the excavation area.

The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.

#### **304.3.4 Preparation of Foundation**

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 at the cost of the Contractor. Ordinary filling shall not be permitted to bring the foundation to the design level as shown in the drawing.

When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level or stepped as directed by the Engineer. All seams shall be cleaned out and filled with cement mortar or grout to the satisfaction of the Engineer. In the case of excavation in rock, annular space around footing shall be filled with lean concrete M 15 upto the top level of rock.

If the depth of fill required is more than 1.5 m in soft rock or 0.6 m in hard rock above the foundation level, the filling upto this level shall be done with M-15 concrete and portion above shall be filled by concrete or by boulders grouted with cement.

When foundation piles are used, the excavation for pile cap shall be done after driving/casting of all piles forming the group. After pile driving operations in a given pit are completed, all loose and displaced materials therein shall be removed to the level of the bottom of the pile cap.

#### **304.3.5 Slips and Slip-Outs**

If there are any slips or slip-outs in the excavation, these shall be removed by the Contractor at his own cost.

#### **304.3.6 Public Safety**

Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, 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.

#### **304.3.7 Backfilling**

Backfilling shall be done with approved material after concrete or masonry is fully set and carried out in such a way as not to cause undue thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface in layers not exceeding 150 mm compacted thickness. The compaction shall be done with the help of suitable equipment such as trench compactor, mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve the maximum dry density.

#### **304.3.8 Disposal of Surplus Excavated Materials**

Clause 301.3.11 shall apply.

#### **304.4 Measurements for Payment**

Excavation for structures shall be measured in cu.m for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer. Excavation over increased width, cutting of slopes, production/support to the existing structures shoring, shuttering and planking shall be deemed as incidental to the main work and shall not be measured and paid separately.

Preparation of rock foundation shall be measured in square metres.

#### **304.5 Rates**

**304.5.1** The Contract unit rate for the items of excavation for structures shall be payment in full for carrying out the required operations including full compensation for:

- i) setting out;
- ii) transporting the excavated materials for use or disposal with all leads and lifts;

- iii) construction of necessary cofferdams, cribs/sheeting, shoring and bracing and their subsequent removal;
- iv) removal of all logs, stumps, grubs and other deleterious matter and obstructions, for placing the foundations including trimming of bottoms of excavations;
- v) foundation sealing, dewatering including pumping when no separate provision for it is made in the Contract;
- vi) backfilling, clearing up the site and disposal of all surplus material with all leads and lifts or as otherwise specified; and
- vii) all labour, materials, tools, equipment, safety measures, diversion of traffic and incidentals necessary to complete the work to Specifications.

**304.5.2** The Contract unit rate for preparation of rock foundation shall be full compensation for cutting, trimming and cleaning the foundation surface and filling/sealing of all seams with cement grout or mortar including all materials, labour and incidentals required for completing the work.

## **305 EMBANKMENT CONSTRUCTION**

### **305.1 General**

#### **305.1.1 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.

### **305.2 Materials and General Requirements**

#### **305.2.1 Physical Requirements**

**305.2.1.1** 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 OI, O1, 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.

**305.2.1.2** Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 percent when tested as per IS:2720 - Part 40) shall not be used as a fill material. Where an expansive clay having "free swelling index" value less than 50 percent is used as a fill material, subgrade and top 500 mm portion of the embankment just below sub-grade shall be non-expansive in nature.

Section 300 Earthwork, Erosion Control and Drainage

**305.2.1.3** Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as S03) per litre when tested in accordance with BS:1377, Part 3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm distance (or any other distance described in

the Contract), of permanent works constructed out of concrete, cement bound materials or other cementitious material.

Materials with a total sulphate content (expressed as SO<sub>3</sub>) exceeding 0.5 percent by mass, when tested in accordance with BS:1377, Part 3 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.

**305.2.1.4** The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when placed in the embankment and 50 mm when placed in the sub-grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle size in such cases, however, shall not be more than two-thirds of the compacted layer thickness.

**305.2.1.5 Ordinarily**, only the materials satisfying the density requirements given in Table 300-1 shall be employed for the construction of the embankment and the sub-grade.

**Table 300-1 : Density Requirements of Embankment and Sub-grade Materials**

S. No.	Type of Work	Maximum laboratory dry unit weight when 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

1) This Table is not applicable for lightweight fill material. e.g., cinder, fly ash, etc. 2) The material to be used in subgrade shall be non-expansive and shall satisfy design CBR at the specified dry density and moisture content. In case the available materials fail to meet the requirement of CBR, use of stabilization methods in accordance with Clauses 403 and 404 or by any stabilization method approved by the Engineer shall be followed.

**305.2.1.6** The material to be used in subgrade shall conform to the design CBR value at the specified dry density and moisture content of the test specimen. In case the available materials fail to meet the requirement of CBR, use of stabilization methods in accordance with Clauses 403 and 404 or by any stabilization method approved by the Engineer or by the IRC Accreditation Committee shall be followed.

**305.2.1.7** The material to be used in high embankment construction shall satisfy the specified requirements of strength parameters.

### **305.2.2 General Requirements**

**305.2.2.1** The materials for embankment shall be obtained from approved sources with preference given to acceptable materials becoming available from nearby roadway excavation under the same Contract.

The work shall be so planned and executed that the best available materials are saved for the subgrade and the embankment portion just below the subgrade.

#### **305.2.2.2 Borrow Materials**

The arrangement for the source of supply of the material for embankment and sub-grade and compliance with the guidelines, and 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.



Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width of a minimum of 10m.

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.

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 siting of temporary buildings or structures.

### **305.3.6 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.

The compaction shall be done with the help of self-propelled single drum vibratory roller or pad foot vibratory roller of 80 to 100 kN static weight or heavy pneumatic tyre roller of adequate capacity capable of achieving the required compaction. The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for the site trials shall 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 to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and 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 provided the gauge is calibrated to give 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/sub-grade/earthen shoulders, 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 using appropriate mechanical means such as light weight vibratory roller, double drum walk behind roller, vibratory plate compactor, trench compactor or vibratory tamper to the density requirements and satisfaction of the Engineer.

### **305.3.7 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.

### **305.3.8 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 required density in accordance with Clause 305.3.6. 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 the arranging of machinery/equipment for the purpose.

### **305.3.9 Finishing Operations**

Finishing operations shall include the work of shaping and dressing the shoulders/verge/roadbed 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 described in Clause 902. 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 (Clauses 301.3.2 and 305.3.3) 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.

Where directed, the slopes shall be turfed with sods in accordance with Clause 307. If seeding and mulching of slopes is prescribed, this shall be done to the requirements of Clause 308.

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

## **305.4 Construction of Embankment and Sub-grade under Special Conditions**

### **305.4.1 Earthwork for Widening Existing Road Embankment**

When an existing embankment and/or sub-grade 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/subgrade material to be added. The material obtained from cutting of benches could be utilized in the widening of the embankment/subgrade. However, when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontal, the slope surface may only be ploughed or scarified instead of resorting to benching.

Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of light weight Vibratory roller, double drum walk behind roller, Vibratory plate compactor or vibratory tamper or any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

### **305.4.3 Earthwork over Existing Road Surface**

Where the embankment is to be placed over an existing road surface, the work shall be carried out as indicated below:

#### **305.4.4**

i) If the existing road surface is of granular type and lies within 1 m of the new formation levels, it shall be scarified to a depth of 50 mm or as directed so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new sub-grade level is compacted to the desired density;

- ii) If the existing road surface is of bituminous type or cement concrete and lies within 1 m of the new formation level, the bituminous or cement concrete layer shall be removed completely;
- iii) If the level difference between the existing road surface and the new formation level is more than 1 m, the existing surface shall be roughened after ensuring that the minimum thickness of 500 mm of subgrade is available.

#### **Embankment and Sub-Grade Around Structures**

To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points, to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure.

Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and sub-grade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS:2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC:78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2504 unless otherwise specified in the Contract.

Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

#### **305.4.5 Construction of Embankment over Ground Incapable of Supporting Construction Equipment**

Where embankment is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geosynthetic material to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any area of the Contract will be the responsibility of the Contractor and no extra payment will be made to him. The remainder of the embankment shall be constructed as specified in Clause 305.3

#### **305.4.6 Embankment Construction under Water and Waterlogged Areas**

#### **305.4.6.1 Embankment Construction under Water**

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall be of GW, SW, GP, SP as per IS:1498 and consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

#### **305.6 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.

#### **305.7 Sub-grade Strength**

305.7.1 It shall be ensured prior to actual execution that the material to be used in the sub-grade satisfies the requirements of design CBR.

**305.7.2** Sub-grade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed subgrade shall be determined on remoulded samples, compacted to the field density at the field moisture content and tested for soaked/unsoaked condition as specified in the Contract.

#### **305.8 Measurements for Payment**

**305.8.1 Earth embankment/sub-grade construction shall be measured separately by** taking cross sections at intervals given in Sub-Section 113.3 after completion of clearing and grubbing and after completion of embankment/sub-grade. The volume of earthwork shall be computed in cubic metres by the method of average end areas.

**305.8.2 The measurement of fill material from borrow areas shall be the difference** between the net quantities of compacted fill and the net quantities of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cU.m of suitable material brought to site from road and drainage excavation forms one cU.m of compacted fill and all bulking or shrinkage shall be ignored.

**305.8.3** The embankment constructed with fly ash will be measured in cU.m, separately for the fly ash portions and for the soil cover and intervening layers of soil, unless otherwise specified in the Contract.

**305.8.4** Construction of embankment under water shall be measured in cU.m.

**305.8.5** Construction of high embankment with specified material and in specified manner shall be measured in cU.m.

**305.8.6** in cU.m.

Stripping including storing and reapplication of top soil shall be measured

**305.8.7** Work involving loosening and recompacting of ground supporting embankment/sub-grade shall be measured in cU.m.

**305.8.S** Removal of unsuitable material at embankment/sub-grade foundation and replacement with suitable material shall be measured in cU.m.

**305.8.9** Scarifying existing granular/bituminous road surface shall be measured in square metres.

**305.8.10** Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.

**305.8.11** Filter medium and backfill material behind abutments, wing walls and other retaining structures shall be measured as finished work in position in cU.m.

#### **305.9 Rates**

**305.9.1** The Contract unit rates for the items of embankment and sub-grade construction shall be payment in full for carrying out the required operations including full compensation for:

i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract; ii) Setting out; iii) Compacting ground supporting embankment/sub-grade except where removal and replacement of suitable material or loosening and recompacting is involved; iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and sub-grade as applicable; v) Cost of watering or drying of material in borrow areas and/or embankment and sub-grade during construction as required; vi) Spreading in layers, bringing to appropriate moisture and compacting to Specification requirements; vii) Shaping and dressing top and slopes of the embankment and subgrade including rounding of corners; viii) Restricted working at sites of structures; ix) Working on narrow width of embankment and sub-grade; x) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and sub-grade site with all leads and lifts unless otherwise provided for in the Contract; xi) All labour, materials, tools, equipment and incidentals necessary to complete the work to the Specifications; xii) Dewatering; and xiii) Keeping the embankment/completed formation free of water as per Clause 311. xiv) Transporting unsuitable excavated material for disposal with all leads and lifts.

**305.9.2** Clause 301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil including reapplication of topsoil.

**305.9.3** Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompacting the embankment/sub-grade foundation.

**305.9.4** Clauses 309.1.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material, respectively.

**305.9.5** The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals, necessary to complete the work. This will also comprise of handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

**305.9.6** Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.

**305.9.7** The Contract unit rate for providing and laying filter material shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

**305.9.8** The Contract unit rate for providing and compacting backfill material behind abutments and retaining walls shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

**305.9.9** Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.

**305.9.10** *Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer.*

## **307 TURFING WITH SODS**

### **307.1 Scope**

This work shall consist of furnishing and laying of the live sod of perennial turf forming grass on Section 300 Earthwork, Erosion Control and Drainage 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.

### **307.2 Materials**

The sod shall consist of dense, well-rooted growth of permanent and desirable grasses, indigenous to the locality where it is to be used, and shall be practically free from weeds or other undesirable matter. At the time the sod is cut, the grass on the sod shall have a length of approximately 50 mm and the sod shall have been freed of debris.

Thickness of the sod shall be as uniform as possible, with some 50-80 mm or so of soil covering the grass roots depending on the nature of the sod, so that practically all the dense root system of the grasses is retained in the sod strip. The sods shall be cut in rectangular strips of uniform width, not less than about 250 mm x 300 mm in size but not so large that it is inconvenient to handle and transport these without damage. During wet weather, the sod shall be allowed to dry sufficiently to prevent tearing during handling and during dry weather shall be watered before lifting to ensure its vitality and prevent the dropping of the soil in handling.

### **307.3 Construction Operations**

#### **307.3.1 Preparation of the Earth Bed**

The area to be sodded shall have been previously constructed to the required slope and cross-section. Soil on the area shall be loosened, freed of all stones larger than 50 mm size, sticks, stumps and any undesirable foreign matter, and brought to a reasonably fine granular texture to a depth of not less than 25 mm for receiving the sod.

Where required, topsoil shall be spread over the slopes. Prior to placing the topsoil, the slopes shall be scarified to a depth which, after settlement, will provide the required nominal depth shown on the drawings. Spreading shall not be done when the ground is excessively wet.

Following soil preparation and topsoiling, where required, fertilizer and ground limestone when specified shall be spread uniformly at the rate indicated on the drawings. After spreading, the materials shall be incorporated in the soil by using disc harrow or other means to the depths shown on the drawings.

#### **307.3.2 Placing the Sods**

The prepared sod bed shall be moistened to the loosened depth, if not already sufficiently moist, and the sod shall be placed thereon within approximately 24 hours after the same Earthwork, Erosion Control and Drainage Section 300

had been cut. Each sod strip shall be laid edge to edge and such that the joints caused by abutting ends are staggered. Every strip, after it is snugly placed against the strips already in position, shall be lightly tamped with suitable wooden or metal tampers so as to eliminate air pockets and to press it into the underlying soil.

On side slopes steeper than 2 (horizontal) to 1 (vertical), the laying of sods shall be started from bottom upwards. At points where water may flow over a sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over this followed by its thorough compaction.

#### **307.3.3 Staking the Sods**

Where the side slope is 2 (horizontal) to 1 (vertical) or steeper and the distance along the slope is more than 2 m, the sods shall be staked with pegs or nails spaced approximately 500 to 1000 mm along the longitudinal axis of the sods strips. Stakes shall be driven approximately plumb through the sods to be almost flush with them.

#### **307.3.4 Top Dressing**

After the sods have been laid in position, the surface shall be cleaned of loose sod, excess soil and other foreign material. Thereafter, a thin layer of topsoil shall be scattered over the surface of top dressing and the area thoroughly moistened by sprinkling with water.

#### **307.3.5 Watering and Maintenance**

The sods shall be watered by the Contractor for a period of at least four weeks after laying. Watering shall be so done as to avoid erosion and prevent damage to sodded areas by wheels of water tanks.

The Contractor shall erect necessary warning signs and barriers, repair or replace sodded areas failing to show uniform growth of grass or damaged by his operations and shall otherwise maintain the sod at his cost until final acceptance.

#### **307.4 Measurements for Payment**

Turfing with sods shall be measured as finished work in square metres.

#### **307.5 Rate**

The Contract unit rate for turfing with sods shall mean paying in full for carrying out all the required operations explained above including compensation for

i) furnishing all the materials to be incorporated in the Works with all leads and lifts; and

81

Section 300 Earthwork, Erosion Control and Drainage

ii) all labour, tools, equipment and incidentals to complete the work in accordance with these Specifications.

The Contract unit rate for application of topsoil shall be as per Clause 301.9.5.

### **309 SURFACE/SUB-SURFACE DRAINS**

#### **309.1 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.

Providing & Laying Plain Cement Concrete M-15 grade

### **700 GEOSYNTHETICS**

#### **701 GEOSYNTHETICS FOR ROAD AND BRIDGE WORKS**

##### **701.1 Application and General Requirements**

The specification covers the various applications of geosynthetic materials for use in road and bridge works including supplying and laying as per contract specifications.

Geosynthetic is a general classification for all synthetic materials used in geotechnical engineering application. It includes geotextiles, geogrids, geostrips, geomembranes, geonets, geocomposites, geocells, geosynthetic mats, paving fabric and glass grid etc. Geo fabrics made from natural fibres such as jute, and coir referred to herein under natural geotextiles may also be used in different geotechnical engineering applications.

i) Geotextiles: Any permeable synthetic textile used with foundation, soil, rock, earth, or any other geotechnical engineering-related material as an integral part of a human-made project, structure, or system.

The geotextile fabric shall be a woven, non-woven or knitted fabric consisting of long-chain polymeric filaments or yarns such as polypropylene, polyethylene or polyester or any combination thereof, formed into a stable network such that the filaments or yarns retain their relative position to each other.

There are several application areas for geotextiles requiring specific functions namely separation, filtration, drainage, reinforcement or a combination thereof.

ii) Geogrids : A deformed or non-deformed netlike polymeric material used with foundation, soil, rock, earth, or any other geotechnical engineering-related material as an integral part of human-made project, structure, or system.

Geogrids have relatively high strength, high modulus, and low-creepsensitive openings/holes in geogrids are either elongated ellipse, near squares with rounded corners, squares or rectangles. Geogrids can be of uni-axial grid, bi-axial grid or three dimensional grids. Geostrip is another form of geogrid, which is used in reinforced soil structures. It is primarily made of synthetic material in strips and is made from high tenacity polyester yarn and contained in a suitable polymer sheath.

These are used as reinforcement in pavements and reinforced soil slopes.

iii) Geomembranes: An essentially impermeable membrane (liner or barrier) used with foundation, soil, rock, earth, or in any other geotechnical application as an integral part of human-made project, structure, or system, used to control fluid migration

Geomembranes are made from PVC or polyethylene sheets, which are duly protected from ultraviolet exposure by carbon black or any antioxidants and thermal stabilizers.

These are used as capillary cut off in roads in water logged areas.

iv) Geonets: Geonets are used in combination with other types of geosynthetics. These are usually formed by continuous polymeric ribs at acute angle to one another. When the ribs are opened relatively large size apertures are formed in a net like configuration.

These are used in combination with other geosynthetic materials to form a composite material.

v) Geocomposite: A manufactured material, which could be a combination of any two or more synthetic materials like geotextiles, geogrids, geonets and geomembranes etc., in laminated or composite form. One of the popular form of geocomposite is Drainage Composite. Drainage Composites are formed by combining geotextile or geomembrane with a core of geonet or serrated/corrugated polymeric materials.

Prefabricated Vertical Drains (PVD)/Sand Drains and Fin Drains come under the category of geocomposites.

vi) Geocell: It is a three dimensional structure with interconnected cells. The geocells are made of polyester/polypropylene/high density polyethylene stabilized with carbon black.

Geocells may be used in erosion control of slopes.

vii) Geosynthetic Mats: These are two dimensional or three dimensional mats with specified thickness, made of multi-filaments, with apertures to allow vegetation growth for erosion control application. Geosynthetic mat consists of UV stabilized non-degradable polypropylene/polyethylene or similar polymer fibres that are extruded or heat bonded to provide a dimensionally stable matrix. A tension element like steel wire mesh or geogrid shall be included in these mats as reinforcement, where these mats are required to possess more strength against erosive forces, like in steep slopes or in heavy rainfall areas.

These are used for erosion protection of slopes.

viii) Natural Geotextiles : These geotextiles are made of natural fibres like jute or coiro. The blankets/mats/mesh made of these fibres are sometimes further reinforced with polymeric nettings to enhance its tensile strength and for holding the fibres intact. The polymer netting is securely stitched on both sides of the fabric to form a strong quilted



mat. These fabrics have excellent drapability and aid in quick growth of vegetation and are used for erosion control applications.

ix) **Paving Fabric and Glass Grids:** The paving fabrics are non woven heat set material, consisting of atleast 85% by weight of polyolefins, polyester or polyamides. They are heat bonded only on one side.

Glass grids are either a composite glass fibre reinforced geogrid with continuous filament nonwoven geotextile chemically /mechanically bonded to the grid, or bituminous coated glass fibre geogrids with or without adhesive on one side of the grid.

The paving fabric, glass grids and composite of fabric and glass grids are used in bituminous pavements to act as stress relieving membrane and crack retarding layer within the pavement structure. The paving fabric also serves the function of water barrier.

## **701.2 Testing, Certification and Acceptance**

### **701.2.1 Geosynthetic Materials Shall be Tested and Certified in the Following**

- a) The manufacturer shall have ISO or CE certification for manufacturing process and quality control.
- b) The manufacturer shall provide manufacturer's test certificate for every lot supplied from the factory.
- c) The supplier shall provide third party test reports from an independent laboratory with valid accreditation for all the test values in Manufacturer's test certificate.

**701.2.2 Geosynthetics** shall be tested in accordance with tests prescribed by BIS. In absence of IS codes, tests prescribed either by ASTM, EN, BS or ISO shall be conducted.

**701.2.3** The material shall meet the requirements as specified in the contract.

### **701.3 Marking**

Geosynthetic rolls shall be marked with the following information:

- a) Manufacturer's name
- b) Roll number
- c) Grade
- d) Length
- e) Date of manufacture; and
- f) Product identification details

### **701.4 Packing, Storage and Handling**

**701.4.1** Each geosynthetic roll shall be wrapped with a material that will protect the geosynthetic from damage due to shipment, water, sunlight and contaminants. The protective wrapping with a tarpaulin or opaque plastic sheet shall be maintained during periods of shipment and storage.

During storage, geosynthetic rolls shall be elevated off the ground and adequately covered to protect from site construction damage, precipitation, prolonged ultra-violet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 71°C, and any other environmental condition that may damage the physical properties of the geosynthetics.

**701.4.2** If the outer layer of the geosynthetic is damaged, or exposed to sunlight for a period beyond that is permitted the outermost wrap of the rolls shall be discarded, and only the remaining undamaged/unexposed material shall be used. If the geosynthetic rolls become wet, the water proof cover shall be removed, the rolls shall be elevated off the ground and exposed to wind in order to dry the fabric. The paving fabric used with bitumen overlays shall be completely dry prior to installation.

## **702 GEOTEXTILES FOR DRAINAGE, SEPARATION AND EROSION CONTROL**

### **702.1 Scope**

The work covers the use of geotextile materials for drainage, separation/filtration and erosion control works including supplying and laying as per design, drawing and these specifications. For drainage/filtration function, geotextile shall be able to convey water across the plane of the fabric throughout its design life.

For separation function the geotextile shall prevent intermixing of two layers of dissimilar materials, throughout the design life of the structure.

The geotextile as a filter material below erosion control measures like stone pitching or stone filled mattresses over the slopes, shall allow the water to flow out and at the same time prevent the loss of soil under the protective measures.

### **702.2 Material**

#### **702.2.1 Strength Requirement**

The minimum strength of geotextile in terms of MARV under different installation conditions shall be as specified in Table 700-1

Table 700-1 : Minimum Geotextile Strength Property Requirements

Table 700-1 : Minimum Geotextile Strength Property Requirements

Installation Condition	Type	Strength Property Requirement (MARV)							
		Grab Strength in Newton (N) as per ASTM D 4632/ IS:13162 Part 5		Tear Strength in Newton (N) as per ASTM D 4533/ IS:14293		Puncture Strength in Newton (N) as per IS:13162 Part 4		Burst Strength in Newton (N) as per ASTM D 3786/ IS:1966	
		Elongation at Failure							
		<50 %	>50 %	<50 %	>50 %	<50 %	>50 %	<50 %	>50 %
Harsh installation condition	Type I	1400	900	500	350	500	350	3500	1700
Moderate Installation condition	Type II	1100	700	400	250	400	250	2700	1300
Less Severe Installation condition	Type III	800	500	300	180	300	180	2100	950

Note:

- 1) All numeric values in the above table represent Minimum Average Roll Value (MARV) in weaker principal direction. The MARV is derived statistically as the average value minus two standard deviations.

- 2) When the geotextiles are joined together by field sewing, the seam strength shall be at least 60 percent of the material's tensile strength. All field seams shall be sewn with thread as strong as the material in the fabric.
- 3) The puncture strength if determined in accordance with ASTM D 6241, the minimum requirement in terms of "Newton (N)" shall be as follows:

Installation condition	Strength property requirement (MARV)	
	Puncture Strength in Newton (N) as per ASTM D 6241.	
	Elongation at Failure	
	< 50 %	> 50 %
Harsh installation condition	2800	2000
Moderate Installation condition	2250	1400
Less Severe Installation condition	1700	1000

### 702.2.2 Ultraviolet Stability Requirements

The material shall satisfy the ultraviolet stability requirements specified in Table: 700-2.

Table 700-2 : Requirements for Ultra Violet Stability

S.No	Properties of Fabric	Requirements (Retained Strength)
1)	Grab Strength	Not less than 70% after 500 hours of exposure
2)	Tear Strength	
3)	Puncture Strength	
4)	Burst Strength	

### 702.2.3 Hydraulic Requirements for Various Applications

#### 702.2.3.1 Subsurface Drainage

The geotextile shall conform to the physical requirements specified in Table 700-3.

Table 700-3 : Geotextile Requirements for Subsurface Drainage

In-situ Passing 0.075 mm Sieve (%)	Permittivity, per sec, as per ASTM D 4491/IS:14324-1995	Maximum Apparent Opening Size, mm ASTM D 4751/IS:14294-1995
<15	0.7	0.43
15 to 50	0.2	0.25
> 50	0.1	0.22

### 702.3 Construction

#### 702.3.1 General

Exposure of geotextiles to the elements between lay down and cover shall be a maximum of 14 days to minimize damage potential.

In trenches, after placing the backfill material, the geotextile shall be folded over the top of the filter material to produce a minimum overlap of 300 mm for trenches greater than 300 mm wide. In trenches less than 300 mm wide, the overlap shall be equal to the width of the trench. The geotextile shall then be covered with the subsequent course.

Overlap at roll ends and at adjacent sheets shall be a minimum of 450 mm, except when placed under water. In such instances, the overlap shall be a minimum of 1 m. Where seams are required in the longitudinal trench direction, they shall be joined by either sewing or overlapping. All seams and overlaps shall be subject to the approval of the Engineer.

Care shall be taken during installation so as to avoid any damage to the geotextile. Damages, if any, during installation shall be repaired by placing a geotextile patch over the damaged area and extending it 1m beyond the perimeter of the tear or damage, or as approved by the Engineer.

#### **702.3.2 Subsurface Drainage**

Construction shall conform to Clause 309.3 of the specifications.

#### **702.3.3 Separation**

After preparation of subgrade as per the specifications along the road alignment, geotextile shall be rolled out as indicated in the drawings. The entire roll shall be placed on the subgrade and unrolled as smoothly as possible. Wrinkles and folds in the fabric shall be removed by stretching as required.

Adjacent rolls of geotextiles shall be overlapped, sewn, or joined as required. For curves, the geotextile shall be folded or cut and overlapped in the direction of construction. Folds in the geotextile shall be stapled or pinned approximately 0.6 m centre-to-centre. Before covering, the condition of the geotextile shall be checked for damage (Le., holes, nips, tears, etc) by the Engineer.

Before placing the first lift of granular sub-base on the geotextile, a trial stretch of 100 m shall be laid as per roll width to establish a proper construction methodology of placing and compacting the sub-base in a manner that no damages are caused to the separation layer of geotextile.

#### **702.3.4 Filter Layer Under Stone Pitching for Erosion Control**

The geotextile shall be placed in intimate contact of soil ensuring slight tension, to avoid wrinkles or folds and shall be anchored on a properly shaped surface as indicated in drawings and approved by the Engineer. It shall be ensured that the placement of the overlying material be placed in such a manner that it does not tear/puncture the geotextile. Anchoring of the terminal ends of the geotextile shall be accomplished as per drawings through the use of key trenches or aprons at the crest and toe of slope.

The geotextile shall be placed with the machine direction parallel to the direction of water flow. Adjacent geotextile sheets shall be joined by either sewing or overlapping.

The pitching shall begin at the toe and proceed up the slope. Big sized boulders shall not be allowed to roll down the slope.

Any geotextile damaged shall be either replaced or repaired with a patch, as directed by the Engineer, at the cost of the contractor.

#### **702.4 Measurement for Payment**

The measurement for payment for sub surface drains shall be as per Clause 309.

The geotextile for separation and for filter layer shall be measured in square metres as per planned dimensions with no allowance for overlapping at transverse and longitudinal joints. Excavation, back fill, bedding and cover material shall be measured separately as per relevant clauses of the Contract.

## 702.5 Rate

The contract unit rate for subsurface drains using geotextile shall be as per Clause 309.5.

The contract unit rate for the accepted quantities of geotextile for separation and filter layer in place shall be full compensation for furnishing, preparing, hauling, and placing geotextile including all labour, freight, tools, equipment, and incidentals to complete the work as per specifications.

## 703 GEOGRID

### 703.1 Scope

The work covers the use of geogrids in sub-base of pavement, erosion control of slopes, reinforced soil slopes and reinforced soil walls including supplying and laying as per design, drawing and these specifications.

The use of geogrids as a component for reinforced soil slopes and walls shall be as per Section 3100.

### 703.2 Materials

#### 703.2.1 General

Geogrids shall be either made from high tenacity polyester yarn jointed at cross points by weaving, knitting or bonding process with appropriate coating or from polypropylene or polyethylene or any other suitable polymeric material by an appropriate process. Geogrids manufactured by extrusion process are integrally jointed, mono or bi-directionally oriented or stretched meshes, in square, rectangular, hexagonal or oval mesh form. The geogrids manufactured by weaving/knitting/bonding process shall be formed into a stable network such that ribs, filaments or yarns retain their dimensional stability relative to each other including selvages.

#### 703.2.2 Sub-base Reinforcement

Geogrid for use as reinforcement of sub-base layers of flexible pavements shall meet the requirement as per the design subject to the minimum requirements as given in Table 700-7.

#### 703.2.3 Erosion Control

The geogrid for erosion control application shall have the minimum tensile strength of 4 kN/m, when tested as per ASTM D5035 (Minimum Average Roll Value in Machine Direction). The aperture opening size shall be minimum 20 mm x 20 mm and average grid thickness shall be minimum 1.0 mm. Geogrid for erosion control application shall be UV stabilized. The geogrid shall have ultraviolet stability of 70 percent after 500 hrs exposure as per ASTM D 4355.

Table 700-7 : Minimum Requirements for Geogrid for Sub-Base of Flexible Pavement

Property	Test Method	Unit	Requirement
Stiffness at 0.5% strain	ISO-10319	kN/m	>_350; both in machine and crossmachine direction
Tensile strength @2% strain	ASTM 06637	kN/m	>_15% of TU't ; both in machine and cross-machine direction
Tensile strength @5% strain	ASTM 06637	kN/m	>_20% of TU't ; both in machine and cross-machine

			direction
Junction Efficiency for extruded geogrids	GRI-GG2-870r ASTM-WK 14256		90% of rib ultimate tensile strength
Ultraviolet stability	ASTM 04355		90% of rib ultimate tensile strength

Note: 1) All numerical values in the Table represent MARV in the specified direction.  
2) All geogrids shall be placed along machine direction parallel to the centre line of roadway alignment.

#### **703.2.4 Reinforced Soil Slopes and Walls**

The strength and other requirements shall be as per Section 3100.

### **703.3 Installation and Construction Operations**

#### **703.3.1 Sub-base Reinforcement**

Prior to laying of geogrid, the surface shall be properly prepared, cleaned and dressed to the specified lines and levels as shown on the drawings.

The geogrid shall be laid within the pavement structure as shown on the drawings.

Geogrid reinforcement shall be placed flat, pulled tight and held in position by pins or suitable means until the subsequent pavement layer is placed.

No vehicle shall be allowed on geogrid unless it is covered by at least 150 mm thick sub-base material.

#### **703.3.2 Erosion Control**

The geogrid for erosion control applications shall be installed in accordance with the manufacturer's recommendation and as per Clause 706.3.

#### **703.3.3 Reinforced Slopes and Walls**

The geogrid for reinforced slopes and walls shall be installed in accordance with the manufacturer's recommendation and as per Section 3100.

#### **703.4 Measurement for Payment**

The geogrid shall be measured in square metres as per planned dimensions with no allowance for overlapping at joints, anchoring at toe and crest of the slope. Excavation, back fill, bedding and cover material shall be measured separately as per relevant clauses of the Specifications. Reinforced soil slopes and walls shall be measured as per Section 3100.

#### **703.5 Rate**

The contract unit rate for the accepted quantities of geogrid in place shall be in full compensation for furnishing, preparing, hauling, and placing geogrid including all labour, freight, tools, equipment, and incidentals to complete the work as per specifications.

For reinforced soil slopes and walls, Section 3100 shall govern.

### **704 GEOCOMPOSITE DRAINS**

#### **704.1 Scope**

The work covers the use of geocomposite drainage system: (i) Fin drains and (ii) Prefabricated Vertical Drains. The work for fin drains shall be carried out 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. The work for prefabricated vertical drain shall be carried out as per Clause 314.

Fin drains with plastic core shall be installed for affecting vertical and/or horizontal drainage.

Prefabricated vertical drains shall be installed in soft saturated subsoils at designed spacing so as to accelerate the rate of consolidation.

## **704.2 Materials**

### **704.2.1 Fin Drains**

Fin drains shall be made of light weight, three dimensional high compressive strength polyethylene core; and heat bonded or needle punched polypropylene/polyester geotextile provided on one side or both sides of the core as per the requirements. Geotextile used in a drainage composite shall meet the requirements as specified in Table 700-9. The properties of the core material shall meet the requirements as indicated in Table 700-10.

**Table 700-9 : Geotextile Requirements for Fin Drains**

<b>In-situ Soil Passing 0.075 mm Sieve (%)</b>	<b>Permittivity, per sec ASTM D 4491/IS:14324-1995</b>	<b>Maximum Apparent Opening Size, mm as per ASTM D 4751/IS:14294-1995</b>
< 15	0.5	0.43
15 to 50	0.2	0.25
> 50	0.1	0.22

**Table 700-10 : Properties for Fin Drain Core**

<b>Property</b>		<b>Test Method</b>	<b>Units</b>	<b>Minimum Average Roll Value</b>
Tensile strength		EN ISO-10319	kN/m	16
CBR Puncture Resistance		EN ISO-12236	N	3000
Mass per unit area		EN ISO-9864	g/m <sup>2</sup>	710
Thickness of Composite		EN ISO-9863	mm	4.5
In-plane permeability	Hydraulic Gradient, i=1 at 100 kPa pressure	EN ISO-12958	l/m	0.55
	Hydraulic Gradient, i=1 at 200 kPa pressure			0.45

### **704.2.2 Prefabricated Vertical Drains (PVDs)/Band Drains**

The PVDs/Band Drains shall meet the requirements as specified in Table 700-11.

Table 700-11 : Properties for Prefabricated Vertical Drains/Band Drains

Table 700-11 : Properties for Prefabricated Vertical Drains/Band Drains

S. No	Property	Test Method	Value
<b>A</b>	<b>Composite Drain</b>		
1)	Width		≥100 mm
2)	Thickness	ASTM D5199	≥4 mm
3)	Tensile strength	ASTM D4595	>2.00 kN
4)	Elongation at break		
5)	Discharge capacity i = 1.0 at, 300 kPa pressure	ASTM D4716	>1.5 x 10 <sup>-5</sup> m <sup>3</sup> /s

S. No	Property	Test Method	Value
<b>B</b>	<b>Core</b>		
1)	Material		Polypropylene/Polyethylene
2)	Configuration/structure		Corrugated, filament, dimpled, studded etc.
<b>C</b>	<b>Filter</b>		
1)	Material		Polyester/polypropylene
2)	Structure		Nonwoven
3)	Mass per unit area	ASTM D5261	>120 g/m <sup>2</sup>
4)	Tensile strength	ASTM D4632	>500 N
5)	Elongation at break		
6)	Trapezoid tear strength	ASTM D4533	>150 N
7)	Permeability	ASTM D4491	>5 x 10 <sup>-6</sup> m/s
8)	Apparent opening size	ASTM D4751	

### 704.3 Installation

#### 704.3.1 Fin Drains

The installation of fin drains shall be as per drawings. Where fin drains are assembled on site, the assembly area shall be clean and dry. No geotextile or core material shall be exposed to daylight (or any source of ultraviolet radiation) for a period exceeding 50 hours. Where fin drains are laid in a trench, the bottom of the trench shall be free of irregularities and shall be brought to the required level. Rock and other hard protrusions shall be removed and any excess cut in the trench bottom shall be filled and compacted back to the required grade with suitable excavated or imported material as directed by the Engineer. Fin drains shall be capable of being connected longitudinal or laterally into pipe systems or chambers for inflow and outflow purposes. Joints parallel to the direction of flow and any exposed edge shall be protected from the ingress of soil by a geotextile wrapping with a minimum overlap of 150 mm or other measures as approved by the Engineer. The splicing of lengths of geotextile and minimum overlap shall be as per the drawing or as approved by the Engineer.

#### 704.3.2 Prefabricated Vertical Drains (PVD)

The installations for PVO shall be as per relevant Clauses of Section 314.

#### 704.4 Measurement for Payment

Measurement for Fin drain shall be in running metre of its length.

Measurement for payment for PVOs shall be as per Clause 314.2.3.



#### 704.5 Rate

The Contract unit rate for fin drains shall be payment in full for all items such as excavation, dressing the sides and bottom, providing fin drains and installation etc., including full compensation for all materials, labour, tools, equipment incidental to complete the work as shown on drawings with all leads and lifts including removal and disposal with all leads of unsuitable material. Provision of inlets, outlet pipes, bedding, etc., wherever required shall be incidental to construction of drain.

Unit rate for installation of vertical drains shall be as per Clause 314.2.4.

### 705 GEOCELL FOR SLOPE PROTECTION

#### 705.1 Scope

The work covers the use of geocells for erosion control of soil slope including supplying and laying as per design, drawings and these specifications.

Geocells filled with local soil or with granular material shall be placed on cut or fill slope to hold top cover soil and allow vegetation to grow.

#### 705.2 Materials

The geocell is a three dimensional structure consisting of series of cells and resembles a honey combed structure. The geocell shall be made of a suitable polymeric material such as high density polyethylene stabilised with carbon black.

##### 705.2.1 Strength and Other Requirements of Geocell

Geocell shall meet the minimum specifications and properties specified in Table 700-12.

The geocells for erosion control measures shall have cells with nominal opening of 450 cm<sup>2</sup> to 1250 cm<sup>2</sup> and perforations in the cell wall shall be between 11 % to 16%.The cell depth for erosion control shall vary from 75 mm to 100 mm.

For anchoring the cells on steep slopes suitable arrangements shall be made as shown on the drawings.

#### 705.3 Installation and Construction Operations

Prior to laying of geocell on the slope, the surface shall be properly prepared, clean and dressed to the specified lines and levels as shown on the drawings.

Property	Test method	Unit	Min. Required Value
Density	ASTM D1505	gm/cm <sup>3</sup>	0.900
Environmental Stress crack resistance (ESCR)	ASTM D1693	Hrs	3000
Carbon Black Content		% by Weight	1.5 to 2
Strip/Cell Wall thickness	ASTM D5199	mm	1.20
Seam Peel-Strength Test		N per 25 mm of cell depth.	350
Creep Rupture Strength	ASTM D2990		Creep Rupture Load at 10,000 hours shall be 1 kN minimum obtained from the 95% prediction interval at 10,000 hours considering a logarithmic time/ creep rupture model.

Trench keys along the crest and at the bottom of slope area shall be dug to fix the cellular system in the ground.

Cellular section shall be expanded to the predesigned shape and size, and placed over prepared slope. Geocell sections shall be fastened together using accessories as per manufacturer's installation guide and the drawings. After cellular sections are secured to the slope, the cells shall be filled with the specified materials ensuring that no damage is caused to the cells. Filling of cells shall be done from the toe of slope to crest of slope. The fill shall be overfilled between 25 mm to 50 mm and material shall be suitably tamped to leave soil flush with top edge of cell walls.

Once the soil filling is completed, turfing/seeding shall be done as recommended.

#### **705.4 Measurement for Payment**

The geocell protection work shall be measured as finished work in square meters as per planned dimensions with no allowance for overlapping at joints, anchoring at toe and crest of the slope. It shall also include the fixing and anchoring of cells in the ground with accessories as per manufacturer's recommendation or as specified in the design and drawings.

The above also includes turfing, seeding and all other incidental items to cover the work of vegetation on slopes, unless otherwise specified in the contract. The quantities of cellular system for erosion control as shown on the drawings may be increased or decreased at the direction of the Engineer based on construction procedure and actual site conditions that occur during construction of the project. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

#### **705.5 Rate**

The contract unit rate for geocell protection system shall payment in full be in full for furnishing and installing the specified materials in accordance with the contract documents including fixing and anchoring of cells in the ground as per manufacturer's recommendations, filling of cells with specified materials, seeding and all other incidentals including all other items to complete the work as per these specifications.

### **706 GEOSYNTHETIC MAT**

#### **706.1 Scope**

The work covers the use of geosynthetic mats for control of erosion of slopes including supplying and laying the mat, spreading soil and seeding to promote the design of vegetation, as per design, drawing and these specifications.

#### **706.2 Material and Strength Requirements**

Geosynthetic mat shall be a three-dimensional structure consisting of UV stabilized nondegradable polypropylene, polyethylene, nylon or similar polymer fibres that are extruded or heat bonded at the contact points to provide a dimensionally stable matrix for soil erosion protection. A tension element, i.e., a reinforcing element like geogrid or steel wire mesh shall be included along with the three dimensional polymeric mats to provide strength against erosive forces, if specified in the contract

The tensile strength requirements for non reinforced and reinforced three dimension geosynthetics mat shall meet the minimum requirement as specified in Table 700-13 and Table 700-14 respectively.

#### **706.3 Installation**

Prior to laying of geosynthetics mat on the slope, the surface shall be properly prepared, cleaned and dressed to the specified lines and levels as shown on the drawings. Specified trench keys along the crest and at the bottom of slope area shall be provided to fix the geosynthetics mat in the ground. In case the soil is not fertile, it shall be mixed with suitable amount of fertilizer or seeds.

Table 700-13: Tensile Strength Requirement for Normal (Non-Reinforced) Three Dimensional Geosynthetic Mat for Erosion Control Application (Less Severe Environmental Condition)

Property	Test Method	Units	Minimum Average Roll Value
Tensile strength requirement (For slopes less than 60°)	ASTM D 5035	kN/m	2
Ultraviolet stability at 500h, Retained strength percentage with respect to original strength	ASTM D 4355	%	80
Thickness	ASTM D 6525	mm	6.5
Mass per unit area	ASTM D 3776	gm/m <sup>2</sup>	250

Table 700-14: Tensile Strength Requirement for Reinforced Three Dimensional Geosynthetic Mat for Erosion Control Application (Severe Environmental Conditions)

Property		Test Method	Units	Minimum Average Roll Value
Tensile strength requirement	For Slopes up to 60°	ASTM D 5035	kN/m	10
	For Slopes up to 80°			35
Ultraviolet stability at 500h, Retained strength percentage with respect to original strength		ASTM D 4355	%	80
Thickness		ASTM D 6525	mm	12
Mass per unit area of the composite		ASTM D 3776	gm/m <sup>2</sup>	500

The work of laying the mat shall begin at the top of the slope providing anchor blankets in a 300 mm deep and 300 mm wide trench and anchoring with staples/pins. The mat shall then be unrolled down the slope in the machine direction. The blanket shall not be stretched but shall have full contact with the soil. The blanket shall be anchored using staples or stakes.

Edges of adjacent parallel rolls shall be overlapped by approximately 100 mm to 120 mm and anchored with staples at 600 mm to 800 mm spacing depending on the slope. When blankets have to be spliced, the upper blanket end shall be placed over lower blanket end (shingle style) with 300 mm overlap and anchoring with two staggered rows of staples at 300 mm spacing.

A minimum cover of soil shall be spread followed by spreading the seeds and fertiliser.

In the absence of rain, blankets shall be regularly watered for viable growth till vegetation sustains on its own.

If any damage due to heavy downpour is noticed, suitable corrective measures shall be taken immediately

Gully formations, if any, shall be suitably corrected depending upon the site condition.

The treated area shall be protected from the movement of cattle (goat, sheep & cow). Grazing shall be avoided till the vegetation sustains on its own

#### 706.4 Measurement for Payment

The geosynthetic mat shall be measured in square metre as per planned dimensions with no allowance for overlapping at joints, anchoring at toe and crest of the slope.

#### 706.5 Rate

The contract unit rate for geosynthetic mat for erosion control shall be in full compensation for furnishing and installing the specified materials and growth of vegetative cover in accordance with the contract documents including site preparation, and for furnishing all labour, tools, equipment and incidentals to complete the work as per these Specifications.

### 707 NATURAL GEOTEXTILE

#### 707.1 Scope

The work covers the use of natural geotextiles for control of erosion of slopes including supplying and laying the mat spreading soil and seeding to promote the growth of vegetation, as per design, drawing and these specifications.

Natural Geotextile shall be used to control surface erosion of top cover soil on cut or fill slopes and to facilitate vegetation to grow.

#### 707.2 Strength Requirements

The natural fibre geotextiles made of Jute shall meet the minimum requirement as stated in IS:14715 - Woven Jute Geotextiles - Specification. However for coir fibre geotextile, it shall meet the requirements as specified in Table 700-15, when used for erosion control measures.

Table 700-15: Typical Specifications of Natural Geotextile (MARV\*) using Coir

Type of Price	Weight (gsm)	Width (cm)	Thickness (mm)	Tensile Strength (KN/m)		Elongation at Break (%)	Water Holding Capacity (%)	Porometry ( <sup>95</sup> ), Micron
				MD	CD			
Open Mesh fabric	300	120	4.0	5	2.5	20	-	-
Nonwoven Fabric	450	150	4.0	7.5	2.5	30	80	75

\* Minimum average roll value

#### 707.3 Installation

Prior to laying of natural geotextiles on the slope, the surface shall be properly prepared, cleaned and dressed to the specified lines and levels as shown on the drawings. Specified trench keys along the crest and at the bottom of slope area shall be provided to fix the natural geotextile in the ground. In case the soil is not fertile, it shall be mixed with suitable amount of fertilizer or seeds.

The work of laying the mat shall begin at the top of the slope providing anchor blankets in a 300 mm deep and 300 mm wide trench and anchoring with staples/pins. The mat shall then be unrolled down slope in the machine direction. The blanket shall not be stretched but shall have full contact with the soil. The blanket shall be anchored using staples or stakes. Edges of adjacent parallel rolls shall be overlapped by approximately 100-120 mm and anchored with staples at 600-800 mm spacing depending on the slope. When blankets have to be spliced, the

upper blanket end shall be placed over lower blanket end (shingle style) with 300 mm overlap and anchoring with two staggered rows of staples at 300 mm spacing.

A minimum cover of soil shall be spread followed by spreading the seeds and fertilizer. A slow release supplementary fertilizer may be applied to speed up the growth of the vegetation. In the absence of rain, blankets shall be regularly watered for viable growth till vegetation sustains on its own.

If any damage due to heavy downpour is noticed, suitable corrective measures shall be taken immediately.

Gully formations, if any, shall be suitably corrected depending upon the site conditions.

The treated area shall be protected from the movement of cattle (goat, sheep & cow). Grazing shall be avoided till the vegetation sustains on its own.

#### **707.4 Measurement for Payment**

The natural geotextile shall be measured in square metres as per planned dimensions with no allowance for overlapping at joints, anchoring at toe and crest of the slope.

#### **707.5 Rate**

The contract unit rate for natural geotextile mat for erosion control shall be in full compensation for furnishing and installing the specified materials and growth of vegetative cover in accordance with the contract documents including site preparation, and for furnishing all labour, tools, equipment and incidentals to complete the work as per these Specifications

### **708 PAVING FABRICS/GLASS GRIDS**

#### **708.1 Scope**

This work shall consist of laying geosynthetic materials either non-woven paving fabric or fibre glass coated grid over existing bituminous surface, including preparation of surface and joining, stitching or overlapping of geosynthetic fabric etc., as part of highway pavement strengthening in layers as shown on drawings or as directed by the Engineer.

#### **708.2 Material Requirements**

##### **708.2.1 Paving Fabrics**

The paving fabric will be a non-woven heat set material consisting of at least 85 percent by weight of polyolefins, polyesters or polyamides. The paving fabric shall be resistant to chemical attack, rot and mildew and shall have no tears or defects which will adversely alter its physical properties. The fabric shall be specifically designed for pavement applications and be heat bonded only on one side to reduce bleed-through of tack coat during installation. The fabric shall meet the physical requirements given in Table 700-16.

Table 700-16: Physical requirements for Paving Fabrics (Minimum Average Roll Value)

Property	Units	Standard Requirements	Test Method
Grab Tensile Strength	N	450	ASTM D 4632
Elongation	%	≥ 50	ASTM D 4632
Mass Per Unit Area	gm/m <sup>2</sup>	140	ASTM D 3776
Asphalt Retention	Kg/10 sq.m	10*	ASTM D 6140
Melting Point	°C	150	ASTM D 276
Surface Texture	-	Heat bonded on One side only	Visual Inspection

Note: \* the product asphalt retention property must meet MARV provided by the manufacturer

### 708.2.2 Glass Grids

These will be either a composite glass fibre reinforced geogrid with continuous filament nonwoven Geotextile chemically or mechanically bonded to the grid; or bituminous coated glass fiber geogrid with or without adhesive on one side of the grid. The physical and mechanical properties of glass grid fabric shall conform to the requirements given in Table 700-17.

Table 700-17 : Properties of Glass Fibre Grids

Property	Units	Requirement			
		Tensile Strength in Both Median and Cross-Machine Direction			
Tensile Strength	kN/m	ASTM D 6637	50	1000	200
% Elongation at break	%		> 4	> 4	> 4
Minimum Mesh Size	mm		25 x 25	12.5 x 12.5	12.5 x 12.5
Melting Point	°C	ASTM D 276	> 250	> 250	> 250

### 708.2.3 Asphalt Reinforcing Geogrids

These shall be made of high modulus polyester yarns with low creep properties. The grid shall be connected to low weight non-woven polypropylene fabric. The composite shall have a bitumen finish. The properties shall conform to the requirements given in Table 700-18.

Table 700-18 : Properties of Asphalt Reinforcement Geogrids

Property	Units	Test Method	Requirement		
			Tensile strength in both MD and CD, Not less than		
Tensile strength	kN/m	ISO-10319	25	50	100
% Elongation at break	%	ISO-10319	12.5%	12.5%	12.5%
Mesh Size			35 x 35 20 x 20	35 x 35 20 x 20	35 x 35 20 x 20
Melting Point	°C		> 190	> 190	> 190

## 708.3 Installation

### 708.3.1 Weather Limitations

The air and pavement temperatures shall be at least 10°C for placement of hot bitumen and at least 16°C for placement of asphalt emulsion. The asphalt tack coat or Glass grid shall not be placed when weather conditions are not suitable.

### **708.3.2 Surface Preparation**

The pavement surface shall be dry and cleaned of all dirt and oil to the satisfaction of the Engineer. Cracks wider than 3 mm shall be cleaned and filled with suitable bituminous material

approved by the Engineer. Potholes and locally failed and cracked pavement sections shall be repaired as directed by the Engineer. If the existing pavement is rough or has been milled, a levelling course shall be provided prior to installation of the Glass grid.

### **708.3.3 Tack Coat**

The tack coat used to impregnate the fabric and bond the fabric to the pavement shall be paving grade Bitumen of VG-1 O. Glass fiber grids with adhesive on one side may not require a tack coat.

The tack coat shall be applied using a calibrated distributor spray bar. Hand spraying, squeegee and brush application may be used only in locations where the distributor truck cannot reach. The tack coat shall be uniformly applied at a rate to bond the nonwoven scrim to the existing pavement surface. The tack coat application rate shall be 1 Kg per square metre or as specified in the contract. When using emulsions, the application rate must be increased as directed by the Engineer to take into account the water content in the emulsion. The temperature of the tack coat shall be sufficiently high to permit a uniform spray. Bitumen shall be sprayed at temperatures between 143°C and 163°C. For emulsions, the distributor tank temperatures shall be maintained between 55°C and 71°C. The target width of the tack coat application shall be equal to the Glass grid width plus 100-150 mm. The tack coat shall be applied only as far in advance of Glass grid installation as is appropriate to ensure a tacky surface at the time of Glass grid placement. Traffic shall not be allowed on the tack coat. Excess tack coat shall be cleaned from the pavement.

### **708.3.4 Paving Fabric Placement**

The paving fabric shall be placed onto the tack coat using mechanical or manual lay down equipment capable of providing a smooth installation with a minimum amount of wrinkling or folding. The paving fabric shall be placed before to the tack coat cools and loses tackiness. After laying the paving fabric, some loose bituminous premix material shall be sprinkled on it in the wheel path of the paver and the tipper to ensure that the fabric is not picked up between the wheels. Paving fabric shall not be installed in areas where the bituminous overlay tapers to a thickness of less than 40 mm. Excess paving fabric which extends beyond the edge of existing pavement or areas of tack coat application shall be trimmed and removed. When bitumen emulsions are used, the emulsion shall be allowed to cure properly such that no water/moisture remains prior to placing the paving fabric. Wrinkles or folds in excess of 25 mm shall be single-lapped in the direction of the paving operation. Brooming and/ or pneumatic rolling will be required to maximize paving fabric contact with the pavement surface. Additional hand-placed tack coat may be required at laps and repairs as determined by the Engineer to satisfy bitumen retention of the lapped paving fabric. All areas where paving fabrics have been placed shall be paved the same day. No traffic except necessary

construction equipment will be allowed to drive on the paving fabric. Turning of the paver and other vehicles shall be done gradually and kept to a minimum to avoid movement and damage to the paving fabric. Abrupt starts and stops shall also be avoided. Damaged fabric shall be removed and replaced with the same type of fabric. Overlaps shall be shinglelapped in the direction of paving. Additional tack coat shall be placed between the overlap to satisfy saturation requirements of the fabric. Overlap shall be sufficient to ensure full closure of the joint but not exceed 150 mm. Transverse joints shall be overlapped in the direction of the pavement by 100 to 150 mm or as per the manufacturer's recommendations or as directed by the Engineer. Longitudinal joints shall be overlapped by 20-30 mm or as per the manufacturer's recommendations or as directed by the engineer. The overlay operations shall be completed at the earliest after laying the fabric.

#### **708.3.5 Glass Grid Placement**

The glass grid shall be placed on the surface provided by the tack coat using mechanical or manual lay down equipment capable of providing a smooth installation with a minimum amount of wrinkling or folding. On curves, the Glass grid must be cut and realigned to match the curvature.

Glass grid shall not be installed in areas where the bituminous overlay tapers to a compacted thickness of less than 40 mm. When emulsions are used, the emulsion shall be allowed to cure properly such that no water/moisture remains prior to placing the glass grid. Wrinkles severe enough to cause folds shall be slit and laid flat. Brooming and/or rubber-tire rolling will be required to maximize glass grid contact with the pavement surface. Additional hand-placed tack coat may be required at overlaps and repairs as required by the Engineer. Turning and braking of the paver and other vehicles shall be done gradually and kept to a minimum to avoid movement and damage to the glass grid. Damaged composite shall be removed and replaced with the same type of composite and a tack coat.

All areas where glass grid has been placed shall be paved the same day. No traffic except necessary construction traffic shall be allowed to drive on the glass grid.

Overlaps shall be shingle - lapped in the direction of paving. Additional tack coat shall be placed between the overlap to satisfy saturation requirements of the fabric. Overlap shall be sufficient to ensure full closure of the joint but not exceeding 150 mm.

#### **708.3.6 Overlay Placement**

Bituminous overlay construction shall closely follow the placement of paving fabric or glassgrid. Excess tack coat that bleeds through the paving fabric or glass grid shall be removed by broadcasting hot mix or sand on the glass grid. Excess sand or hot mix shall be removed before beginning the paving operation. In the event of rainfall prior to the placement of the asphalt overlay, the fabric must be allowed to dry completely before the overlay is placed. Overlay asphalt thickness shall meet the requirements of the contract drawings and documents. The minimum compacted thickness of the first lift of overlay asphalt concrete shall not be less than 40 mm.

#### **708.4 Measurement**

The paving fabric/ glass fibre geogrid shall be measured in Square metres of paved area covered by the fabric/ glass fibre geogrid.

#### **708.5 Rate**



The contract unit rate shall be for the accepted quantities of paving fabric. The rate shall be full compensation for the work performed and furnishing, preparing, hauling and placing materials including all labour, material, freight, tools, equipment and incidentals to complete the work as per contract.

### **1501 DESCRIPTION (FORMWORK)**

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, centering, scaffolding and temporary construction required for their support.

### **1502 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.

### **1503 DESIGN OF FORMWORK**

**1503.1** The design, erection and removal of formwork shall conform to IRC:87 "Guidelines for Formwork, Falsework and Temporary Structures" and these specifications. The forms shall be such as to ensure that they can be conveniently removed without disturbing the concrete. The design shall facilitate proper and safe access to all parts of formwork for inspection.

**1503.2** The Contractor shall furnish the design and drawing of complete formwork (Le. the forms as well as their supports) for approval of the Engineer before any erection is taken up. If proprietary system of formwork is used, the Contractor shall furnish detailed information as per Appendix 1500/1, to the Engineer for approval.

Notwithstanding any approval or review of drawing and design by the Engineer, the Contractor shall be entirely responsible for the adequacy and safety of formwork.

**1503.3** In the case of prestressed concrete superstructure, careful consideration shall be given to redistribution of loads on props due to prestressing.

### **1504**

#### **1504.1 WORKMANSHIP**

The formwork shall be robust and strong and the joints shall be leak-proof.

Sallies shall not be used as staging. Staging must have cross bracings and diagonal bracings in both directions. Staging shall be provided with an appropriately designed base plate resting on firm strata.

**1504.2** The number of joints in the formwork shall be kept to a minimum by using large sized panels. The design shall provide for proper "soldiers" to facilitate alignment. All joints shall be leak proof and must be properly sealed. Use of PVC joint sealing tapes, foam rubber or PVC T-section, is essential to prevent leakage of grout.

**1504.3** As far as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable, minimum number of nails shall be used and these shall be of the double-headed type. Alternatively, if the nails are of the normal type, they shall be left partially projecting without being driven to their full length, so that they can be withdrawn easily.

**1504.4** Use of ties shall be restricted, as far as practicable. Wherever ties are used they shall be used with HDPE sheathing so that they can easily be removed. No parts prone to corrosion shall be left projecting or near the surface. The sheathing shall be grouted with cement mortar of the same strength as that of the structure.

**1504.5** Unless otherwise specified, or directed, chamfers or fillets of size 25 mm x 25 mm shall be provided at all angles of the formwork to avoid sharp corners. The chamfers, beveled edges and mouldings shall be made in the formwork itself. Opening for fixtures and other fittings shall be provided in the shuttering as directed by the Engineer.

**1504.6** Shuttering for walls, sloping members and thin sections of considerable height shall be provided with temporary openings to permit inspection and cleaning out before placing of concrete.

**1504.7** The formwork shall be constructed with pre-camber to the soffit to allow for deflection of the formwork. This shall be in addition to the pre-camber for the permanent structure as shown on the drawings.

**1504.8** Where centering trusses or launching trusses are adopted for casting of superstructure, the joints of the centering trusses, whether welded, riveted or bolted shall be thoroughly checked periodically. Also, various members of the centering trusses should be periodically examined for proper alignment and unintended deformation before proceeding with the concreting. They shall also be periodically checked for any deterioration in quality due to steel corrosion. Launching truss, casting truss of span more than 40 m and travelling forms, shall be load tested before they are put to use.

**1504.9** The formwork shall be so made as to produce a finished concrete true to shape, line and levels and dimensions as shown on the drawings, subject to the tolerances specified in respective Sections of these specifications, or as directed by the Engineer.

**1504.10** Where metal forms are used, all bolts and rivets shall be countersunk and well ground to provide a smooth, plane surface. Where timber is used it shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mar the surface of concrete.

**1504.11** Forms shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration during and after placing the concrete. Screw

Formwork Section 1500

jacks or hard wood wedges where required shall be provided to make up any settlement in the formwork either before or during the placing of concrete.

**1504.12** The formwork shall ensure the correct final shape of the structure, with the calculated amount of positive or negative camber. The deformation of falsework, scaffolding or propping and the instantaneous or deferred deformation due to various causes arising in prestressed structures, shall be properly accounted for.

**1504.13** Suitable camber shall be provided to horizontal members of structure, specially in long spans, to counteract the effects of deflection. The formwork shall be so fixed as to provide for such camber.

**1504.14** The formwork shall be coated with an approved release agent that will effectively prevent sticking and will not stain the concrete surface. Lubricating oils (machine oils) shall be prohibited for use as coating.

#### **1505 LINING OF FORMWORK**

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 anyone 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.

#### **1506 PRECAUTIONS**

The following precautions shall be observed:

- i) It shall be ensured that any cut-outs or openings provided in any structural member to facilitate erection of formwork, are closed with the same grade of concrete as that of the structure, after formwork is removed.
- ii) Provision for safe access to the formwork shall be made at all levels as required.
- iii) Close watch shall be maintained to check for settlement of formwork during concreting and any settlement shall be promptly rectified.
- iv) Natural ground shall be checked for bearing capacity and likely settlement before erection of the staging.
- v) It shall be ensured that water used for curing or rain water does not stagnate near the base plate of the staging.
- vi) For shutters used for deep and narrow member, temporary openings in the sides shall be provided to facilitate pouring and compaction of concrete.

Section 1500 Formwork

#### **1507 PREPARATION OF FORMWORK BEFORE CONCRETING**

The inside surfaces of forms shall, except in the case of permanent formwork or where otherwise agreed to by the Engineer, be coated with a release agent supplied by approved manufacturer or of an approved material to prevent adhesion of concrete to the formwork. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come in contact with any reinforcement or prestressing tendons and anchorages. Different release agents shall not be used in formwork for exposed concrete.

Before re-use of forms, the following actions shall be taken:

- i) The contact surfaces of the forms shall be cleaned carefully and dried before applying a release agent.
- ii) It should be ensured that the release agent is appropriate to the surface to be coated. The same type and make of release agent shall be used throughout on similar formwork materials and different types should not be mixed.
- iii) The form surfaces shall be evenly and thinly coated with release agent. The vertical surface shall be treated before horizontal surface and any excess wiped out.
- iv) It shall be ensured that the reinforcement or the surface of the hardened concrete shall not come in contact with the release agent.

All forms shall be thoroughly cleaned immediately before concreting.

The Contractor shall give the Engineer due notice before placing any concrete in the forms to permit him to inspect and approve the formwork. However, such inspection shall not relieve the contractor of his responsibility for safety of formwork, men, machinery, materials and finish or tolerances of concrete.

### **1508 REMOVAL OF FORMWORK**

The scheme for removal of formwork (Le. de-shuttering and de-centering) shall be planned in advance and furnished to the Engineer for scrutiny and approval. No formwork or any part thereof shall be removed without prior approval of the Engineer.

The formwork shall be so removed as not to cause any damage to concrete. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually to avoid any shock or vibration.

Form work shall not be released unless the concrete has achieved strength of at least twice the stress the concrete may be subjected at the time of the removal of formwork. When no Formwork Section 1500

test is conducted for determination of strength of concrete and where the time of removal of formwork is not specified, the same shall be as under:

### **1512 MEASUREMENTS FOR PAYMENT**

Unless stated otherwise, the rate for concrete in plain concrete or reinforced concrete or pre stressed concrete, shall be deemed to include all formwork required in accordance with this Section, which shall not be measured separately.

Where it is specifically stipulated in the Contract that the formwork shall be paid for separately, measurement of formwork shall be taken in square metres of the surface area of concrete which is in contact with formwork.

### **1513 RATE**

The unit rate of plain concrete or reinforced concrete or pre stressed concrete as defined in respective Sections of these Specifications, shall be deemed to cover the costs of all formwork and staging, including cost of all materials, labour, tools and plant required for design, construction and removal of formwork and supervision as described in this Section including properly supporting the members until the concrete is cured, set and hardened as required.

Where the contract unit rate for formwork is specially provided as a separate item in the contract, it shall include the cost of all materials, labour, tools and plant required for design, construction and removal of formwork and supervision as described in this Section including properly supporting the members until the concrete is cured, set and hardened as required.

a)	Walls, piers, abutments, columns and vertical faces of structural members	12 to 48 hours as may be decided by the Engineer
b)	Soffits of Slabs (with props left under)	3 days
c)	Props left under slabs	14 days
d)	Soffits of Girders (with props left under)	7 days
e)	Props (left under girders)	21 days

The above time schedule is applicable when ordinary Portland Cement is used without any admixtures at an ambient temperature exceeding 10°C.

For concrete made with Portland pozzolona cement, Portland slag cement or mineral admixtures, additional cube samples shall be taken for verifying the strength of concrete to decide the time of de shuttering.

Where there are re-entrant angles in the concrete sections, the formwork should be removed at these sections as soon as possible after the concrete has set, in order to avoid cracking due to shrinkage of concrete.

Additional precautions as given in Clause 8.17 of IRC: 87, shall also be followed.

#### **1509 RE-USE OF FORMWORK**

When the formwork is dismantled, its individual components shall be examined for damage and damaged pieces shall be removed for rectification. Such examination shall always be carried out before their use again. Before re-use all components shall be cleaned of deposits of soil, concrete or other unwanted materials. Threaded parts shall be oiled after cleaning.

All bent steel props shall be straightened before re-use. The maximum permissible deviation from straightness is 1/600 of the length. The maximum permissible axial loads in used props shall be suitably reduced depending upon their condition. The condition of the timber components, plywood and steel shuttering plates shall be examined closely for distortion and defects before re-use.

#### **1510 SPECIALISED FORMWORK**

Specialised formwork such as slipform, floating caisson and travelling form, wherever used shall be designed and detailed by competent agencies and a set of complete working drawings and installation instructions supplied to the Engineer. In case proprietary equipment is used, the supplier shall furnish drawings, details, installation instructions etc, in the form of manuals along with the formwork.

##### **Section 1500 Formwork**

For slipform, the rate of climb of the formwork shall be designed for each individual case taking into account various parameters including the grade of concrete, concrete strength, concrete temperature, ambient temperature and concrete admixtures.

For floating caisson, the details of fabrication, floating to site and placing in position shall be as given in Clause 1203.5 of these Specifications.

In order to verify the time and sequence of striking/removal of specialised formwork, routine field tests for the consistency and strength development of concrete are mandatory.

For specialised formwork, the form lining material may be either plywood or steel sheet of appropriate thickness.

#### **1511 TESTS AND STANDARDS OF ACCEPTANCE**

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria. The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

#### **1512 MEASUREMENTS FOR PAYMENT**

Unless stated otherwise, the rate for concrete in plain concrete or reinforced concrete or prestressed concrete, shall be deemed to include all formwork required in accordance with this Section, which shall not be measured separately.

Where it is specifically stipulated in the Contract that the formwork shall be paid for separately, measurement of formwork shall be taken in square metres of the surface area of concrete which is in contact with formwork.

#### **1513 RATE**

The unit rate of plain concrete or reinforced concrete or prestressed concrete as defined in respective Sections of these Specifications, shall be deemed to cover the costs of all formwork and staging, including cost of all materials, labour, tools and plant required for

design, construction and removal of formwork and supervision as described in this Section including properly supporting the members until the concrete is cured, set and hardened as required.

Where the contract unit rate for formwork is specially provided as a separate item in the contract, it shall include the cost of all materials, labour, tools and plant required for design, construction and removal of formwork and supervision as described in this Section including properly supporting the members until the concrete is cured, set and hardened as required.

## **1600 STEEL REINFORCEMENT**

### **1601 DESCRIPTION**

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.

### **1602 GENERAL**

Steel for reinforcement shall meet the requirements of Section 1000 of these Specifications. Reinforcements may be either mild steel or high strength deformed bars. They may be uncoated or coated with epoxy.

### **1603 PROTECTION OF REINFORCEMENT**

Uncoated reinforcing steel shall be protected from rusting or chloride contamination. Reinforcements shall be free from rust, mortar, loose mill scale, grease, oil or paints. This may be ensured either by using reinforcement fresh from the factory or by thoroughly cleaning it using any suitable method such as sand blasting, mechanical wire brushing etc., as directed by the Engineer. Reinforcements shall be stored above the ground in a clean and dry condition, on blocks, racks or platforms and shall be suitably marked to facilitate inspection and identification.

Portions of uncoated reinforcing steel and dowels projecting from concrete, shall be protected within one week after initial placing of concrete, with a brush coat of neat cement mixed with water to a consistency of thick paint. This coating shall be removed by lightly tapping with a hammer or other tool not more than one week before placing of the adjacent pour of concrete. Coated reinforcing steel shall be protected against damage to the coating. If the coating on the bars is damaged during transportation or handling and cannot be repaired, the same shall be rejected.

In case of fusion bonded epoxy coated reinforcement or hot dipped galvanized bars used, reference shall be made Clause 1010.3.2 of Section 1000 of these specifications.

### **1604 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.

#### **Section 1600 Steel Reinforcement**

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.

Bars shall not be bent or straightened in a manner that will damage the parent material or the coating.

Bars bent during transport or handling shall be straightened before being used on work. They shall not be heated to facilitate straightening.

## 1605 PLACING OF REINFORCEMENT

a) The reinforcement cage should generally be fabricated in the yard at ground level and then shifted and placed in position. The reinforcement shall be placed strictly in accordance with the drawings and shall be assembled in position only when the structure is otherwise ready for placing of concrete. Prolonged time gap between assembling of reinforcement and casting of concrete, which may result in rust formation on the surface of the bars, shall not be permitted.

b) Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.

c) Bars shall be kept in position usually by the following methods:

i) In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover, shall be placed between the bars and formwork, subject to satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer, provided they have the same strength and specification as those of the member.

ii) In case of dowels for columns and walls, the vertical reinforcement shall be kept in position by means of timber templates with slots cut in them accurately, or with cover blocks tied to the reinforcement. Timber templates shall be removed after the concreting has progressed upto a level just below their location.

iii) Layers of reinforcements shall be separated by spacer bars at approximately one metre intervals. The minimum diameter of

$$CE = C + \frac{Mn}{6} + \frac{Cr+Mg+V}{5} + \frac{Ni+Cu}{15}$$

is 0.4 or less.

1606.2.3 The method of welding shall conform to IS:2751 and IS:9417, any supplemental specifications and Clause 1904.8 of these Specifications to the satisfaction of the Engineer. Welding may be carried out by metal arc welding process. Oxy-acetelene welding shall not be permissible. Any other process may be used subject to the approval of the Engineer and necessary additional requirements to ensure satisfactory joint performance. Precautions on overheating, choice of electrode, selection of correct current in arc welding etc., should be strictly observed.

All bars shall be butt welded except for smaller diameter bars (diameter of less than 20 mm) which may be lap welded. Single-V or Double-V butt joints may generally be used. For vertical bars single bevel or double bevel joints may be used.

Welded joints shall be located well away from bends and shall be not less than twice the bar diameter away from a bend.

Generally, shop welding in controlled conditions is to be preferred, where feasible. Site welding where necessary shall, however, be permitted when the facilities, equipment, process, consumables, operators and welding procedure, are adequate to produce and maintain uniform quality at par with that attainable in shop welding, to the satisfaction of the Engineer.

Joint welding procedures which are to be employed shall invariably be established by a procedure specification. All welders and welding operators to be employed shall be qualified by tests prescribed in IS:2751. Inspection of welds shall conform to IS:822 and destructive or non-destructive testing may be undertaken when deemed necessary. Joints with weld defects detected by visual inspection or dimensional check inspection, shall not 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. When welding is done in two or three stages, the surface shall be cleaned properly after each stage. Bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before carrying out welding. Only competent and experienced welders shall be employed on the work with the approval of the Engineer. No welding shall be done on coated bars.

M.S. electrodes used for welding shall conform to IS:814.

Steel Reinforcement Section 1600

**1606.2.4** Welded joints shall preferably be located at points where steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at anyone section, not more than 20 percent of the bars are welded.

**1606.2.5** Specimens of welded pieces of reinforcement taken from the site, shall be tested. The number and frequency of tests shall be as directed by the Engineer.

### **1606.3 Mechanical Couplers and Anchorages**

#### **1606.3.1 Mechanical Couplers**

Bars may be joined with approved patented mechanical devices as indicated on the drawing or as approved by the Engineer e.g. by special grade steel sleeves swaged on to bars in end to end contact or by screwed couplers. In case such devices are permitted by the Engineer, they shall develop at least 125 percent of the characteristic strength of the reinforcement bar.

#### **1606.3.2 Anchorages**

Bars may be anchored with approved patented mechanical anchorages as indicated on the drawing or as approved by the Engineer. The anchorages shall be connected to the reinforcing bar by the use of taper thread system. The anchorage shall be capable of developing the characteristic strength of reinforcement without damage to concrete and shall have sufficient diameter and width to develop adequate shear cone strength. The connection shall develop 125% of the characteristic strength of reinforcement bar.

### **1607 TESTING AND ACCEPTANCE**

The material shall be tested in accordance with relevant IS specifications and necessary test certificates shall be furnished. Additional tests, if required, will be got carried out by the Contractor at his own cost.

The supply, fabrication and placing of reinforcement shall be in accordance with these Specifications and shall be as checked and accepted by the Engineer.

Manufacturer's test certificate regarding compliance with Indian Standards for each lot of steel, shall be obtained and submitted to the Engineer. If required by the Engineer, the Contractor shall carry out confirmatory tests in the presence of a person authorized by the Engineer. Cost of these tests shall be borne by the Contractor. The sampling and testing procedure shall be as laid down in IS:1786. If any test piece selected from a lot fails, no re-testing shall be done and the lot shall be rejected.

### **1608 MEASUREMENT FOR PAYMENT**



Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the

### **Section 1600 Steel Reinforcement**

weight of reinforcement shall be calculated in tonnes on the basis of IS:1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing, shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

#### **1609 RATE**

The contract unit rate for coated/uncoated reinforcement shall cover the cost of material, royalty, fabricating, transporting, storing, bending, placing, binding and fixing in position as shown on the drawings and as per these Specifications and as directed by the Engineer, including all labour, equipment, supplies, incidentals, sampling, testing and supervision.

The unit rate for coated reinforcement shall be deemed to also include cost of all material, labour, tools and plant, royalty, transportation and expertise required to carry out the coating work as well as sampling, testing and supervision required for the work.

### **1700 STRUCTURAL CONCRETE**

#### **1701 DESCRIPTION (M-15)**

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.

#### **1702 MATERIALS**

All materials shall conform to Section 1000 of these Specifications.

#### **1703 GRADES OF CONCRETE**

1703.1 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 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
M20	M20		20
	M25		25
	M30	M30	30
	M40	M35	35
	M45	M40	40
	M50	M45	45
		M50	50
		M55	55
		M60	60
		M65	65
		M70	70
		M75	75
		M80	80
		M85	85
		M90	90

1. Normal Mix Concrete is made on the basis of nominal mix proportioned by weight of its main ingredients - cement, coarse and fine aggregates and water

2. Standard concrete is made on the basis of design mix proportioned by weight of its ingredients, which in addition to cement, aggregates and water, may contain chemical admixtures to achieve certain target values of various properties in fresh condition, achievement of which is monitored and controlled during production by suitable tests. Generally, concrete of grades up to M50 are included in this type.
3. High Performance Concrete is similar to standard concrete but contains additional one or more mineral admixtures providing binding characteristics and partly acting as inert filler material which increases its strength, reduces its porosity and modifies its other properties in fresh as well as hardened condition. Concrete of grades upto M90 are included in this type.
4. For concrete of grades higher than M90, the design parameters may be obtained from specialized literature and experimental results.

**1703.2** The minimum grades of concrete and corresponding minimum cement content and maximum water/cement ratios for different exposure conditions shall be as indicated in Table 1700-2.

**1703.3** For concrete subjected to sulphate attack the minimum grades of concrete, minimum cement content and maximum water/cement ratios and types of cement for different concentration of sulphate content shall be as indicated in Table 1700-3.

**Table 1700-2 : 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

**Note:**

Note: i) All three provisions given in the above table for a particular exposure condition, shall be satisfied. ii)  
iii)

The term cement for maximum w/c ratio and minimum cement content shown in Table includes all cementitious materials mentioned in Clause 1715.2. The maximum limit of flyash and ground granulated blast furnace slag in the blended cement shall be as specified in 18:1489 (Part 1) and 18:455 respectively. For plain cement concrete, with or without surface reinforcement, the minimum grade of concrete can be lowered by 5 MPa and maximum water/cement ratio exceeded by 0.05.

Cement content shown in the above table shall be increased by 40 kg/m<sup>3</sup> for use of 12.50 mm nominal size aggregates and decreased by 30 kg/m<sup>3</sup> for use of 40 mm nominal size aggregates.

**Table 1700-3 : Requirement of Concrete Exposed to Sulphate Attack**

Class	Concentration of Sulphates as SO <sub>3</sub>			Type of Cement (Note ii)	Minimum Cement Content, kg/m <sup>3</sup>	Maximum Water / Cement Ratio	Minimum Grade of Concrete
	In Soils		In Ground Water, g/l				
	Total SO <sub>3</sub> , %	SO <sub>3</sub> in 2:1 Water: Soil Extract, g/l					
1)	Traces	< 1.0	< 0.3	-OPC, PPC or PSC	280	0.5	M25
2)	2.0 to 0.5	1.0 to 1.9	0.3 to 1.2	-OPC, PPC or PSC -SRPC	330	0.5	M25
3)	0.5 to 1.0	1.9 to 3.1	1.2 to 2.5	-SRPC, -PPC or PSC	330 350	0.5 0.45	M25 M30
4)	1.0 to 2.0	3.1 to 5.0	2.5 to 5.0	-SRPC	370	0.45	M35
5)	>2.0	>5.0	>5.0	-SRPC with protective coatings	400	0.4	M40

Note: If the requirements of maximum water/cement ratio, minimum grade of concrete and minimum cement content from other durability considerations as given in Table 1700-2 are more stringent than those given in this table, then the former will govern.

OPC: Ordinary Portland Cement, PPC: Portland Pozzolona Cement. PSC: Portland Slag Cement, SRPC: Sulphate Resisting Portland Cement.

The minimum cement content shall be as low as possible but not less than the quantities specified in Table 1700-2 and 1700-3.

The maximum cement content excluding any mineral admixtures (Portland cement component alone) shall not exceed 450 kg/cu.m.

**1703.4** Concrete used in any component or structure shall be specified by designation along with prescribed method of design of mix i.e. 'Design Mix' or 'Nominal Mix'. For all items of concrete, only design mix shall be used, except where nominal mix concrete is permitted as per drawing or by the Engineer. Nominal mix may be permitted only for minor bridges and culverts or other incidental construction, where strength requirements are upto M 20 only. Nominal mix may also be permitted for non-structural concrete or for screed below open foundations.

**1703.5** If the Contractor so proposes, the Engineer may permit the use of concrete of higher grade than that specified on the drawing, provided the higher grade concrete meets the specifications applicable. The additional cost of such higher grade concrete shall be borne by the Contractor

#### **1704 PROPORTIONING OF CONCRETE**

Prior to the start of construction, the Contractor shall design the mix in case of design mix concrete or propose nominal mix in case of nominal mix concrete, and submit to the Engineer for approval, the proportions of materials, including admixtures to be used. Water-reducing admixtures (including plasticisers or super-plasticisers) may be used at the Contractor's option, subject to the approval of the Engineer.

##### **1704.1 Requirements of Consistency**

The mix shall have the consistency which will allow proper placement and compaction in the required position. Every attempt shall be made to obtain uniform consistency. Slump test shall be used to measure consistency of the concrete.

The optimum consistency for various types of structures shall be as indicated in Table 1700-4, or as directed by the Engineer. The slump of concrete shall be checked as per IS:516.

**Table 1700-4 : Requirements of Consistency**

<b>Type</b>		<b>Slump (mm) (at the Time of Placing of Concrete)</b>
1	a) Structure with exposed inclined surface requiring low slump concrete to allow proper compaction	25
	b) Plain cement concrete	25
2	RGG structure with widely spaced reinforcements; e.g. solid columns, piers, abutments, footings, well steining	40-50
3	RGG structure with fair degree of congestion of reinforcement; e.g. pier and abutment caps, box culverts, well curb, well cap, walls with thickness greater than 300mm	50-75
4	RGG and PSG structure with highly congested reinforcements e.g. deck slab girders, box girders, walls with thickness less than 300 mm	75-125
5	Underwater concreting through tremie e.g. bottom plug, cast in-situ piling	150-200

Notwithstanding the optimum consistency indicated against Sl. No.1 to 3, the situation should be properly assessed to arrive at the desired workability with the adjustment of admixture in each case, where the concrete is to be transported through transit mixer and placed using concrete pump. Under these circumstances, the optimum consistency during placement for the items of work of Sl. No.1 to 3, can be considered ranging from 75 mm to 150 mm. This is, however, subject to satisfying the other essential criteria of strength, durability etc. and approval of the Engineer.

## **1704.2 Requirements for Design Mixes**

### **1704.2.1 Target Mean Strength**

Concrete Grade	Current Margin	Target Mean Strength (MPa)
M15	M10	25
M20	M10	30

### **1704.2.2 Trial Mixes**

The Contractor shall give notice to the Engineer to enable him to be present at the time of carrying out trial mixes and preliminary testing of the cubes. Prior to commencement of trial mix design, all materials forming constituents of proposed design mix should have been tested and approval obtained in writing from the Engineer. Based on test results of material, draft mix design calculation for all grades of concrete to be used in the works, shall be

prepared after taking into account the provisions in the Contract Technical Specifications, Guidelines of IS:10262, IS:SP:23 and IRC:112 and submitted to the Engineer for approval. Prior to commencement of concreting, trial mix design shall be performed for all grades of concrete and trial mix which has been found successful, shall be submitted by the Contractor and approval obtained. During concreting with the approved trial mix design, if source of any constituents is changed, the mix design shall be revised and tested for satisfying the strength requirements. The initial trial mixes shall be carried out in a laboratory approved by the Engineer. However, Engineer may permit the initial trial mixes to be prepared at the site laboratory of the Contractor, if a full fledged concrete laboratory has been established well before the start of construction, to his entire satisfaction. Sampling and testing procedures shall be in accordance with these Specifications.

When the site laboratory is utilized for preparing initial mix design, the concrete production plant and means of transport employed to make the trial mixes shall be similar to those proposed to be used in the works. For each trial mix, a set of six cubes shall be made from each of three consecutive batches for purposes of testing. Three cubes from each set of six shall be tested at an age of 28 days and three at an earlier age approved by the Engineer. The cubes shall be made, cured, stored, transported and tested in accordance with these Specifications. The mean strength of the nine cubes at 28 days shall exceed the specified characteristic strength by the current margin minus 3.5 MPa.

#### **1704.2.3 Control of Strength of Design Mixes**

##### **a) Adjustment to Mix Proportions**

Adjustment to mix proportions arrived at in the trial mixes, shall be made subject to the Engineer's approval, in order to minimize the variability of strength and to maintain the target mean strength. Such adjustments shall not be taken to imply any change in the current margin.

##### **b) Change of Current Margin**

When required by the Engineer, the Contractor shall recalculate the current margin in accordance with Clause 1704.2.1. The recalculated value shall be adopted as directed by the Engineer, and it shall become the current margin for concrete produced thereafter.

##### **c) Additional Trial Mixes**

In case any changes are observed in the properties of fresh concrete and/or strength of hardened concrete on the basis of early age tests, additional mixes and tests shall be carried out during production, so as to control and bring the quality of concrete within acceptable limits. In case of any change in the source or properties of materials, the design of mix shall be established afresh.

##### **Requirements of Nominal Mix Concrete**

Requirements for nominal mix concrete unless otherwise specified shall be as given in Table 1700-6.

**Table 1700-6 : Requirements for Nominal Mix Concrete**

Table 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

#### 1704.4 Additional Requirements

Concrete shall meet any other requirements as specified on the drawing or as directed by the Engineer. The overall limits of deleterious substances in concrete shall be as follows:

a) Total acid soluble chloride content in the concrete mix expressed as chloride ions shall not exceed the following values by mass of cement.

Prestressed concrete -----0.10 percent

Reinforced concrete (in severe, very severe or extreme exposure condition) 0.20 percent

Reinforced concrete in moderate exposure condition-----0.30 percent

b) The total water soluble sulphate content of the concrete mix expressed as SO<sub>3</sub> shall not exceed 4 percent by mass of cement in the mix.

For concrete made with Portland pozzolona cement, Portland blast furnace slag cement or mineral admixtures, the setting time and rate of gain of strength are different from those for concrete made with OPC alone. Such modified properties shall be taken into account while deciding the de-shuttering time, curing period, early age loading and time of pressurising. Additional cube samples may be required to be taken for verifying the concrete properties.

#### 1704.5 Suitability of Proposed Mix Proportions

The Contractor shall submit the following information for the Engineer's approval:

a) Nature and source of each material

b) Quantities of each material per cubic metre of fully compacted concrete

c) Either of the following:

i) Appropriate existing data as evidence of satisfactory previous performance for the target mean strength, current margin, consistency and water/cement ratio and any other additional requirement (s) as specified.

ii) full details of tests on trial mixes.

d) Statement giving the proposed mix proportions for nominal mix concrete

Any change in the source of material or in the mix proportions shall be subject to the Engineer's prior approval.

#### 1704.6 Checking of Mix Proportions and Water/Cement Ratio

In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement per bag as given by the manufacturer is accepted, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stock at site and not by bag, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or

weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

The specified water/cement ratio shall always be kept constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined as frequently as possible, the frequency for a given job being determined by the Engineer according to the weather conditions. The amount of water to be added shall then be adjusted to compensate

#### **1704.7 Grading of Aggregates for Pumped Concrete**

Materials for pumped concrete shall be batched consistently and uniformly. Maximum size of aggregate shall not exceed one-third of the internal diameter of the pipe.

The grading of aggregates shall be continuous and shall have sufficient ultra fine materials (material finer than 0.25 mm). Proportion of fine aggregates passing through 0.25 mm shall be between 15 and 30 percent and that passing through 0.125 mm sieve shall not be less than 5 percent of the total volume of aggregate. Admixtures to increase workability can be added. When pumping long distances and in hot weather, set-retarding admixtures can be used. Fluid mixes can be pumped satisfactorily after adding plasticisers and super plasticisers. Suitability of concrete shall be verified by trial mixes and by performing pumping test.

### **1705 ADMIXTURES**

#### **1705.1 Chemical Admixtures**

Chemical admixtures such as superplasticisers, or air entraining, water reducing, accelerating and retarding agents for concrete, may be used with the approval of the Engineer.

As the selection of an appropriate concrete admixture is an integral part of the mix design, the manufacturers shall recommend the use of any one of their products only after obtaining complete information of all the actual constituents of concrete as well as methodologies of manufacture, transportation and compaction of concrete proposed to be used in the work. Admixtures/additives conforming to IS:91 03 may be used subject to approval of the Engineer. However, admixtures/additives generating hydrogen or nitrogen and containing chlorides, nitrates, sulphides, sulphates or any other material likely to adversely affect the steel or concrete, shall not be permitted.

The general requirements for admixtures are given in Clause 1007 of these Specifications.

Compatibility of the admixtures with the cement and any other pozzolona or hydraulic addition shall be ensured by avoiding the following problems

- i) Requirement of large dosage of superplasticiser for achieving the desired workability,
- ii) Excessive retardation of setting,
- iii) Excessive entrainment of large air bubbles,
- iv) Unusually rapid stiffening of concrete,
- v) Rapid loss of slump
- vi) Excessive segregation and bleeding.

#### **1705.2 Mineral Admixtures**

For use of mineral admixtures, refer Clauses 1714.1 and 1715.2.

### **1706 SIZE OF COARSE AGGREGATES**

The size (maximum nominal) of coarse aggregates for concrete to be used in various components shall be as given in Table 1700-7.

Table 1700-7 : Maximum Nominal Size of Coarse Aggregates

Components	Maximum Nominal Size of Coarse Aggregate (mm)
i) RCC well curb	20
ii) RCC/PCC well steining	40
iii) Well cap or Pile Cap Solid type piers and abutments	40
iv) RCC work in girder, slabs wearing coat, kerb, approach slab, hollow piers and abutments, pier/abutment caps, piles	20
v) PSC Work	20
vi) Any other item	As specified by the Engineer

Maximum nominal size of aggregates shall also be restricted to the smaller of the following values:

- a) 10 mm less than the minimum lateral clear distance between individual reinforcements
- b) 10 mm less than the minimum clear cover to the reinforcement
- c) One quarter of minimum thickness of member

The proportions of the various individual sizes of aggregates shall be so adjusted that the grading produces the densest mix and the grading curve corresponds to the maximum nominal size adopted for the concrete mix.

### 1707 EQUIPMENT

Unless specified otherwise, equipment for production, transportation and compaction of concrete shall be as under:

#### a) Production of Concrete:

- i) For overall bridge length of less than 200 m - batch type concrete mixer, diesel or electric operated, with a minimum size of 200 litres automatic water measuring system and integral weigher (hydraulic/pneumatic type).
- ii) For overall bridge length of 200 m or more - concrete batching and mixing plant fully automatic, with minimum capacity of 15 cum per hour.

All measuring devices of the equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be checked over the range in use, when set up at each site and thereafter, periodically as directed by the Engineer.

The accuracy of the measuring devices shall fall within the following limits:

Measurement of Cement	:	± 3 percent of the quantity of cement in each batch
Measurement of Water	:	± 3 percent of the quantity of water in each batch
Measurement of Aggregate	:	± 3 percent of the quantity of aggregate in each batch
Measurement of Admixture	:	± 3 percent of the quantity of admixture in each batch

#### b) Transportation of Concrete:

- i) Concrete dumpers



- ii) Powered hoists
- iii) Chutes
- iv) Buckets handled by cranes
- v) Transit truck mixer
- vi) Concrete pump
- vii) Concrete distributor booms
- viii) Belt conveyor
- ix) Cranes with skips
- x) Tremies

c) For Compaction of Concrete :

- |                       |   |
|-----------------------|---|
| i) Internal vibrators | size 25 mm to 70 mm                           |
| ii) Form vibrators    | minimum 500 watts                             |
| iii) Screed vibrators | full width of carriageway<br>(upto two lanes) |

## **1708 BATCHING, MIXING, TRANSPORTING, PLACING AND COMPACTION**

### **1708.1 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.

### **1708.2 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 stock piles. The materials should be stock piled 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.

The water/cement ratio shall always be maintained constant at its correct value. To this end, determination of moisture content in both fine and coarse aggregates shall be made as frequently as possible, depending on weather conditions. The amount of added water shall be adjusted to compensate for any observed variations in the moisture content. To allow for the variation in mass of aggregate due to variation in moisture content, suitable adjustment in the mass of aggregate, shall also be made. Accurate control shall be kept on the quantity of mixing water, which when specified, shall not be changed without approval.

### **1708.3 Mixing Concrete**

#### **1708.3.1 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.

Mixing shall be continued till materials are uniformly distributed, a uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall mixing be done for less than 2 minutes. It shall be ensured that the mixers are not loaded above their rated capacities and are operated at a speed recommended by the manufacturer. When mineral admixtures are added at the mixing stage, their thorough and uniform blending with cement shall be ensured, if necessary by longer mixing time. The addition of water after the completion of the initial mixing operation, shall not be permitted.

Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch and also before changing from one type of cement to another.

#### **1708.3.2 Ready Mix Concrete**

Use of ready mix concrete proportioned and mixed off the project site and delivered to site in a freshly mixed and unhardened state conforming to IS:4926, shall be allowed with the approval of the Engineer.

#### **1708.4 Transporting Concrete**

Mixed concrete shall be transported from the place of mixing to the place of final deposit as rapidly as possible by methods which will prevent the segregation or loss of the ingredients. The method of transporting or placing of concrete shall be approved by the Engineer. Concrete shall be transported and placed as near as practicable to its final position so that no contamination, segregation or loss of its constituents materials take place.

Concrete may be transported by transit mixers or properly designed buckets or by pumping. Transit mixers or other hauling equipment when used should be equipped with the means of discharge of concrete without segregation. During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to be reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted.

When concrete is conveyed by chute, the plant shall be of such size and design as to ensure practically continuous flow. Slope of the chute shall be so adjusted that the concrete flows without excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork.

In case concrete is to be transported by pumping, the fresh concrete should have adequate fluidity and cohesiveness to be pumpable. Proper concrete mix proportioning and initial trials should ensure this. The conduit shall be primed by pumping a batch of mortar through the line to lubricate it. Once the pumping is started, it shall not be interrupted, as concrete standing idle in the line is liable to cause plug. The operator shall ensure that some concrete is always there in the pump's receiving hopper during operation. The lines shall always be maintained clean and free of dents.

Pipelines from the pump to the placing area shall be laid with minimum bends. For large quantity placements, standby pumps shall be available. Suitable air release valves, shutoff valves etc. shall be provided as per site requirements. The pumping of priming mix i.e. rich

mix of creamy consistency, to lubricate the concrete pump and pipelines, shall precede the pumping of concrete. Continuous pumping shall be done to the extent possible. After concreting, the pipelines and accessories shall be cleaned immediately. The pipes for pumping shall not be made of material which has adverse effect on concrete. Aluminium alloy pipelines shall not be used.

#### **1708.5 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.

No concrete shall be placed in any part of the structure until the approval of the Engineer has been obtained. If concreting is not started within 24 hours of the approval being given, the approval shall have to be obtained again from the Engineer. Concreting shall proceed continuously over the area between the construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes, unless a proper construction joint is formed.

The concrete shall be deposited as nearly as practicable in its original position to avoid rehandling. Methods of placing should be such as to preclude segregation. Care should be taken to avoid displacement of reinforcement or movement of formwork. To achieve this, concrete should be lowered vertically in the form and horizontal movement of concrete inside the forms should, as far as practicable, be minimised.

The concrete shall be placed and compacted before its initial setting so that it is amenable to compaction by vibration. The workability of concrete at the time of placement shall be adequate for the compaction equipment to be used. If there is considerable time gap between mixing and placing of concrete, as in the case of ready mixed concrete plants or off-site batching and mixing plants, concrete mix shall be designed to have appropriately higher workability at the time of discharge from the mixer, in order to compensate the loss of workability during transit. This is generally achieved by suitable chemical admixtures. Keeping these considerations in view, the general requirement for ready mixed concrete plants or off-site batching and mixing plants, is that concrete shall be discharged from the truck mixer within two hours of the time of loading. A longer period may be permitted if suitable retarding admixtures are used.

In wall forms, drop chutes attached to hoppers at the top should preferably be used to lower concrete to the bottom of the form. As a general guidance, the permissible free fall of concrete may not exceed 1.5 metres and under no circumstances shall it be more than 2 metres. When free fall of larger height is involved, self compacting concrete having adequate fluidity, cohesiveness and viscosity and which uniformly and completely fills every corner of the formwork by its own weight without segregation, shall be used.

Except where otherwise agreed to by the Engineer, concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm when internal vibrators are used and not more than 300 mm in all other cases.

Concrete when deposited shall have temperature of not less than 5°C and preferably not more than 30°C and in no case more than 40°C. In case of site mixing, fresh concrete shall be placed and compacted in its final position within 30 minutes of its discharge from the mixer. When the concrete is carried in properly designed agitator operating continuously, the concrete shall be placed and compacted within 1 hour of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. It may be necessary to add

retarding admixtures to concrete, if trials show that the periods indicated above are unacceptable. In all such matters, the Engineer's decision shall be final.

#### **1708.6 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. Over-vibration shall be avoided to minimize the risk of forming a weak surface layer. When external vibrators are used, the design of formwork and disposition of vibrator shall be such as to ensure efficient compaction and to avoid surface blemishes. Vibrations shall not be applied through reinforcement and where vibrators of immersion type are used, contact with reinforcement and all inserts like ducts etc., shall be avoided.

When internal vibrators are used, they shall be inserted vertically to the full depth of the layer being placed and ordinarily shall penetrate the layer below for a few centimetres. The vibrator should be kept in place until air bubbles cease escaping from the surface and then withdrawn slowly to ensure that no hole is left in the concrete, care being taken to see that it remains in continued operation while being withdrawn. The internal vibrators shall be inserted in an orderly manner and the distance between insertions should be about one and half times the radius of the area visibly affected by vibration. Additional vibrators in serviceable condition shall be kept at site so that they can be used in the event of breakdown.

Mechanical vibrators used shall comply with 18:2502, 18:2506, 18:2514 and 18:4656.

#### **1709 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, but if joints in aggressive zones cannot be avoided, they should be sealed. Joints should be located away from the regions of maximum stress caused by loading; particularly where shear and bond stresses are high. In beams and slabs joints should not be near the supports. Construction joints between slabs and ribs in composite beams, shall be avoided. For box girders, there shall be no construction joint between the soffit and webs.

Joints should be either vertical or horizontal. For a vertical construction joint, the lifts of concrete shall finish level or at right angles to the axis of the member. Concreting shall be continued right up to the joint.

Before resuming work at a construction joint when concrete has not yet fully hardened, all laitance shall be removed thoroughly. The surface shall be roughened, taking care to avoid dislodgement of coarse aggregates. Concrete shall be brushed with a stiff brush soon after casting, while the concrete has only slightly stiffened. If the concrete has partially hardened, it may be treated by wire brushing or with a high pressure water jet, followed by drying with an air jet, immediately before the new concrete is placed. Fully hardened concrete shall be

treated with mechanical hand tools or grit blasting, taking care not to split or crack aggregate particles. The practice of first placing a layer of mortar or grout when concreting joints, shall be avoided. The old surface shall be soaked with water, without leaving puddles, immediately before starting concreting. The new concrete shall be thoroughly compacted against it.

Where there is likely to be a delay before placing the next concrete lift, protruding reinforcement shall be protected. In all cases, where construction joints are made, the joint surface shall not be contaminated with release agents, dust, or sprayed curing membrane and reinforcement shall be firmly fixed in position at the correct cover.

The sequence of concreting, striking of forms and positioning of construction joints for every individual structure, shall be decided well in advance of the commencement of work.

### **1710 CONCRETING UNDER WATER**

When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of mix to be used, shall be got approved from the Engineer before any work is started.

Concrete shall not be placed in water having a temperature below 5°C. The temperature of the concrete, when deposited, shall not be less than 16°C, nor more than 30°C.

Coffer dams or forms shall be sufficiently tight to ensure still water conditions, if practicable, and in any case to reduce the flow of water to less than 3 m per minute through the space into which concrete is to be deposited. Coffer dams or forms in still water shall be sufficiently tight to prevent loss of mortar through the joints in the walls. Pumping shall not be done while concrete is being placed, or until 24 hours thereafter. To minimise the formation of laitance, care shall be exercised not to disturb the concrete as far as possible while it is being deposited.

All under water concreting shall be carried out by tremie method only. The number and spacing of the tremies should be worked out to ensure proper concreting. However, it is necessary to have a minimum number of 2 tremies for any concreting operation, so that even if one of the tremies goes out of commission during concreting, the other one can be used to complete the work. The tremie concreting when started, should continue without interruption for the full height of the member being concreted. The capacity of the concrete production and placement equipment should be sufficient to enable the underwater concreting to be completed uninterrupted within the stipulated time.

The top section of the tremie shall have a hopper large enough to hold one full batch of the mix or the entire contents of the transporting bucket, as the case may be. The tremie pipe shall not be less than 200 mm in diameter and shall be large enough to allow a free flow of concrete and strong enough to withstand the external pressure of the water in which it is suspended, even if a partial vacuum develops inside the pipe. Preferably, flanged steel pipe of adequate strength shall be used. A separate lifting device shall be provided for each tremie pipe with its hopper at the upper end. Unless the lower end of the pipe is equipped with an approved automatic check valve, the upper end of the pipe shall be plugged with a wadding of gunny sacking or other approved material before delivering the concrete to the tremie pipe through the hopper, so that when the concrete is forced down from the hopper to the pipe, it will force the plug (and along with it any water in the pipe) down the pipe and out of the bottom end, thus establishing a continuous stream of concrete. It will be necessary to raise the tremie slowly in order to allow a uniform flow of concrete. At all times after placing of concrete is started and until all the required quantity has been placed, the lower end of

the tremie pipe shall be kept below the surface of the plastic concrete and shall not be taken out of concrete. This will cause the concrete to build up from below instead of flowing out over the surface and thus avoid formation of layers of laitance. It is advisable to use retarders or suitable superplasticizers to retard the setting time of concrete, which shall be established before the commencement of work.

## **1711 CONCRETING IN EXTREME WEATHER**

### **1711.1 Concreting in Cold Weather**

Where concrete is to be deposited at or near freezing temperature, precautions shall be taken to ensure that at the time of placing, it has a temperature of not less than 5°C and that the temperature shall be maintained above 4°C until the concrete has hardened. When necessary, concrete ingredients shall be heated before mixing but cement shall not be heated artificially other than by the heat transmitted to it from other ingredients of the concrete. Stockpiled aggregate may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or on sheet metal over fire. In general, the temperature of aggregates or water shall not exceed 65°C. Salt or other chemicals shall not be used for the prevention of freezing. No frozen material or materials containing ice shall be used. All concrete damaged by frost shall be removed. Concrete exposed to freezing weather shall have entrained air and the water content of the mix shall not exceed 30 litres per 50 kg of cement. To counter slower setting of concrete, accelerators can be used with the approval of the Engineer. However, accelerators containing chloride shall not be used.

### **1711.2 Concreting in Hot Weather**

When depositing concrete in hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 30°C while placing. This shall be achieved by using chilled mixing water, using crushed ice as a part of mixing water, shading stock piles of aggregates from direct rays of the sun, sprinkling the stock piles of coarse aggregate with water to keep them moist, limiting temperature of cement below 30°C at the time of use, starting curing before concrete dries out and restricting time of concreting as far as possible to early mornings and late evenings. When ice is used to cool mixing water, it will be considered as part of the water in design mix. Under no circumstances shall the mixing operation be considered complete until all ice in the mixing drum has melted. The Contractor will be required to state his methodology for the Engineer's approval when temperatures of concrete are likely to exceed 30°C during the work.

## **1712 PROTECTION AND CURING**

### **1712.1 General**

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.
- g) Vibration caused by traffic including construction traffic.

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.

#### **1712.2 Water Curing**

Water for curing shall be as specified in Section 1000 of these specifications.

Sea water shall not be used for curing. Sea water shall not come into contact with concrete members before they have attained adequate strength.

The concrete should be kept constantly wet by ponding or covering or use of sprinklers/perforated pipes for a minimum period of 14 days after concreting, except in the case of concrete with rapid hardening cement, where it can be reduced to 5 days. Water should be applied on surfaces after the final set. Curing through watering shall not be done on green concrete. On formed surfaces, curing shall start immediately after the forms are stripped. The concrete shall be kept constantly wet with a layer of sacking, canvas, hessian or similar absorbent material.

#### **1712.3 Steam Curing**

Where steam curing is adopted, it shall be ensured that it is done in suitable enclosure to contain the live steam in order to minimize moisture and heat losses. The initial application of the steam shall be after about four hours of placement of concrete to allow the initial set of the concrete to take place.

Where retarders are used, the waiting period before application of the steam shall be increased to about six hours.

The steam shall be at 100 percent relative humidity to prevent loss of moisture and to provide excess moisture for proper hydration of the cement. The application of steam shall not be directly on the concrete. Steam curing is applied in enclosures or tunnels through which concrete members are transported on a conveying system. Alternatively, portable enclosures or plastic covers are placed over precast members and steam is supplied to the enclosures. The rate of increase or decrease of temperature should not be more than 1 DoC to 20°C per hour and the maximum temperature shall be about 70°C. The maximum temperature shall be maintained until the concrete has attained the desired strength required at the end of steam curing period and shall be decided by prior trials. When steam curing is discontinued, the air temperature shall not drop at a rate exceeding 1 DoC per hour, until a temperature of about 1 DoC above the ambient temperature outside has been reached. Steam curing of concrete shall be followed by water curing for at least 7 days. The concrete shall not be exposed to temperatures below freezing for at least six days after curing.

#### **1712.4 Curing Compound**

Membrane forming curing compounds consisting of waxes, resins, chlorinated rubbers etc. may be permitted by the Engineer in special circumstances. Curing compounds shall not be used on any surface which requires further finishing to be applied. All construction joints shall be moist cured and no curing compound shall be permitted in locations where concrete surfaces are required to be bonded together.

Liquid membrane forming compounds shall conform to ASTM C 309 and the curing efficiency shall be as per ASTM C 156.

Curing compounds shall be continuously agitated during use. All concrete cured by this method shall receive two applications of the curing compound. The first coat shall be applied immediately after acceptance of concrete finish. If the surface is dry, the concrete shall be saturated with water and curing compound applied as soon as the surface film of water disappears. The second application shall be made after the first application has set. Placement in more than two coats may be required to prevent streaking. The membrane formed shall be stripped off after 14 days, when curing is complete. Impermeable membranes, such as sheet materials for curing concrete conforming to ASTM C 171 or polyethylene sheeting

covering closely the concrete surface, may also be used to provide effective barrier against evaporation.

### **1713 FINISHING**

Immediately after the removal of forms, exposed bars or bolts, if any, shall be cut inside the concrete member to a depth of at least 50 mm below the surface of the concrete and the resulting holes filled with cement mortar. All fins caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners, and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar. The mortar shall be of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry a consistency as possible. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been pointed shall be kept moist for a period of twenty four hours. Special pre-packaged proprietary mortars shall be used where appropriate or where specified in the drawing.

All construction and expansion joints in the completed work shall be left carefully tooled and free from any mortar and concrete. Expansion joint filler shall be left exposed for its full length with clean and true edges.

Immediately on removal of forms, the concrete work shall be examined by the Engineer before any defects are made good. The work that has sagged or contains honeycombing to an extent detrimental to structural safety or architectural appearance of the member, shall be rejected. Surface defects of a minor nature may be accepted. On acceptance of such work, the same shall be rectified as directed by the Engineer.

### **1714 CONCRETE WITH BLENDED CEMENTS OR MINERAL ADMIXTURES**

#### **1714.1 Production of Concrete**

In order to improve the durability of the concrete, use of blended cement or blending of mineral admixtures, is permitted. The maximum limit of flyash and ground granulated blast furnace slag in concrete, shall be as specified in Clause 1715.2. Blending at site shall be permitted only through a specific facility with complete automated process control to achieve the specified design quality or through RMC plants with similar facility.

#### **1714.2 Modified Properties**

For concrete made with Portland Pozzolona Cement, Portland Blast furnace slag cement or mineral admixtures, the setting time and rate of gain of strength are different from those of concrete made with OPC alone. Cognizance of such modified properties shall be taken in deciding de-shuttering time, initial time of prestressing, curing period and for early age loading.

#### **1714.3 Compatibility of Chemical Admixtures**



Compatibility of chemical admixtures and superplasticizers with Portland Pozzolona cement, Portland blast furnace slag cement and mineral admixtures shall be ensured by trials outlined in Clause 1705.

#### **1714.4 Additional Tests**

In addition to the strength tests prescribed in other Sections of these Specifications, the following additional tests are required to be carried out from considerations of durability.

### **1715 HIGH PERFORMANCE CONCRETE**

#### **1715.1 General**

##### **i) Rapid Chloride Ion Permissibility Test**

Rapid Chloride Ion permeability test on as per ASTM C 1202 at 56 days for extreme, very severe and severe conditions of exposure. The permissible value of Chloride-ion permeability for extreme condition 800 Coulombs very severe condition 1200 coulombs and severe exposure condition 1500 coulombs.

##### **ii) Water Permeability Test**

Water permeability test as per DIN: 1048 Part 5-1991 shall be carried out as described in Clause 1717.2.5.5.

### **HIGH PERFORMANCE CONCRETE**

#### **General**

High Performance Concrete shall be used where special performance requirements of high strength, high early strength, high workability, low permeability and high durability for severe service environments, are required. Production and use of such concrete in the field shall be carried out with high degree of uniformity between batches and very stringent quality control.

#### **1715.2 Materials**

Cement, mineral admixtures, chemical admixtures, aggregates and water shall conform to Section 1000 of these Specifications and this Section.

Flyash when used, shall neither be less than 20 percent nor shall be greater than 35 percent of the total by mass of ordinary Portland cement and flyash and shall conform to grade-1 of IS:3812.

Ground granulated blast furnace (GGBS) slag when used, shall neither be less than 50 percent nor greater than 70 percent of the total mass of ordinary Portland cement and GGBS and shall conform to IS:12089.

Silica fume conforming to IS: 15388 shall be used.

The cement content of concrete inclusive of any mineral admixtures shall not be less than 380 kg/m<sup>3</sup>. The cement content excluding any mineral admixtures (Portland cement content alone) shall not exceed 450 kg/m<sup>3</sup>. The water/cement (cement plus all cementitious materials) ratio should generally not exceed 0.33 but in no case shall be more than 0.40.

#### **1715.3 Compatibility of Admixtures**

Compatibility of the superplasticiser and admixtures with the cement and any other Pozzolanic or hydraulic dilutes shall be ensured by trials as outlined under Clause

#### **1715.4 Characteristic Strength and Target Mean Strength**

Characteristic strength and the initial target mean strength of concrete, shall be as given in Table 1700-8.

The target mean strength shall be calculated as per Clause 1704.2 after obtaining data on standard deviation from sufficient samples.

Table 1700-8 : Characteristic Compressive Strength and Target Mean Strength

Grade Designation	Specified Characteristic Compressive Strength at 28 days (MPa)	Target Mean Strength (MPa)
M 40	40	52
M 45	45	58
M 50	50	63
M 55	55	69
M 60	60	74
M 65	65	80
M 70	70	85
M 75	75	90
M 80	80	95
M85	85	101
M90	90	106

### 1715.5 Workability and Other Requirements

Workability, concrete mix design, field trial mixes, chloride and sulphate contents shall be as laid down in other Sections of these Specifications.

### 1715.6 Mixing of Concrete

The concreting plant and means of transportation employed to make trial mixes and to transport them to representative distances shall be similar to the corresponding plant and transport to be used in the works. The optimum sequence of mixing of ingredients shall be established by trials. Mixing time may be longer than in normal grade concrete mixes.

The temperature of concrete at the time of placement shall not exceed 25°C. The temperature of concrete at the mixing stage should be lower, to allow for rise in temperature during transport. When considerable distance of transport is involved, particular attention should be paid to ensure retention of slump as targeted for placement.

### 1715.7 Prototype Testing

Mock-up trials or prototype testing may be carried out to ensure that the concrete can be satisfactorily placed and compacted, taking into account the location of placement and provision of reinforcement, and required adjustments made in concrete mix design and/or detailing of reinforcement.

### 1715.8 Curing of Concrete

High performance concrete containing silica fume is more cohesive than normal mixes hence, there is a little or no bleeding and no bleed water to rise to the surface to offset water loss due to evaporation. Plastic shrinkage cracking is possible, if curing is not proper. Initial curing should commence soon after initial setting of concrete. Concrete should be covered with moist covers, opaque colour plastic sheets or suitable curing compound. Final moist curing should commence after final setting of concrete and continue for at least 14 days.

### 1715.9 Additional Tests for Concrete

Apart from the strength tests prescribed in other Sections of these Specifications, the additional tests as specified under Clause 1714.3, shall also be carried out.

### 1716 TOLERANCES

Tolerances for dimensions/shape of various components shall be as indicated in these Specifications or shown on the drawings or as directed by the Engineer.

### 1717 TESTS AND STANDARDS OF ACCEPTANCE

**1717.1** Concrete shall conform to the surface finish and tolerance as prescribed in these Specifications for respective components.

**1717.2** Random sampling and lot by lot acceptance inspection, shall be made for the 28 days cube strength of concrete.

**1717.3** 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:

**1717.4**

- i) No individual lot shall be more than 30 cU.m 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.

**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.

Where automated batching plant/Ready Mixed Concrete Plant is located away from the place of use and the time gap between production and placement is more than the initial setting time or where any ingredients are added subsequent to mixing, separate sets of samples shall be collected and tested at batching plant and at location of placement. The results shall be compared and used to make suitable adjustment at batching plants so that properties of concrete at placement are as per the requirements.

**1717.5 Test Specimen and Sample Strength**

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or for any other purpose.

The test strength of the sample shall be the average of the strength of 3 cubes. The individual variation should not be more than  $\pm 15$  percent of the average. If variation is more, the test results of the sample are invalid.

**1717.6 Frequency**

The minimum frequency of sampling of concrete of each grade shall be in accordance with Table

Table 1700-9 : Minimum Frequency of Sampling

Quantity of Concrete in Work, m <sup>3</sup>	No. of Samples
1 – 5	1
6 – 15	2
16 – 30	3
31 – 50	4
51 and above	4 plus one additional sample for each additional 50 m <sup>3</sup> or part thereof

At least one sample shall be taken from each shift of work.

## **1717.7 Acceptance criteria**

### **1717.7.1 Compressive Strength**

#### **1) Cubes**

The concrete shall be taken as having the specified compressive strength when both the following conditions are met:

- a) The mean strength determined from any group of four consecutive non-overlapping samples exceeds the specified characteristic compressive strength by 3 MPa.
- b) Strength of any sample is not less than the specified characteristic compressive strength minus 3 MPa.

The quantity of concrete represented by the test results include the batches from which the first and last samples were taken, together with all intervening batches.

#### **2) Cores**

When the concrete does not satisfy both the conditions given in (1) above, representative cores shall be extracted from the hardened concrete for compression test in accordance with the method described in IS: 1199 and tested to establish whether the concrete satisfies the requirement of compressive strength.

Evaluation of compressive strength by taking cores may also be done in case of doubt regarding the grade of concrete used either due to poor workmanship or based on results of cube strength tests.

The locations from which core samples are to be taken and their number shall be decided so as to be representative of the whole of the concrete under consideration. However, in no case shall fewer than three cores be tested. Cores shall be prepared and tested as described in

IS:516. Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength of the grade of concrete specified for the corresponding age and no individual core has strength less than 75 percent of the specified strength.

### **1717.7.2 Chloride and Sulphate Content**

The total chloride and sulphuric anhydride (SO<sub>3</sub>) content of all the constituents of concrete as a percentage of mass of cement in the mix, shall not exceed the values given in this Section.

### **1717.7.3 Density of Fresh Concrete**

Where minimum density of fresh concrete is specified, the mean of any four consecutive non-overlapping samples shall not be less than the specified value and any individual sample result shall not be less than 97.5 percent of the specified value.

### **1717.7.4 Density of Hardened Concrete**

Where minimum density of hardened concrete is specified, the mean of any four consecutive non-overlapping samples shall not be less than the specified value and any individual sample result shall not be less than 97.5 percent of the specified value.

### **1717.7.5 Permeability Test**

Water permeability test as per DIN:1048 Part 5-1991 shall be carried out as described below:

- i) A cylindrical test specimen 150 mm dia and 160 mm high shall be prepared.

- ii) After 28 days of curing, the test will be conducted between 28 and 35 days. The test specimen shall be fitted in a machine such that specimen can be subjected to a water pressure of up to 7 bars. A typical machine is shown in Appendix-1700/1.
- iii) The concrete specimen shall be subjected to a water pressure of 0.5 N/mm<sup>2</sup> from the top for a period of 3 days. The pressure shall be maintained constant throughout the test period. If the water penetrates through to the underside of the specimen, the test may be terminated and the specimen rejected as failed.
- iv) After 3 days, the pressure shall be released and the sample shall be taken out. The specimen shall be split in the middle by compression applied on two round bars on opposite sides above and below.
- v) When the split faces show signs of drying (after 5 to 10 minutes), the maximum depth of penetration in the direction of height shall be measured with the scale and extent of water penetration established.
- vi) The mean of maximum depth of penetration obtained from three specimens thus tested, shall be taken as the test result and it shall not exceed 25 mm.

**1717.7.6** If the concrete is not able to meet any of the standards of acceptance as prescribed, the effect of such deficiency on the structure shall be investigated by the Contractor as directed by the Engineer. The Engineer may accept the concrete as sub-standard work. Any additional work required by the Engineer for such acceptance, shall be carried out by the Contractor at his cost. In case the concrete is not found to be acceptable even after investigation, the Contractor shall remove the rejected concrete forthwith.

**1717.7.7** When durability of concrete is desired the rapid chloride ion permeability test as stated under Clause 1714.3.1 shall also be performed in addition to above tests.

#### **1718 MEASUREMENTS FOR PAYMENT**

Structural concrete shall be measured in cubic metres. In reinforced or prestressed concrete, the volume occupied by reinforcement or prestressing cables and sheathing shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab.

#### **1719 RATE**

The contract unit rate for structural concrete shall cover costs of all materials, labour, tools, plant and equipment required for mixing, transporting and placing in position, vibrating and compacting, finishing and curing as per this Section or as directed by the Engineer, including all incidental expenses, sampling and testing, quality assurance and supervision. Unless mentioned separately as an item in the contract, the contract unit rate for concrete shall also include the cost of providing, fixing and removing formwork required for concrete work as per Section 1500 of these Specifications.

If the concrete is found to be acceptable by the Engineer as sub-standard work, the Contractor shall be subjected to reduction in his contract unit rate. For deficiency in compressive strength of concrete when accepted by the Engineer, the reduction in rate shall be applied as under

$$\text{Percentage reduction in rate} = \frac{\text{Design Strength} - \text{Observed Strength}}{\text{Design Strength}} \times 100$$

#### **2100 Open Foundation**

The work shall cover furnishing and providing plain or reinforced concrete foundation placed in open excavation, in accordance with the drawings and these Specifications or as directed by the Engineer.

**2102 MATERIALS** Materials shall conform to Section 1000 of these Specifications.

### **2103 GENERAL**

A method statement indicating the following shall be submitted by the Contractor for approval of the Engineer, well in advance of the commencement of construction of open foundation:

- i) Sources of materials
- ii) DeSign, erection and removal of formwork
- iii) Production, transportation, laying and curing of concrete
- iv) Personnel employed for execution and supervision
- v) Tests and sampling procedures
- vi) Equipment details
- vii) Quality Management System to be adopted including Quality Manual
- viii) Any other relevant information

#### **2104.1 Preparation of Foundations**

Excavation for laying the foundation shall be carried out in accordance with Section 300 of these Specifications. The last 300 mm of excavation shall be done just before laying of lean concrete below foundation. Excavation shall be made only to the exact depth as shown on the drawing. In the event of excavation having been made deeper than that shown on the drawing or as ordered by the Engineer, the extra depth shall be made up with M 10 concrete in case of foundation resting on soil and with concrete of the same grade as that of the foundation, in case of foundation resting on rock. This shall be done at the cost of the Contractor and shall be considered as incidental to the work.

Open foundations shall be constructed in dry conditions and the Contractor shall provide for Where light blasting is required for excavation in rock or other hard strata, the same shall be carried out in accordance with Clause 302 of these Specifications. Where blasting is likely to endanger adjacent foundations or other structures, controlled blasting with all necessary precautions shall be resorted to.

#### **2104.2 Setting Out**

The plan dimensions of the foundation shall be set out at the bottom of foundation trench and checked with respect to original reference line and axis.

#### **2104.3 Construction**

- i) Excavation for open foundations shall be carried out in accordance with Section 300 of these Specifications. For guidance regarding safety precautions to be taken, IS:3764 may be referred.
- ii) For foundation resting on soil, a layer of MiD concrete of minimum thickness 100 mm shall be provided above the natural ground to provide an even surface to support the foundation concrete. Before laying of lean concrete layer, the earth surface shall be cleaned of all loose material and wetted. Care shall be taken to avoid muddy surface. If any part of the surface has become muddy due to over-wetting, the same shall be removed. If required, the MiD concrete may be laid to a thickness of more than 100 mm, as per the direction of the Engineer. No construction joint shall be provided in the lean concrete. For foundations resting on rock, the rock surface shall be cleaned of any loose material and then levelled with a layer of concrete of the same grade as that of the foundation, so as to provide an even surface.

- iii) No point of the surface of the lean concrete, in the case of foundation on soil or the surface of hard rock, in the case of foundation on hard rock, shall be higher than the founding level shown on the drawing or as ordered by the Engineer. Levels of the surface shall be taken at intervals of not more than 3 metres centre-to-centre in each direction, subject to a minimum of nine levels on the surface.
- iv) No formwork is necessary for the lean concrete layer. Side formwork shall be used for foundation concrete work. When concrete is laid in slope without top formwork, the slump of the concrete shall be carefully maintained to ensure that compaction is possible without slippage of freshly placed concrete down the slope. In certain cases it may be necessary to build the top formwork progressively as the concreting proceeds up the slope. Reinforcement shall be laid as shown on the drawing.
- v) Before laying foundation concrete, the lean concrete or hard rock surface shall be cleaned of all loose material and lightly moistened. Foundation concrete of required dimensions and shape shall be laid continuously up to the location of construction joint shown on the drawing or as directed by the Engineer.
- vi) The concrete surface shall be finished smooth with a trowel. The location of construction joint and its treatment shall be done as per requirements of Section 1700 of these Specifications. Formwork shall not be removed earlier than 24 hours after placing of concrete. Where formwork has been provided for top surface, the same shall be removed as soon as concrete has hardened. Curing of concrete shall be carried out by wetting of formwork before removal. After its removal, curing shall be done by laying not less than 100 mm thickness of loose moistened sand free from clods or gravel, over the concrete. The sand shall be kept continuously moist for a period of 7 days. Before backfilling is commenced, the loose sand shall be removed and disposed of as directed by the Engineer.
- vii) Normally, open foundations shall be laid dry. Where dewatering is necessary for laying of concrete, it shall be carried out adopting any one of the following methods or any other method, approved by the Engineer:
- a) A pit or trench of suitable size, deeper than the founding level as necessary, is dug beyond the foundation excavation so that the water flows into it and the excavated surface at founding level is fully drained.
- b) Water table is depressed by well point system or other methods.
- c) Steel/concrete caissons or sheet piling are used for creating an enclosure for the foundations, which can subsequently be dewatered.
- No pumping of water shall be permitted from the time of placing of concrete up to 24 hours after placement.
- viii) In situations where foundations cannot be laid dry or where percolation is too heavy to keep foundation strata dry, concrete may be laid under water only by tremie. In case of flowing water or artesian spring, the flow shall be stopped or reduced to the feasible extent at the time of placing the concrete.
- ix) Where blasting is required, it shall be carried out in accordance with Section 300 of these Specifications, observing all precautions indicated therein. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as controlled blasting, providing rubber mat cover to prevent flying of debris etc., shall be taken to prevent any damage.

x) All spaces excavated and not occupied by the foundations or other permanent works shall be refilled with earth up to surface of surrounding ground with sufficient allowance for settlement. All backfill shall be thoroughly compacted and in general, its top surface shall be neatly graded. Backfilling shall be in accordance with Section 300 of these Specifications. xi) In case of excavation in rock, the annular space around the footing shall be filled with M 15 concrete up to the level of top of rock. Filling with M 15 concrete shall also be carried out for excavations having depth up to 1.5 m in ordinary rock or 0.6 m in hard rock. In case, the excavations are even deeper so as to require further filling up to the level of top of rock, the same shall be done by boulders grouted with cement.

xii) Protective works, where provided shall be completed before the onset of floods so as to avoid the risk of the foundation getting undermined.

## **2105 TESTS AND STANDARDS OF ACCEPTANCE**

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

## **2106 TOLERANCES**

a) Variation in dimensions : +50 mm, -10 mm b) Misplacement from specified position in plan : 15 mm c) Surface unevenness measured with 3 m straight edge : 5 mm d) Variation of levels at the top :  $\pm 25$  mm

## **2107 MEASUREMENT FOR PAYMENT**

Excavation in foundation shall be measured in cubic metres in accordance with Section 300 of these Specifications, based on the quantity ordered or as shown on the drawing.

Lean concrete shall be measured in cubic metres in accordance with Section 1700 of these Specifications, based on the quantity ordered or as shown on the drawing.

Concrete in foundation shall be measured in cubic metres in accordance with Section 1700 of these Specifications, based on the quantity ordered or as shown on the drawing.

Reinforcement steel shall be measured in tonnes in accordance with Section 1600 of these Specifications, based on the quantity ordered or as shown on the drawing.

## **2108 RATE**

The contract unit rates for excavation in foundation, lean concrete, including dewatering and blasting where required, concrete in foundation and reinforcement steel shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing open foundation as mentioned in this Section and as show on the drawings.

## **2200 SUBSTRUCTURE**

### **2201 DESCRIPTION**

The work shall cover furnishing and providing masonry or reinforced concrete substructure in accordance with the drawings and as per these Specifications or as directed by the Engineer.

### **2203 GENERAL**

**2203.1** A method statement for construction indicating the following shall be submitted by the Contractor for approval of the Engineer, well in advance of the commencement of substructure:

i) Sources of materials,



- ii) Design, erection and removal of formwork,
- iii) Production, transportation, laying and curing of concrete,
- iv) Personnel employed for execution and supervision,
- v) Tests and sampling procedures,
- vi) Equipment details,
- vii) Quality Management System to be adopted including Quality Manual
- viii) Safety measures
- ix) Any other relevant information.

## **2204 PIERS AND ABUTMENTS**

**2204.1** For concrete piers, horizontal construction joints shall be avoided as far as possible, by pouring the entire required concrete in one operation. Where construction

**2204.5** The surface finish shall be smooth, except on the earth face of abutments which shall be rough finished.

**2204.6** In case of abutments likely to experience considerable movement on account of earth pressure from backfill of approaches and settlement of foundations, the construction of the abutment shall be followed by filling up of embankment in layers to the full height to allow for the anticipated movement during construction. Casting of superstructure resting on the abutment shall be taken up only thereafter.

## **2209 MEASUREMENTS FOR PAYMENT**

**2209.1** Masonry in substructure shall be measured in cubic metres in accordance with Section 1300 or Section 1400 of these Specifications, based on the quantities ordered or as shown on the drawings.

**2209.2** Concrete in substructure shall be measured in cubic metres in accordance with Section 1700 of these Specifications, based on the quantity ordered or as shown on the drawings. No deduction shall be made for weep holes.

**2209.3** Steel in concrete of substructures shall be measured in tonnes, in accordance with Section 1600 of these Specifications, based on the quantity ordered or as shown on the drawings.

**2209.4** Weep holes shall be measured as per Section 2700 of these Specifications, based on the numbers provided or as shown on the drawings.

## **2210 RATE**

The contract unit rates for masonry, concrete, reinforcement and weep holes shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing substructure as mentioned in these Specifications and shown on the drawings.

## **2300 CONCRETE SUPERSTRUCTURE**

### **2301 DESCRIPTION**

The work shall cover furnishing and providing of concrete superstructure in accordance with the drawings and as per these Specifications or as directed by the Engineer.

### **2302 MATERIALS**

Materials shall conform to Section 1000 of these Specifications.

### **2303 GENERAL**

**2303.1** A method statement for construction, indicating the following, shall be submitted by the Contractor for approval of the Engineer, well in advance of the commencement of the construction of superstructure.

i) Sources of Materials ii) Design, erection and removal of formwork iii) Production, transportation, laying and curing of concrete iv) Prestressing system, if applicable v) Personnel employed for execution and supervision vi) Tests and sampling procedure vii) Equipment details viii) Quality Management System to be adopted including Quality Manual ix) Safety measures x) Any other relevant information

**2303.2** Dimensions, lines and levels shall be set out and checked with respect to permanent reference lines and permanent bench mark so that the completed superstructure is in full accordance with the drawings and as approved by the Engineer.

**2303.3** The formwork, steel reinforcement, structural concrete and prestressing for concrete superstructure shall conform to Section 1500, Section 1600, Section 1700 and Section 1800 respectively, of these Specifications.

**2303.4** Specifications with regard to some of the common types of concrete superstructure construction shall be as given in subsequent Clauses of this Section.

## **2304 REINFORCED CONCRETE CONSTRUCTION**

### **2304.1 Solid Slabs**

Where adjacent span of slab has already been cast, the expansion joint and filler board shall be placed abutting the already cast span, which shall form the shutter on that side of the new span to be cast. The reinforcement for the road kerb and railings embedded in the slab shall be tied in position before casting of slab. The entire slab shall be cast in one go. Where the slab is continuous over two spans or more, the entire span of the first slab and the length of the slab in the next adjacent span up to the point of contraflexure, shall be cast in one go, the same sequence of concreting being repeated for additional spans as required. No other construction joint shall be allowed except with the express permission of the Engineer. In very wide slabs, however, longitudinal construction joints may be permitted with the approval of the Engineer. Construction joints, if provided, shall be made in the prescribed manner as per Clause 1710 of these Specifications. The portions of solid slab near expansion joints shall be cast along with reinforcements and embedments for expansion joints. For this purpose, the portion of solid slab near expansion joints may be cast in a subsequent stage, if permitted by the Engineer.

Where wearing coat is required to be provided after the slab has been cast, the surface of the slab shall be finished rough, but true to lines and levels as shown on the drawings, before the concrete has hardened.

The top of the slab shall be covered with clean moist sand as soon as the surface has hardened. Curing shall be carried out as per Section 1700 of these Specifications.

If bearings are provided for the solid slab, the same shall be placed in position in accordance with the drawings, before casting of slab.

### **2304.2 RCC T-Beam and Slab**

Provision of construction joint shall conform to the drawings or as per directions of the Engineer. No construction joint shall be provided between the bottom bulb and the web. If not indicated on the drawing, construction joint may be provided at the junction of the web and the fillet between the web and the deck slab, with the approval of the Engineer.

The portions of deck slab near expansion joints shall be cast along with reinforcements and embedments for expansion joints. For this purpose, the portion of deck slab near expansion joints may be cast in a subsequent stage, if permitted by the Engineer.

The surface of the deck slab shall be finished rough but true to lines and levels as shown on the drawings before the concrete has hardened. Care shall be taken for setting of bearings as indicated on the drawings.

#### **2307.2 Cast In-Situ Superstructure**

- a) Variations in thickness of top and bottom slab for box girders, top and bottom flange for T-girders and slabs -----5 mm to +10 mm
- b) Variations in web thickness -----5 mm to +10 mm
- c) Variations in overall depth or width -----±5mm
- d) Variation in length overall and length between bearings-----5 mm to +10 mm shall not exceed  $\pm 10$  mm or  $\pm 0.1$  percent of the span length, whichever is less
- e) Permissible surface unevenness in 5 mm deck slab when measured with a 3 m straight edge or template

#### **2308 TESTS AND STANDARDS OF ACCEPTANCE**

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance

#### **2309 MEASUREMENT FOR PAYMENT**

Concrete in superstructure shall be measured in accordance with Section 1700, based on the quantity ordered or as shown on the drawings.

Steel reinforcement (untensioned) in superstructure shall be measured in accordance with Section 1600, based on the quantity ordered or as shown on the drawings.

High tensile steel (prestressing) in superstructure shall be measured in accordance with Section 1800, based on the quantity ordered or as shown on the drawings.

#### **2310 RATE**

The contract unit rates for concrete, steel reinforcement (untensioned) and high tensile steel (prestressing) shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing superstructure as mentioned in this Section and as shown on the drawings.

#### **2400 SURFACE AND SUBSURFACE GEOTECHNICAL INVESTIGATION**

##### **2401 DESCRIPTION**

**2401.1** The work shall cover investigation to determine the suitability or otherwise of the soil or rock to support the foundations of the bridge or other structure and also to determine soil parameters and rock characteristics required for the design of foundations by in-situ testing or testing of samples/cores taken from bores/drill holes. The subsurface investigation shall be carried out in such a way that the profiles of different types of soil for the entire length of the proposed structure are obtained and recorded. Other information to be obtained are mechanical and physical properties such as grain-size distribution, sensitivity, existence of deleterious material in soil or ground water, porosity of rock, subsidence due to mining, ground water level, artesian condition, likely sinking and driving effort and likely constructional difficulties.

**2401.2** The field work shall consist of excavation, drilling of boreholes for the purpose of collection of undisturbed and disturbed samples, standard penetration tests, insitu vane tests, static and dynamic cone penetration tests, other field tests, as specified by the Engineer and preparation of bore logs. It will also include collection, preservation and testing

of disturbed and undisturbed samples from boreholes, borrow pits, etc. as specified by the Engineer. All in-situ tests shall be supplemented by laboratory investigations. Relevant Indian Standards such as IS:1498, IS:1888, IS:1892, IS:2131, IS:2132, IS:2720, IS:4434 and IS:4968 and Annex 2 of IRC:78 shall be followed for guidance.

**2401.3** The soundings by dynamic method, where required shall be carried out in bore holes using a standard sampler as specified in IS:2131.

## **2402 EXTENT AND NUMBER OF BORES**

**2402.1** Investigations shall cover the entire length of the bridge and also extend on either side for a distance about twice the depth below bed of the last main foundation. Bores shall be taken at the location of each pier and abutment of the bridge. A minimum of two bores shall be taken in the approaches on either side, along the centre line of the alignment, at a distance of 50 m and 120 m behind the abutment positions. In case of viaducts in the approaches on either side of the bridge, bores shall be taken at the location of each foundation of the viaduct spans.

**2402.2** Where detailed investigation indicates appreciable variation or where variations in a particular foundation are likely to appreciably affect the construction (specially in case of bridge foundations resting on rock), it will be necessary to take additional bores in the transverse direction also, to establish complete profile of the underlying strata. The number of additional bores shall be decided depending upon the extent of variation in local geology at a particular foundation location and should cover the entire area of that foundation.

## **2403 DEPTH OF BORES**

**2403.1** The bores shall be taken below the proposed founding level to a depth of at least 1 Y. times the width of foundation. In case the soil at that level is found to be unsuitable or of doubtful bearing capacity, the depth of investigation below the proposed founding level, shall be extended to 4 times the width of foundation or till firm and stable soil or rock is met with. If rock is met with, the depth of drilling into rock having ROD more than 75, may be limited to 3 metres.

**2403.2** For embankments and guide bunds, the depth of bore should cover all strata likely to cause undesirable settlement affecting their stability. The depth of bore holes below the ground level may ordinarily be 2.5 times the maximum height of the embankment! guide bund, subject to a minimum of 20 m. However, borings can be terminated at shallower depths when firm strata or bed rock is encountered. Where highly compressible strata are encountered, the boring may have to be taken deeper. In order to ensure that firm strata is sufficiently thick, the boring should extend 3 metres into the firm strata.

## **2404 DETAILED INVESTIGATION**

**2404.1** The subsurface investigation for bridges shall be carried out in the following

- i) between bed level and up to anticipated maximum scour depth (below H.F.L.)
- ii) from the maximum scour depth to the founding level
- iii) from founding level to a depth of about 1 Y. times the width of the foundation

The data required to be obtained from each zone will cover soil classification, particle size distribution, shearing strength characteristics, compressibility and permeability as detailed in Table 1 of Annex 2 of IRC:78. In all cases, samples of soils shall be collected at every 1 m to 1.5 m depth or at change of strata.

**2404.2** For high embankments, the average shear stress of each strata below ground level and compressibility of clayey strata, if present, shall be ascertained. The location and depth of bore for undisturbed sampling, shall be such as to give information regarding boundaries

of the various strata. At least one representative undisturbed sample should be collected from each strata. When the homogeneous strata is very thick, one representative sample shall be collected for each 3 m thickness of the strata.

**2404.3** Whenever a change in the subsoil strata/rock profile is encountered during construction, further investigations shall be carried out to establish the correct data required for revised design of foundations, if necessary.

**2404.4** Logging of bore holes by radioactive methods for detailed investigations, if required, shall be done as specified in the contract or in special provisions.

**2404.5** For bridge works, the investigations shall be comprehensive enough to give the following information to the designer:

**2404.5**

- i) the engineering properties of the soil/rock,
- ii) the location and extent of soft layers, cavities and gas pockets, if any, under the hard founding strata,
- iii) the geological condition like type of rock, faults, fissures or subsidence due to mining, cavities, hollows, porosity etc.,
- iv) ground water level,
- v) artesian conditions, if any,
- vi) quality of water in contact with the foundation,
- vii) the depth and extent of scour,
- viii) suitable depth of foundation,
- ix) bearing capacity of the stratum
- x) probable settlement and differential settlement of the foundations,
- xi) likely sinking or driving effort, and
- xii) likely construction difficulties.

**2407 RECORDS OF BORINGS AND TRIAL PITS**

**2407.1** The field records for the preliminary and detailed investigation shall contain the date when the boring was made, the location of the boring with reference to a permanent system of co-ordinates and the elevation of the ground surface with respect to a permanent bench mark. They shall include elevation at which the water table and the upper boundary of each of the successive soil strata were encountered, the investigator's classification of the layer on the basis of general information obtained from field examination (refer to Appendix 2.1 of IRC:75) and the value of the resistance obtained by means of Standard Penetration Test. The type of tools used for borings shall be recorded. If the tools were changed at any stage, the depth at which the change was made and the reason therefore shall also be noted. Incomplete and abandoned borings shall be described with no less care than successfully completed ones. The notes shall contain everything of significance observed on the job such as the elevation at which wash water was lost from the hole.

**2407.2** For borings and trial pits, necessary information shall be given covering the following. A site plan showing the disposition of the bore holes shall also be attached:

- a) Agency
- b) Location with reference map
- c) Pit/Bore-hole number
- d) Reduced level (R.L.) of ground surface or other reference point
- e) Dates of starting and completion
- f) Name of supervisor

- g) Scales of plans and sections
- h) Description of methods such as hand tools, blasting, boring, etc. used for proceeding with investigation
- i) General description of strata met with the RLs at which they are met
- j) Position and altitude of contacts, faults, strong joint, slicken sides, etc.
- k) Inflow of water, methods of controlling the water, required capacity of pumps for dewatering
- l) The level at which subsoil water is met
- m) Dip and strike of bedding and of cleavage
- n) Visual description of strata
- o) Results of field tests e.g. SPT, in-situ vane shear test etc.
- p) Any other information and remarks.
- q) 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 upon removal of sampling tube.

## **2408 METHODS OF SAMPLING**

There are two types of samples viz. (a) Disturbed sample (b) Undisturbed sample. The usual methods for sampling conforming to IS:1892 and IS:2132 are given below:

2409

2409.1

Nature of Ground	Type of Sample	Method of Sampling
Soil	Disturbed	Hand Samples, Auger Samples, Shell Samples
	Undisturbed	Hand Samples, Tube Samples
Rock	Disturbed	Wash samples from Percussion or rotary drilling
	Undisturbed	Cores

## **2409 PROCEDURE FOR TAKING SAMPLES**

**2409.1** For proper identification of subsurface material, sample should be recovered containing all the constituents of the materials in their proper proportion. In clayey deposits, such samples could be collected by split spoon samplers. In sandy deposits, sampling spoons shall be fitted with suitable devices for retaining samples. All data required for soil identification (Appendix-2.1 of IRC:75) should be collected from the samples so extracted when undisturbed samples, are not available. Penetration test should be carried out with the standard splitspoon sampler or penetrometers if the soil is coarse grained. If the soil profile is known to be fairly regular, preliminary and detailed investigation may be combined. Tube samplers can be used in place of split spoon samplers for collecting samples in clayey strata.

### **2409.2 Disturbed Soil Samples**

**2409.2.1** Disturbed samples of soil shall be obtained in the course of excavation and boring. For procuring samples from below the ground water level, where possible, special type of sampler shall be used. Where Standard Penetration Test is conducted, representative samples shall be obtained from the split spoon. While collecting disturbed samples from borrow areas it shall be ensured that the samples collected represent all types of borrow materials to be used in the construction of embankment and subgrade

**2409.2.2** The size of sample generally required shall be as given in Table 2400-2.

Table 2400-2 : Size of Soil Sample Required

<b>S.No.</b>	<b>Purpose of Sample</b>	<b>Soil Type</b>	<b>Weight of Sample Required Kg</b>
1	Weight of Sample Required Kg content tests, mechanical analysis and index properties, chemical tests	cohesive soils sands & gravels	1 3
2	Compression tests	cohesive soils and sand	12.5
3	Comprehensive examination of construction material and borrow area soil including soil stabilization	cohesive soils sands gravelly soil	25-50 50-100

**2409.2.3** While taking out disturbed soil samples, Standard Penetration Test may also be conducted to find out the bearing capacity of the subsoils at specified levels.

#### **2409.3 Undisturbed Soil Samples**

**2409.3.1** The location of the bore-hole shall be as indicated on the drawing or given by the Engineer. The depth of the bore-hole shall be as indicated on the drawing or shall be governed by the criteria given therein or as directed by the Engineer.

**2409.3.2** Samples shall be obtained in such a manner that their moisture content and structure do not get altered. This may be ensured by use of correctly designed sampler and by careful preservation and packing.

**2409.3.3** Standard Penetration Test may have to be conducted in each case to obtain additional data as directed by the Engineer. In soft clay, in-situ vane shear test as per IS:4434 may have to be conducted. Where all the three operations have to be carried out in one layer, the sequence shall be as follows: undisturbed soil sampling, in-situ vane shear test, Standard Penetration Test.

**2409.3.4** For compression test samples, a core of 40 mm diameter and about 150 to 200 mm length may be sufficient, but for other laboratory tests, a core of 100 mm diameter and 300 mm length shall be taken unless otherwise specified by the Engineer.

**2409.3.5** The upper few millimeters of both types of sample shall be removed as the soil at the bottom of the bore hole usually gets disturbed by the boring tools.

#### **2409.4.2 Undisturbed Samples**

Block samples taken from the rock formation shall be dressed to a size of about 90 mm x 75 mm x 50 mm.

Cores of rock shall be taken by means of rotary drills fitted with a coring bit with core retainer, if warranted.

**2409.4.3** In case rock is met with at shallow depths, test pits or trenches may be dug. These are most dependable since they permit a direct examination of the surface, the weathered zone and discontinuities, if any. It is also possible to take representative samples for tests. For guidance, IS:4453 may be referred

#### **2410 PRESERVATION, HANDLING AND LABELLING OF SAMPLES**

**2410.1** The samples shall be labelled and handled carefully so that they are received in the laboratory in a fit state for examination and testing and can be correctly identified as coming from a specified trial pit or bore.

**2410.2** The disturbed material in the upper end of the tube shall be completely removed before applying wax for sealing. The length and type of material so removed should be recorded.

**2410.3** The soil at the lower end of the tube shall be reamed for a length of about 20 mm. After cleaning, both ends shall be sealed with wax applied in such a way that it does not enter the sample. Wax used for sealing should not be heated to more than a few degrees above its melting temperature. The empty space in the samplers, if any, should be filled with moist soil or saw dust and the ends covered with tight fitting caps.

**2410.4** Labels Giving the Following Information Should be Affixed to the Tubes:

- a) Job designation
- b) Sample location
- c) Boring number
- d) Tube number
- e) Sample number
- f) Depth
- g) Penetration
- h) Gross recovery ratio

The tube and boring numbers should be marked in duplicate.

The boring number and sample number should also be marked on a sheet of material which will not be affected by moisture and enclosed in the tube.

## **2700 WEARING COAT AND APPURTENANCES**

### **2701 DESCRIPTION**

The work shall include wearing coat and bridge appurtenances such as railing, crash barrier, approach slab, drainage spout and weep holes. The work shall be executed in conformity with details shown on the drawings and these specifications or as approved by the Engineer.

#### **2702.1 Bituminous Wearing Coat**

Bituminous wearing coat shall comprise of following types:

Bituminous Concrete 50 mm thick laid in single layer

Bituminous Concrete 40 mm thick overlaid with 25 mm thick mastic asphalt

Stone Matrix Asphalt 50 mm thick laid in single layer

Mastic Asphalt 50 mm thick laid in single layer

Before laying wearing coat the deck surface shall be thoroughly cleaned and tack coat shall be applied. The construction operations and bituminous mixes and tack coat shall conform to

### **2703 RAILING AND CRASH BARRIER**

General

- a) Bridge railing/crash barrier includes the portion of the structure erected on and above the kerb.
- b) Railing/crash barrier shall not be constructed until the centering false work for the span has been released and the span is self-supporting.
- c) For concrete with steel reinforcement, specifications for the items of controlled concrete and reinforcement mentioned under relevant Sections of these Specifications shall be applicable.
- d) The railing/crash barrier shall be carefully erected true to line and grade. Posts shall be vertical with a tolerance not exceeding 6 mm in 3 m. The pockets left for posts shall be filled with non-shrink mortar.
- e) The type of railing/crash barrier to be constructed shall be as shown on the drawings and shall conform to IRC:5 and IRC:6.



f) Care shall be exercised in assembling expansion joints in the railing/ crash barrier to ensure that they function properly.

g) The railing/crash barrier shall be of such design as to be amenable to quick repairs.

h) The material of metal railing/crash barrier shall be handled and stored with care, so that it remains clean and free from damage. Railing/crash barrier materials shall be stored above the ground on platforms, skids, or other supports and kept free from grease, dirt and other contaminants.

Any material which is lost, stolen or damaged after delivery shall be replaced or repaired by the Contractor. Methods of repairs shall be such that they do not damage the material or protective coating.

### **2703.2 Metal Railing/Crash Barrier**

Materials, fabrication, transportation, erection and painting for bridge railing/crash barrier shall conform to the requirements of Section 1900 of these Specifications

All steel railing elements, pipe terminal Sections, posts, bolts, nuts, hardware and other steel fittings shall be galvanised or painted with an approved paint.

If galvanised, all elements of the railing/crash barrier shall be free from abrasions, rough or sharp edges, and shall not be kinked, twisted or bent. If straightening is necessary, it shall be done as per method approved by the Engineer.

Damaged galvanised surfaces, edges of holes and ends of steel railing/crash barrier cut after galvanising shall be cleaned and re-galvanised.

The railing/crash barrier shall be carefully adjusted prior to fixing in place to ensure proper matching at abutting joints and correct alignment and camber throughout its length. Holes for field connections shall be drilled with the railing/crash barrier in place in the structure at proper grade and alignment.

Unless otherwise specified on the drawings, metal railing/crash barrier shall be given one shop coat of paint and three coats of paint after erection, if sections are not galvanised.

Railing/crash barrier shall follow the alignment of the deck. Where required as per the drawings, the rail elements shall be before erection.

### **2703.3 Cast In-Situ Concrete Railing/Crash Barrier**

The portion of the railing/crash barrier or parapet which is to be cast in-situ shall be constructed in accordance with the requirements for Structural Concrete Section and reinforcement conforming to Sections 1600 and 1700 of these Specifications.

Forms shall be fabricated conforming to the shape of railing/crash barrier shown on the drawings. It shall be ensured that no form joint appears on plane surfaces. For bridges/ viaducts of length more than 500 m horizontal slip forms shall be used for casting of crash barriers.

All mouldings, panel work and bevel strips shall be constructed according to the details shown on the drawings. All corners in the finished work shall be true, sharp and clean-cut and shall be free from cracks, spalls or other defects. Castings of posts shall be done in single pour.

### **2703.4 Precast Concrete Railing/Crash Barrier**

Precast members for railing/crash barrier shall be of reinforced cement concrete and shall conform to Sections 1600 and 1700 of these Specifications. The maximum size of the aggregate shall be limited to 12 mm and minimum concrete grade shall be M30 for railings and M40 for crash barriers. The precast members shall be removed from the moulds as soon as practicable and shall be kept damp for a period of at least 10 days, during which

they shall be protected from sun and wind. Any precast member that becomes chipped, marred or cracked before or during the process of placing shall be rejected

#### **2704 APPROACH SLAB**

Reinforced concrete approach slab with 12 mm dia bars at 150 mm clc in each direction both at top and bottom in M30 grade of concrete covering the entire width of the roadway, shall be provided as per details given on the drawings or as approved by the Engineer. Minimum length of approach slab shall be 3.5 m and minimum thickness 300 mm.

The cement concrete and reinforcement shall conform to Sections 1700 and 1600 respectively of these Specifications.

The approach slab shall rest on a base of 150 mm thick M15 grade concrete or as shown on the drawings or as directed by the Engineer

#### **2705 DRAINAGE SPOUTS**

Drainage along longitudinal direction shall be ensured by sufficient number of drainage fixtures embedded in the deck slab. The spouts shall be of not less than 100 mm in diameter and shall be of corrosive resistant material such as galvanised steel with suitable cleanout fixtures. The spacing of drainage spouts shall not exceed 10m. The discharge from drainage spout shall be kept away from the deck structure by means of suitable down pipes upto 500 mm above High Flood Level. In case of viaducts in urban areas, the drainage spouts should be connected with suitably located runners and down pipes to discharge the surface run-off into drains provided at ground level

##### **2705.1 Fabrication**

The drainage assembly shall be fabricated to the dimensions shown on the drawings. All materials shall be corrosion resistant;. Steel components shall be of mild steel conforming to IS:226. The drainage assembly shall be seam welded for water tightness and then hot-dip galvanised.

##### **2705.2 Placement**

The galvanised assembly shall be given two coats of bituminous paint before placement. The whole assembly shall be placed in true position, lines and levels as shown on the drawings with necessary cut outs in the shuttering for deck slab and held in place firmly. Where the reinforcements of the deck are required to be cut, equivalent reinforcements shall be placed at the corners of the cut out.

##### **2705.3 Finishing**

After setting of the deck slab concrete, the shrinkage cracks around the assembly shall be sealed with polysulphide sealant or bituminous sealant as per IS:1834 and the excess sealant trimmed to receive the wearing coat. After the wearing coat is completed, similar sealant shall be provided to cover at least 50 mm on the wearing coat surface all round the drainage assembly

#### **2706 WEEP HOLES**

Weep holes shall be provided on all plain concrete, reinforced concrete, brick masonry and stone masonry structures such as, abutment, wing wall and return walls as shown on the drawings or as directed by the Engineer to permit water to flow out without building up pressure in the back fill. Weep holes shall be provided with 100 mm diameter AC/PVC/HDPE pipe for structures in plain/reinforced concrete or brick masonry. In case of stone masonry, weep holes shall be of rectangular shape 80 mm wide, 150 mm high or circular with 150 mm diameter. Weep holes shall extend through the full width of concrete/masonry with slope of about 1 vertical: 20 horizontal towards the draining face. The

spacing of weep holes shall be 1 m in either direction or as shown in the drawings with the lowest at 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.

#### **2707 TESTS AND STANDARDS OF ACCEPTANCE**

The material shall be tested in accordance with these Specifications and shall meet the prescribed criteria and requirements.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

#### **2708 MEASUREMENTS FOR PAYMENT**

The measurement for payment for wearing coat, railing/crash barrier, approach slab, drainage spout and weep holes shall be made as under:

- i) Bituminous and cement concrete wearing coat shall be measured in cubic metres. Steel reinforcement in wearing coat shall be measured in tonnes.
- ii) Railing and metal beam crash barriers shall be measured in running metres.
- iii) For concrete crash barriers concrete shall be measured in cubic metres and steel shall be measured in tonnes.
- iv) Approach slab and its base shall be measured separately in cubic metres.
- v) Drainage spouts shall be measured in number
- vi) Weep holes in concrete/brick masonry structure shall be measured in numbers. For structures in stone masonry, weep holes shall be deemed to be included in the item of stone masonry work and shall not be measured separately

#### **2709 RATE**

The contract unit rate for wearing coat shall include the cost of all labour, material, tools and plant and other costs necessary for completion of the work as per these specifications.

The contract unit rate of railing and crash barrier shall include the cost of all labour, material, formwork, tools and plant required for completing the work as per these Specifications.

The contract unit rate for approach slab shall include the cost of all labour, material, tools and plant required for completing the work as per these Specifications. The rate for base shall include cost of all labour, material, tools and plant required, including preparation of surface and consolidation complete in all respects.

The contract unit rate for drainage spout shall include the cost of all labour, material, tools and plant required for completing the work as per these Specifications. It shall also include the cost of providing runners and down pipes with all fixtures upto 500 mm above high flood level or up to the drains at ground, as applicable or as shown on the drawings.

The contract unit rate for weep holes shall include the cost of all labour, material, tools and plant required for completing the work as per these Specifications.

***Specification for any other item if involved shall be governed by MoRTH and IRC-37(2013)&73***

***Specifications for Construction of Flexible Bitumen Pavements shall be governed by MORTH (5<sup>TH</sup> revision 2013) and CPWD Book of Specifications (latest Edition); in case the specifications are covered in both, the superior specifications shall be adopted.***

**Drawings**

*Please find the drawings in the Annexure attached at the end of this document.*

## **Environmental, social, health and safety requirements**

*The Environment and Social Management Plan is attached in the Annexure.*

## **PART 3 – Conditions of Contract and Contract Forms**

## General Conditions of Contract

### 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) Not used.
- (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 23.
- (d) Bank means the financing institution **named in the 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 Clause 42 hereunder.
- (g) The Completion Date is the date of completion of the Works as certified by the Project Manager, in accordance with GCC Sub-Clause 53.1.
- (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 Sub-Clause 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) Not used.
- (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 Project Manager upon correction of defects by the

Contractor.

- (p) The Defects Liability Period is the period named in the PCC pursuant to Sub-Clause 34.3 and calculated from the Completion Date.
- (q) Drawings means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract, 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) "In writing" or "written" means hand-written, type-written, printed or electronically made, and resulting in a permanent record;
- (u) The Initial Contract Price is the Contract Price listed in the Employer's Letter of Acceptance.
- (v) 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.
- (w) Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.
- (x) Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.
- (y) 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.
- (z) PCC means Particular Conditions of Contract.
- (aa) The Site is the area **defined as such in the PCC**.
- (bb) 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.

- (cc) Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.
- (dd) 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.
- (ee) 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.
- (ff) Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.
- (gg) A Variation is an instruction given by the Project Manager which varies the Works.
- (hh) 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, words indicating one gender include all genders. Words indicating the singular also include the plural and words indicating the plural also include the singular. 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) Agreement,
  - (b) Letter of Acceptance,
  - (c) Contractor's Bid & Priced Bill of Quantities,
  - (d) Particular Conditions of Contract,

- (e) General Conditions of Contract including Appendices,
- (f) Specifications,
- (g) Drawings,
- (h) Joint Venture Agreement [where applicable], and
- (i) 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**.

Salient features of major labour and other laws that are applicable to construction industry in India are given as Appendix 1 to these General Conditions of Contract.

- 3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in India when

(a) as a matter of law or official regulations, India prohibits commercial relations with that country; or

(b) 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, India prohibits any import of goods from that country or any payments to any country, person, or entity in that country.

### 4. Project Manager's Decisions

- 4.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

However, if the Project Manager is required, under the rules and regulations and orders of the Employer, to obtain approval of some other authorities for specific actions, he will so obtain the approval. Provided further that any requisite approval shall be deemed to have been given by the Employer for any such authority exercised by the Project Manager.

### 5. Delegation

- 5.1 Unless otherwise **specified in the PCC**, the Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may revoke any delegation after notifying the Contractor.

### 6. Communications

- 6.1 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. All oral instructions shall be confirmed in writing in seven working days.

- 7. Subcontracting**
- 7.1 The Contractor may subcontract with the approval of the Project Manager up to a ceiling **specified in PCC**, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.
- 7.2 The Project Manager should satisfy himself before recommending to the Employer whether:
- a) the circumstances warrant such sub-contracting; and,
  - b) the sub-Contractor so proposed for the Work possesses the experience, qualifications and equipment necessary for the job proposed to be entrusted to him in proportion to the quantum of Works to be sub-contracted.
- 7.3 If payments are proposed to be made directly to that sub-contractor, this should be subject to specific authorization by the prime contractor so that his arrangement does not alter the contractor's liability or obligations under the contract.
- 7.4 The Contractor shall not be required to obtain any consent from the Employer for:
- (a) the sub-contracting of any part of the Works for which the Sub-Contractor is already named in the contract;
  - (b) the provision for labour, or labour component, and,
  - (c) the purchase of materials which are in accordance with the standards specified in the contract.

*(Note: 1. All bidders are expected to indicate clearly in the bid, if they proposed sub-contracting elements of the works amounting to more than 10 percent of the Bid Price. For each such proposal the qualification and the experience of the identified sub-contractor in the relevant field should be furnished alongwith the bid to enable the Employer to satisfy himself about their qualifications before agreeing for such sub-contracting and include it in the contract. In view of the above, normally no additional sub-contracting should arise during execution of the contract.*

*2. However, [a] sub-contracting for certain specialized elements of the work is not unusual and acceptable for carrying out the works more effectively; but vertical splitting of the works for sub-contracting is not acceptable. [b] in any case, proposal for sub-contracting in addition to what was specified in bid and stated in contract agreement will not be acceptable if the value of such additional sub-contracting exceeds 25% of value of work which was to be executed by Contractor without sub-contracting.*

*3. Assignment of the contract may be acceptable only under exceptional*

*circumstances such as insolvencies/liquidation or merger of companies etc.)*

**8. Other  
Contractors**

- 8.1 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.

## 9. Personnel and Equipment

- 9.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid and **referred to in the PCC**, to carry out the Works 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.
- 9.2 The Project Manager may require the Contractor to remove from the Site of Works, a member of the Contractor's staff or his work force, who:
- (a) persists in any misconduct or lack of care,
  - (b) carries out duties incompetently or negligently,
  - (c) fails to conform with any provisions of the Contract, or
  - (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment.
- 9.3 If the Employer, Project Manager or Contractor determines, that any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with Clause 9.2 above
- 9.4 In all the above cases, the contractor shall ensure that the person leaves the site within seven days and has no further connection with the work in the contract. The Contractor shall appoint a suitable replacement within 28 days or earlier as may be agreed to between the Project manager and the Contractor.
- 9.5 The Contractor shall not employ any retired Gazetted officer who has either not completed two years after the date of retirement or has not obtained permission from the Government authorities for employment with the Contractor<sup>25</sup>.
- 9.6 The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport. The Contractor shall, if required by the Project Manager, deliver to the Project Manager a return in detail, in such form and at such intervals as the Project Manager may prescribe, showing the staff and the numbers of the several

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<sup>25</sup>Based on Government Directives.

classes of labour from time to time employed by the Contractor on the Site and such other information as the Project Manager may require.

**Compliance with  
Labour  
Regulations**

- 9.7 During continuance of the Contract, the Contractor and his Sub-Contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour laws (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law prevailing on the Base Date either by the State or the Central Government or the local authority. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contraventions including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Project Manager/ Employer shall have the right to deduct any money due to the Contractor including his amount of performance security and if applicable, the Environmental, Social, Health and Safety (ESHS) Performance Security. The Employer/ Project Manager shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.
- 9.8 The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.
- 9.9 The Contractor shall duly comply with the provisions of the Apprentices Act 1961 (III of 1961) and the rules made there under, and comply, failure or neglect to shall be subject to all liabilities and penalties provided in the said Act and Rules.

**10. Employer's  
and  
Contractor's  
Risks**

- 10.1 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.

**11. Employer's  
Risks**

- 11.1 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.

11.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

- (a) a Defect which existed on the Completion Date,
- (b) an event occurring before the Completion Date, which was not itself an Employer's risk, or
- (c) the activities of the Contractor on the Site after the Completion Date.

## **12. Contractor's Risks**

12.1 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.

- 13. Insurance**
- 13.1 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 [which are incorporated in works];
  - (b) loss of or damage to Construction 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.
- 13.2 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.
- 13.3 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.
- 13.4 Alterations to the terms of insurance shall not be made without the approval of the Project Manager.
- 13.5 Both parties shall comply with any conditions of the insurance policies.
- 14. Site Data**
- 14.1 The Contractor shall be deemed to have examined any Site Data **referred to in the PCC**, supplemented by any information available to the Contractor.
- 15. Contractor to Construct the Works including protection of environment, and assurance of public health and**
- 15.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings and as per instructions of Project Manager.
- 15.2.1 The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other cause arising as a consequence of his methods of operation.



<b>safety</b>	15.2.2 During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made thereunder, regulations, notifications and by-laws of the State or Central Government, or local authorities and other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority. Salient features of the major laws are given in Appendix 1 to the General Conditions of Contract.
<b>16 The Works to Be Completed by the Intended Completion Date</b>	16.1 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.
<b>17 Approval by the Project Manager</b>	<p>17.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, for his approval.</p> <p>17.2 The Contractor shall be responsible for design of Temporary Works.</p> <p>17.3 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.</p> <p>17.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.</p> <p>17.5 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.</p>
<b>18 Safety</b>	18.1 The Contractor shall be responsible for the safety of all activities on the Site.
<b>19 Discoveries</b>	19.1 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.
<b>20 Possession of the Site</b>	20.1 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 <b>stated in the PCC</b> , the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

- 21 Access to the Site**
- 21.1 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.
- 22 Instructions, Inspections and Audits**
- 22.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.
- 22.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and sub-consultants 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.
- 22.3 The Contractor shall permit and shall cause its Subcontractors and sub-consultants to permit, the Bank and/or persons appointed by the Bank to inspect the Site and/or the accounts and records relating to the performance of the Contract and the submission of the bid, and to have such accounts and records audited by auditors appointed by the Bank if requested by the Bank. The Contractor's and its Subcontractors' and sub-consultants' attention is drawn to Sub-Clause 25.1 which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under Sub-Clause 22.2 constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Bank's prevailing sanctions procedures).
- 23 Appointment of the Adjudicator**
- 23.1 The Adjudicator named in PCC 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.
- 23.1.1 The Adjudicator should be in position before "notice to proceed with work" is issued to the Contractor and an agreement should be signed with the Adjudicator jointly by the Employer and the Contractor in the form attached – Appendix 3.
- 23.2 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 **designated in the PCC** at the request of either party, within 14 days of receipt of such request.

## **24 Procedure for Disputes**

24.1 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.

24.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

24.3 The Adjudicator shall be paid daily 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 that decision 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.

24.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place **specified in the PCC**.

The Arbitrator(s) shall give a decision in writing within 120 days of start of the proceedings unless otherwise agreed to by the Parties. The Arbitrators shall entertain only those issues which have been earlier referred to the Adjudicator and either party is dissatisfied with the decision given by the Adjudicator.

## **25. Corrupt And Fraudulent Practices**

25.1 The Bank requires compliance with its policy in regard to corrupt and fraudulent practices as set forth in Appendix A to the GCC.

25.2 The Employer requires the Contractor to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the bidding process or execution of the Contract. The information shall be disclosed as and when such payments are made or agreed to, and compliance with the disclosure requirement shall be furnished, while submitting each monthly statement for payments; such disclosure must include at least the name and address of the agent or other party, the amount and currency, and the purpose

of the commission, gratuity or fee.

## **B. Time Control**

### **26. Program**

- 26.1 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 revised Program showing the general methods, arrangements, order, and timing for all the activities in the Works alongwith monthly cash flow forecasts.
- 26.2 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.
- 26.3 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.
- 26.4 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.

### **27. Extension of the Intended Completion Date**

- 27.1 The Project Manager shall extend the Intended Completion Date including milestones if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date as per agreed milestones without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.
- 27.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date/milestones 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/milestones.

- |  |  |
|--|--|
| <b>28. Acceleration</b>                          | <p>28.1 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.</p> <p>28.2 If the Contractor's priced proposals for acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.</p>   |
| <b>29. Delays Ordered by the Project Manager</b> | <p>29.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.</p>   |
| <b>30. Management Meetings</b>                   | <p>30.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. (Which will be held at the place <b>indicated in PCC</b>. The periodicity to be fixed by Project Manager / Contractor jointly). The business of a management meeting shall be to review the progress of construction with reference to the construction program given in accordance with GCC 26.1, the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.</p> <p>30.2 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.</p> |
| <b>31. Early Warning</b>                         | <p>31.1 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.</p> <p>31.2 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</p>   |

instruction of the Project Manager.

### **C. Quality Control**

#### **32. Quality Assurance**

- 32.1 The Contractor shall institute Quality Assurance (QA) and Quality Control (QC) systems in accordance with Quality Assurance Plan to demonstrate compliance with the requirements of the Contract as approved by the Project Manager.
- 32.2 Compliance with the QA/QC systems shall not relieve the Contractor of any of his duties obligations or responsibilities under the Contract.

#### **33. Tests**

- 33.1 The Contractor shall provide all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently.
- 33.2 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.

#### **34. Identifying and Correction of Defects**

- 34.1. The Project Manager shall check the Contractor's work and notify the Contractor of any defects that are found specifying a time by which it should be corrected. 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.
- 34.2 The contractor shall permit the Employer's Technical auditor to check the contractor's work and notify the Project Manager and Contractor of any defects that are found. Such a check shall not affect the Contractor's or the Project Manager's responsibility as defined in the Contract Agreement
- 34.3 The Project Manager shall give notice to the Contractor of any Defects [specifying a time limit by which it should be corrected] 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.
- 34.4 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.

**35. Uncorrected Defects**

- 35.1 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.

*Note: 1. Where in certain cases, the technical specifications provide for acceptance of works within specified tolerance limits at reduced rates, Project Manager will certify payments to Contractor accordingly.*

*2. Where the failure to correct a particular defect within the specified time is considered as a fundamental breach of contract a notice should be given to the contractor as stated in GCC 57.2(e).*

**D. Cost Control**

**36. Contract Price**

- 36.1 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.

**37. Changes in the Contract Price**

- 37.1 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 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change.
- (a) If the quantity of work executed exceeds the quantity of the item in BOQ beyond the higher specified limit the Project Manager shall fix the rate to be applied for the additional quantity of the work executed.
  - (b) If the quantity of work executed less than the quantity of the item in BOQ lesser than the lower specified limit, the Project Manager shall fix the rate to be applied for whole of the quantity of the work so executed.
- 37.2. The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Employer.
- 37.3 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.

### **38. Variations**

- 38.1 All Variations shall be included in updated Programs, produced by the Contractor.
- 38.2 The Contractor shall provide the Project Manager with a quotation (with breakdown of unit rates) 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.
- 38.3 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 Sub-Clause 37.1 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.
- 38.4 If the Contractor's quotation is unreasonable, [*or if contractor fails to provide the Project Manager with a quotation within a reasonable time specified by Project Manager in accordance with GCC38.2*] 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
- 38.5 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.
- 38.6 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

### **39. Cash Flow Forecasts**

- 39.1 When the Program, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall be in Indian Rupees.

### **40. Payment Certificates**

- 40.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the



cumulative amount certified previously alongwith details of measurement of the quantity of works executed in a tabular form approved by the Project Manager.

- 40.2 The Project Manager shall check the details given in the Contractor's monthly statement and within 14 days certify the amounts to be paid to the Contractor after taking into account any credit or debit for the month in question in respect of materials for the works in the relevant amount and under conditions set forth in GCC Sub-Clause 49.4 *[Secured Advance]*
- 40.3 The value of work executed shall be determined by the Project Manager after due check and measurement of the quantities claimed as executed by the contractor
- 40.4 The value of work executed shall comprise of the value of the quantities of work in the Bill of Quantities that have been completed;
- 40.5 The value of work executed shall include the valuation of Variations and Compensation Events.
- 40.6 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.

#### **41. Payments**

- 41.1 Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of contract & taxes to be deducted at source [TDS] as per applicable law. 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 upto the date when the late payment is made at the rate **stated in the PCC**.
- 41.2 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 at the rate stated in GCC 41.1 above, from the date upon which the increased amount would have been certified in the absence of dispute.
- 41.3 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.

**42. Compensation Events**

42.1 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 Sub-Clause 20.1.
- (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.

42.2 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.

42.3 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.

42.4 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.

#### **43. Tax**

43.1 The rates quoted by the Contractor shall be deemed to be inclusive of the VAT, Sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source [TDS] as per applicable law.

43.2 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the deadline for 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.

#### **44. Currencies**

44.1 All payments shall be made in Indian Rupees.

#### **45. Price Adjustment**

45.1 Contract price shall be adjusted for increase or decrease in rates and price of labour, materials, fuels and lubricants and other inputs to the works in accordance with the principles and procedures outlined below. A table of adjustment data is **included in the PCC** which indicates the coefficients of various inputs and the sources of indices for various schedules of BOQ. If the PCC does not include a table of adjustment data this sub clause shall not apply and there shall be no price adjustment.

(a) The price adjustment according to sub para (d) below,

shall apply for the work done from the start date given in the PCC upto the end of the Intended Completion Date. If there is delay in completion beyond such date for reasons attributable to the contractor, the Price Adjustment for the work carried out during such period, for reasons attributable to the Contractor, shall be regulated by sub-para (g) below.

- (b) The Contract Price shall be adjusted to take account of any increase or decrease in cost after the base date, which affect the Contractor in performance of obligations under the Contract.
- (c) The total value (R) of the work done during the specified period [GCC 40.1] shall be as under:

$$R = \text{SUM} (R_{S1} + R_{S2} + R_{S3} + \dots R_{Sn}),$$

Where,

‘ $R_{sn}$ ’ is the value of work done during the specified period to which the price adjustment shall be applied for the relevant schedule of Bill of Quantities (BOQ) specified in P.C.C during the specified period, and represented as under:

$R_{sn} = (V_{sn} + S_{sn})$  minus (amount of secured advance recovered in the same period + value of works executed under variations for which price adjustments will be worked separately based on terms mutually agreed between the Project Manager and the Contractor)

where,

$V_{sn}$  is the total value of work done during the specified period for the respective schedule of BOQ, and

$S_{sn}$  is the secured advance paid during the specified period for the respective schedule of BOQ,

- (d) The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate schedule of BOQ and certified in Payment Certificates, shall be determined from formulae which shall be of the following general type:

$$P_n = a + b L_n/L_o + c E_n/E_o + d M_n/M_o + \dots$$

where,

“ $P_n$ ” is the adjustment multiplier to be applied to the value of the work done during the period “ $n$ ”, this period being a month unless otherwise stated in the PCC.

“ $a$ ” is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments;

“ $b$ ”, “ $c$ ”, “ $d$ ”,... are coefficients representing the estimated proportion of each cost element related to the execution of the Works, as stated in the relevant table of adjustment data; such tabulated cost elements may be indicative of resources such as labour, equipment and materials;

“ $L_n$ ”[*Labour*], “ $E_n$ ”[*Equipment*], “ $M_n$ ”[*Material*], .... are the current cost indices or reference prices for period “ $n$ ”, each of which is applicable to the relevant tabulated cost element [*Labour, Equipment, Steel, Cement, Fuel/Lubricants, Bitumen, others*] on the date, specified in the Table-2 of Adjustment Data, prior to the last day of the period (to which the particular Payment Certificate relates); and

“ $L_o$ ”, “ $E_o$ ”, “ $M_o$ ”, ....are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

- (e) The cost indices or reference prices stated in the tables of adjustment data given in PCC shall be used. The base date shall be the deadline for the submission of bids.
- (f) If the Contractor fails to complete the Works within the Intended Completion date, adjustment of prices thereafter shall be made using either:
  - (i) index or price applicable for each cost element tabulated in the tables of adjustment data on the specified date prior to the expiry of the Intended Completion Date, or
  - (ii) the current index or price applicable for the period in question whichever is more favourable to the Employer.
- (g) The weightings (coefficients) for each of the factors of

cost stated in the table(s) of adjustment data shall only be varied by the Project Manager if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

- (h) Unless otherwise **stated in the P.C.C.**, the Price adjustment shall be done in each monthly Interim Payment Certificate [IPC]. The coefficients and indices are given in the Tables of Adjustment Data in Contract data.

To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs

#### 46. Retention

- 46.1 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
- 46.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 53.1, 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. On completion of the whole works the Contractor may substitute the balance retention money with an “on demand” Bank guarantee.

#### 47. Liquidated Damages

- 47.1 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 (for the whole of the works or the milestones as stated in the PCC). 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.

Time is the essence of the contract and payment or deduction of liquidated damages shall not relieve the contractor from his obligation to complete the work as per agreed construction program and milestones, or from any of the Contractor’s other obligations and liabilities under the contract.

	47.2	If the Intended Completion Date including milestones 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 Sub-Clause 41.1.
<b>48. Bonus</b>	48.1	Not used.
<b>49. Advance Payment</b>	49.1	The Employer shall make advance payment to the Contractor of the amounts <b>stated in the PCC</b> by the date <b>stated in the PCC</b> , against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts in Indian Rupees 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 ( <i>each instalment not less than Rs. 500,000</i> ) reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.
	49.2	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.
	49.3	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, Liquidated Damages.
<b>Secured Advances</b>	49.4	The Project Manager shall make advance payment in respect of materials intended for but not yet incorporated in the Works in accordance with conditions <b>stipulated in the PCC</b> .
<b>50. Securities</b>	50.1	The Performance Security and an Environmental, Social, Safety and Health (ESHS) Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in the amounts <b>specified in the PCC</b> (for GCC 50.1), and shall be issued by a Nationalized or Scheduled bank in India. The Performance Security including additional security for unbalanced bids, and the ESHS

Performance Security, shall be valid until a date 28 days from the date of issue of the Certificate of Completion.”

- |                            |      |  |
|----------------------------|------|--|
| <b>51. Dayworks</b>        | 51.1 | Not used.  |
| <b>52. Cost of Repairs</b> | 52.1 | 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. |

### **E. Finishing the Contract**

- |  |      |   |
|--|------|---|
| <b>53. Completion</b>                        | 53.1 | 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 whole of the Works is completed.   |
| <b>54. Taking Over</b>                       | 54.1 | The Employer shall take over the Site and the Works within seven days of the Project Manager’s issuing a certificate of Completion.   |
| <b>55. Final Account</b>                     | 55.1 | The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract at 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 within 56 days of receiving the contractor’s revised account. |
| <b>56. Operating and Maintenance Manuals</b> | 56.1 | If “as built” Drawings [including a compact disk containing digitized drawings] and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates <b>stated in the PCC</b> .   |
|  | 56.2 | If the Contractor does not supply the Drawings [including a compact disk containing digitized drawings] and/or manuals by the dates <b>stated in the PCC</b> pursuant to GCC Sub-Clause 56.1, or they do not receive the Project Manager’s approval, the Project Manager shall withhold the amount <b>stated in the PCC</b> from payments due to the Contractor.  |



## 57. Termination

- 57.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract after giving fourteen (14) days written notice.
- 57.2 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 Contractor does not maintain a Security, which is required;
  - (g) 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**; or
  - (h) if the Contractor, in the judgment of the Employer, has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for or in executing the Contract, then the Client may, after giving fourteen (14) days written notice to the Contractor, terminate the Contract and expel him from the Site.
  - (i) The contractor has contravened Clauses 7 and 9 of GCC.
  - (j) The contractor does not adhere to the agreed construction program, agreed ESHS-MSIP [Clause 26 of GCC] and also fails to take satisfactory remedial action as per agreements reached in the management meetings [Clause 30 of GCC] for a period of 60 days.
  - (k) The contractor fails to carry out of the instructions of the

Project Manager within a reasonable time determined by the Project Manager in accordance with GCC Clause 15.1 and 22.

- (l) The contractor (in case of Joint Venture) has modified the composition of the joint venture and/or the responsibility of each member of the joint venture from what is stated in joint venture agreement without the prior approval of the Employer.

57.3 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 Sub-Clause 57.2 above, the Project Manager shall decide whether the breach is fundamental or not.

57.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

57.5 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.

## **58. Payment upon Termination**

58.1 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 upto the date of the issue of the certificate less other recoveries due in terms of contract, less taxes to be deducted at source [TDS] as per applicable law, 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.

58.2 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 upto the date of the certificate less other recoveries due in terms of the contract and less taxes due to be deducted at source [TDS] as per applicable law.

## **59. Property**

59.1 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.

**60. Release from Performance**

60.1 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 afterwards to which a commitment was made.

**61. Suspension of Bank Loan or Credit**

61.1 In the event that the Bank 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 of such suspension within 7 days of having received the Bank's suspension notice.
- (b) If the Contractor has not received sums due it within the 28 days for payment provided for in Sub-Clause 40.1, the Contractor may immediately issue a 14-day termination notice.

## APPENDIX A TO GENERAL CONDITIONS

### Bank's Policy- Corrupt and Fraudulent Practices

*(Text in this Appendix shall not be modified)*

#### **Guidelines for Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, dated January 2011 Revised July 2014:**

##### **“Fraud and Corruption:**

1.16 It is the Bank's policy to require that Borrowers (including beneficiaries of Bank loans), bidders, suppliers, contractors and their agents (whether declared or not), sub-contractors, sub-consultants, service providers or suppliers, and any personnel thereof, observe the highest standard of ethics during the procurement and execution of Bank-financed contracts.<sup>26</sup> In pursuance of this policy, the Bank:

- (a) defines, for the purposes of this provision, the terms set forth below as follows:
  - (i) “corrupt practice” is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;<sup>27</sup>
  - (ii) “fraudulent practice” is 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;<sup>28</sup>
  - (iii) “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;<sup>29</sup>
  - (iv) “coercive practice” is 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;<sup>30</sup>
  - (v) “obstructive practice” is
    - (aa) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or

<sup>26</sup>In this context, any action to influence the procurement process or contract execution for undue advantage is improper.

<sup>27</sup> For the purpose of this sub-paragraph, “another party” refers to a public official acting in relation to the procurement process or contract execution. In this context, “public official” includes World Bank staff and employees of other organizations taking or reviewing procurement decisions.

<sup>28</sup> For the purpose of this sub-paragraph, “party” refers to a public official; the terms “benefit” and “obligation” relate to the procurement process or contract execution; and the “act or omission” is intended to influence the procurement process or contract execution.

<sup>29</sup> For the purpose of this sub-paragraph, “parties” refers to participants in the procurement process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish bid prices at artificial, non-competitive levels, or are privy to each other's bid prices or other conditions.

<sup>30</sup> For the purpose of this sub-paragraph, “party” refers to a participant in the procurement process or contract execution.

intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or

- (bb) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 1.16(e) below.
- (b) will reject a proposal for award if it determines that the bidder recommended for award, or any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
- (c) will declare misprocurement and cancel the portion of the loan allocated to a contract if it determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement or the implementation of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- (d) will sanction a firm or individual, at any time, in accordance with the prevailing Bank's sanctions procedures,<sup>31</sup> including by publicly declaring such firm or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Bank-financed contract; and (ii) to be a nominated<sup>32</sup>;
- (e) will require that a clause be included in bidding documents and in contracts financed by a Bank loan, requiring bidders, suppliers and contractors, and their sub-contractors, agents, personnel, consultants, service providers, or suppliers, to permit the Bank to inspect all accounts, records, and other documents relating to the submission of bids and contract performance, and to have them audited by auditors appointed by the Bank."

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<sup>31</sup> A firm or individual may be declared ineligible to be awarded a Bank financed contract upon: (i) completion of the Bank's sanctions proceedings as per its sanctions procedures, including, inter alia, cross-debarment as agreed with other International Financial Institutions, including Multilateral Development Banks, and through the application the World Bank Group corporate administrative procurement sanctions procedures for fraud and corruption; and (ii) as a result of temporary suspension or early temporary suspension in connection with an ongoing sanctions proceeding. See footnote 14 and paragraph 8 of Appendix 1 of these Guidelines.

<sup>32</sup> A nominated sub-contractor, consultant, manufacturer or supplier, or service provider (different names are used depending on the particular bidding document) is one which has either been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.

## APPENDIX B

### Environmental, Social, Health and Safety (ESHS)

#### Metrics for Progress Reports

*[Note to Employer: the following metrics may be amended to reflect the Employer's environmental, social, health and safety policies and/or the ESHS requirements of the project. The metrics that are required should be determined by the ESHS risks of the Works and not necessarily by the scale of the Works]*

*Metrics for regular reporting:*

- a. *environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies;*
- b. *health and safety incidents, accidents, injuries and all fatalities that require treatment;*
- c. *interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none);*
- d. *status of all permits and agreements:*
  - i. *work permits: number required, number received, actions taken for those not received;*
  - ii. *status of permits and consents:*
    - *list areas/facilities with permits required (quarries, asphalt & batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to resident engineer (or equivalent), status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);*
    - *list areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, dates submitted to resident engineer (or equivalent);*
    - *identify major activities undertaken in each area in the reporting period and highlights of environmental and social protection (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation);*
    - *for quarries: status of relocation and compensation (completed, or details of activities and current status in the reporting period).*
- e. *health and safety supervision:*
  - i. *safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;*
  - ii. *number of workers, work hours, metric of PPE use (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations observed (by type*

- of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);
- f. worker accommodations:*
- i. number of expats housed in accommodations, number of locals;
  - ii. date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;
  - iii. actions taken to recommend/require improved conditions, or to improve conditions.
- g. HIV/AIDS: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);*
- h. gender (for expats and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);*
- i. training:*
- i. number of new workers, number receiving induction training, dates of induction training;
  - ii. number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;
  - iii. number and dates of HIV/AIDS sensitization and/or training, no. workers receiving training (this reporting period and in the past); same questions for gender sensitization, flag person training.
  - iv. number and date of GBV /SEA sensitization and/or training, number of workers receiving training on code of conduct (in the reporting period and in the past), etc.
- j. environmental and social supervision:*
- i. environmentalist: days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, swamps, forest crossings, etc.), highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management;
  - ii. sociologist: days worked, number of partial and full site inspections (by area: road section, work camp, accommodations, quarries, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, etc.), highlights of activities (including violations of environmental and/or social requirements observed, actions taken), reports to environmental and/or social specialist/construction/site management; and

- iii. community liaison person(s): days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), reports to environmental and/or social specialist /construction/site management.
- k. *Grievances*: list new grievances (e.g. allegations of GBV / SEA) received in the reporting period and unresolved past grievances by date received, complainant, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up (Cross-reference other sections as needed):
  - i. Worker grievances;
  - ii. Community grievances
- l. *Traffic and vehicles/equipment*:
  - i. traffic accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;
  - ii. accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;
  - iii. overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).
- m. *Environmental mitigations and issues (what has been done)*:
  - i. dust: number of working bowsters, number of waterings/day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/spoil lorries with covers, actions taken for uncovered vehicles;
  - ii. erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;
  - iii. quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;
  - iv. blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);
  - v. spill cleanups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination);
  - vi. waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;



- vii. details of tree plantings and other mitigations required undertaken in the reporting period;
- viii. details of water and swamp protection mitigations required undertaken in the reporting period.

*n. compliance:*

- i. compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;
- ii. compliance status of C-ESMP/ESIP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
- iii. compliance status of GBV/SEA prevention and response action plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
- iv. compliance status of Health and Safety Management Plan re: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
- v. other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

## Section IX. Particular Conditions of Contract

Except where otherwise indicated, all PCC should be filled in by the Employer prior to issuance of the Bidding Documents. Schedules and reports to be provided by the Employer should be annexed.

A. General								
<b>GCC 1.1 (d)</b>	The financing institution is: IDA							
<b>GCC 1.1 (r)</b>	The Employer is: Chief Executive Officer J&K ERA/JTFRP ERA Commercial Complex, Rambagh Srinagar. 2 <sup>nd</sup> Floor JKPC Building, Panama Chowk Jammu.							
<b>GCC 1.1 (v)</b>	The Intended Completion Date for the whole of the Works shall be 15 months PLUS 1 years DLP from the date of issue of completion certificate							
<b>GCC 1.1 (y)</b>	The Project Manager is <i>Executive Engineer, PMU JTFRP</i> .							
<b>GCC 1.1 (aa)</b>	The Site is spread across district Bandipora and Baramulla.							
<b>GCC 1.1 (dd)</b>	The Start Date shall be one week after the date of issue of notice to proceed with works to the contractor.							
<b>GCC 1.1 (hh)</b>	<b>The Works consist of Upgradation of :</b> <ol style="list-style-type: none"> <li><b>Sangam Khudwani Road &amp;</b></li> <li><b>Bijbehara to Kanihama Road.</b></li> </ol> Identification number of Contract is <b>Revised/Roads/Kashmir/04</b>							
<b>GCC 1.1 (ii)</b>	The following is added as GCC 1.1. (ii)  “ESHS” means environmental, social (including sexual exploitation and abuse (SEA) and gender based violence (GBV)), health and safety.							
<b>GCC 2.2</b>	<b>Sectional Completions are:</b> <ol style="list-style-type: none"> <li><b>Sangam Khudwani Road.</b></li> <li><b>Bijbehara to Kanihama Road.</b></li> </ol>							
	The following documents also form part of the Contract:							
	<table border="1"> <thead> <tr> <th>S. No.</th><th>Document</th><th>Description of the document</th></tr> </thead> <tbody> <tr> <td> </td><td> </td><td> </td></tr> </tbody> </table>	S. No.	Document	Description of the document				
S. No.	Document	Description of the document						

	1.	Construction Methodology	Construction methodology given in bid amended as per comments of employer given in letter of acceptance.																					
	2.	Quality control	Quality control procedures and assurance plans given in the bid and amended as per comments of Employer given in letter of acceptance.																					
	3	Environmental, Social, Health and Safety	(i) ESHS Management Strategies and Implementation Plans; and (ii) Code of Conduct (ESHS).  Environment and Social Management Plans given in the Bid Document.																					
<b>GCC 3.1</b>	The language of the contract is <i>English</i> .  The law that applies to the Contract is the laws of Union of India.																							
<b>GCC 5.1</b>	The Project manager <i>may</i> delegate any of his duties and responsibilities.																							
<b>GCC 7.1</b>	The ceiling for sub-contractor is 30%																							
<b>GCC 8.1</b>	Schedule of other contractors: Not Applicable																							
<b>GCC 9.1</b>	<p>Key Personnel and equipment:</p> <p>GCC 9.1 is replaced with the following:</p> <p>9.1 Key Personnel are the Contractor’s personnel named in this GCC 9.1 of the Particular Conditions of Contract. The Contractor shall employ the Key Personnel and use the equipment identified in its Bid, to carry out the Works 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.</p> <table><tr><th>S. No</th><th>Designation of Personnel (Position)</th><th>No.</th></tr><tr><td>1.</td><td>Project Manager</td><td>1</td></tr><tr><td>2.</td><td>Site Engineer</td><td>2</td></tr><tr><td>3</td><td>Highway/Pavement Engineer</td><td>1</td></tr><tr><td>4</td><td>Quantity Surveyor</td><td>1</td></tr><tr><td>5.</td><td>Soil &amp; Material Engineer</td><td>1</td></tr><tr><td>6.</td><td>Survey Engineer</td><td>1</td></tr></table>			S. No	Designation of Personnel (Position)	No.	1.	Project Manager	1	2.	Site Engineer	2	3	Highway/Pavement Engineer	1	4	Quantity Surveyor	1	5.	Soil & Material Engineer	1	6.	Survey Engineer	1
S. No	Designation of Personnel (Position)	No.																						
1.	Project Manager	1																						
2.	Site Engineer	2																						
3	Highway/Pavement Engineer	1																						
4	Quantity Surveyor	1																						
5.	Soil & Material Engineer	1																						
6.	Survey Engineer	1																						

		7	Environment, Health and Safety Expert.	1																						
<b>GCC 9.2</b>	The following is inserted as GCC 9.2 (e):  “breaches the Code of Conduct (ESHS) (e.g. spreading communicable diseases, sexual harassment, gender based violence, (GBV), sexual exploitation or abuse, illicit activity or crime).”																									
<b>GCC 13.1</b>	The minimum insurance amounts and deductibles shall be: <table><tr><td>S. No.</td><td>Description</td><td>Minimum cover for Insurance</td></tr><tr><td>(i)</td><td>Works and Plant and Materials which are incorporated in works</td><td>Cost of contract plus 10% excluding maintenance cost</td></tr><tr><td>(ii)</td><td>Loss or damage to Construction Equipment</td><td>10% of contract amount excluding maintenance cost</td></tr><tr><td>(iii)</td><td>Other Property</td><td>5% of contract amount excluding maintenance cost</td></tr><tr><td>(iv)</td><td>Personal injury or death insurance:  a) for other people;</td><td><b>Rs 10 lakh</b> for each person</td></tr><tr><td></td><td>b) for Contractor’s Employees</td><td>In accordance with the statutory requirements applicable in India.</td></tr><tr><td colspan="3">Deductibles shall be as per actual premium of the insurance policies.</td></tr></table>					S. No.	Description	Minimum cover for Insurance	(i)	Works and Plant and Materials which are incorporated in works	Cost of contract plus 10% excluding maintenance cost	(ii)	Loss or damage to Construction Equipment	10% of contract amount excluding maintenance cost	(iii)	Other Property	5% of contract amount excluding maintenance cost	(iv)	Personal injury or death insurance:  a) for other people;	<b>Rs 10 lakh</b> for each person		b) for Contractor’s Employees	In accordance with the statutory requirements applicable in India.	Deductibles shall be as per actual premium of the insurance policies.		
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<b>GCC 14.1</b>	Site Data are: Available Carriageway Width.																									
<b>GCC 16.1 (add new 16.2)</b>	<b>ESHS Management Strategies and Implementation Plans</b>  The following is inserted as a new sub-clause 16.2:  “ <b>16.2</b> The Contractor shall not carry out any Works, including mobilization and/or pre-construction activities (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits),																									

	<p>unless the Project Manager is satisfied that appropriate measures are in place to address environmental, social, health and safety risks and impacts. At a minimum, the Contractor shall apply the Management Strategies and Implementation Plans and Code of Conduct, submitted as part of the Bid and agreed as part of the Contract. The Contractor shall submit, on a continuing basis, for the Project Manager's prior approval, such supplementary Management Strategies and Implementation Plans as are necessary to manage the ESHS risks and impacts of ongoing works. These Management Strategies and Implementation Plans collectively comprise the Contractor's Environmental and Social Management Plan (C-ESMP). The C-ESMP shall be approved prior to the commencement of construction activities (e.g. excavation, earth works, bridge and structure works, stream and road diversions, quarrying or extraction of materials, concrete batching and asphalt manufacture). The approved C-ESMP shall be reviewed, periodically (but not less than every six (6) months), and updated in a timely manner, as required, by the Contractor to ensure that it contains measures appropriate to the Works activities to be undertaken. The updated C-ESMP shall be subject to prior approval by the Project Manager."</p>
<b>GCC 20.1</b>	The Site Possession Date(s) shall be given at the time of signing Contract Agreement.
<b>GCC 23.1 &amp; GCC 23.2</b>	Name of the agreed Adjudicator/Dispute Review Expert shall be agreed at the time of signing of contract
<b>GCC 24.3</b>	Daily rate and types of reimbursable expenses to be paid to the Adjudicator/Dispute Review Expert: INR5000/day
<b>GCC 24.4</b>	<p>The procedure for adhoc arbitration will be as follows:</p> <p>(a) In case of Dispute or difference arising between the Employer and a Contractor relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Arbitration and Conciliation Act, 1996. The arbitral tribunal shall consist of 3 Arbitrators one each to be appointed by the Employer and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators so appointed by the Parties and shall act as Presiding Arbitrator. In case of failure of the two Arbitrators appointed by the parties to reach upon a consensus within a period of 30 days from the appointment of the Arbitrator appointed subsequently, the Presiding Arbitrator shall be appointed by the Chairman of the Institution of Engineers (Srinagar Chapter). If one of the parties fails to appoint its Arbitrator in pursuance of sub-clause (a) above within 30 days after receipt of the notice of the appointment of its Arbitrator by the other party, Chairman of the Institution of Engineers (Srinagar Chapter), shall appoint the Arbitrator. A certified copy of the order of the* Chairman of</p>

	<p>the Institution of Engineers (Srinagar Chapter, making such an appointment shall be furnished to each of the parties.</p> <p>(b) Arbitration may be commenced prior to or after completion of the Works, provided that the obligations of the Employer, the Project Manager, the Contractor and the Adjudicator shall not be altered by reason of the arbitration being conducted during the progress of the Works.</p> <p>(c) Arbitration proceedings shall be held at Srinagar, and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English.</p> <p>(d) The decision of the majority of Arbitrators shall be final and binding upon both parties. The cost and expenses of Arbitration proceedings will be paid as determined by the arbitral tribunal. However, the expenses incurred by each party in connection with the preparation, presentation, etc. of its proceedings as also the fees and expenses paid to the Arbitrator appointed by such party or on its behalf shall be borne by each party itself.</p> <p>(e) Where the value of the contract is Rs.50 million and below, the disputes or differences arising shall be referred to the Sole Arbitrator. The Sole Arbitrator should be appointed by agreement between the parties; failing such agreement, by the appointing authority, namely the Chairman of the Institution of Engineers (Srinagar Chapter</p> <p>(f) The Arbitrator <i>should give final award within 180 days of starting of the proceedings</i></p> <p>(g) Performance under the contract shall continue during the arbitration proceedings and payments due to the contractor by the Employer shall not be withheld, unless they are the subject matter of the arbitration proceedings.</p> <p>"Any dispute or difference whatsoever arising between the parties out of or relating to the construction, meaning, scope, operation or effect of this contract or the validity or the breach thereof shall be settled by arbitration in accordance with the Rules of Domestic Commercial Arbitration of the Indian Council of Arbitration and the award made in pursuance thereof shall be binding on the parties.</p> <p>The arbitral tribunal shall consist of 3 Arbitrators, arbitration proceedings shall be held at Srinagar, India and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English".</p>
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	As laid down in Arbitration and Conciliation Act 1996, with amendments from time to time and rules thereof.
<b>B. Time Control</b>	
<b>GCC 26.1</b>	The Contractor shall submit for approval a Program for the Works within 14 days of delivery of the Letter of Acceptance.
<b>GCC 26.2</b>	<p><b>ESHS Reporting</b></p> <p>Inserted at the end of GCC 26.2</p> <p>“In addition to the progress report the Contractor shall also provide a report on the Environmental, Social, Health and Safety (ESHS) metrics set out in Appendix B. In addition to Appendix B reports, the Contractor shall also provide immediate notification to the Project Manager of incidents in the following categories. Full details of such incidents shall be provided to the Project Manager within the timeframe agreed with the Project Manager.</p> <ul style="list-style-type: none"> <li>(a) confirmed or likely violation of any law or international agreement;</li> <li>(b) any fatality or serious (lost time) injury;</li> <li>(c) significant adverse effects or damage to private property (e.g. vehicle accident, damage from fly rock, working beyond the boundary)</li> <li>(d) major pollution of drinking water aquifer or damage or destruction of rare or endangered habitat (including protected areas) or species; or</li> <li>(e) any allegation of gender based violence (GBV), sexual exploitation or abuse, sexual harassment or sexual misbehavior, rape, sexual assault, child abuse, or defilement, or other violations involving children.</li> </ul>
<b>GCC 26.3</b>	<p>The period between Program updates is 60 days.</p> <p>The amount to be withheld for late submission of an updated Program is INR 500000</p>
<b>GCC 30</b>	Venue of management meeting will be Srinagar/ Jammu
<b>C. Quality Control</b>	

<b>GCC 34.3</b>	The Defects Liability Period is: 365 days.
<b>D. Cost Control</b>	
<b>GCC 38.2</b>	<p>In GCC 38.2, add the following after the first sentence:</p> <p>“The Contractor shall also provide information of any ESHS risks and impacts of the Variation.”</p>
<b>GCC 40</b>	<p>Add new GCC 40.7:</p> <p>“40.7 if the Contractor was, or is, failing to perform any ESHS obligations or work under the Contract, the value of this work or obligation, as determined by the Project Manager, may be withheld until the work or obligation has been performed, and/or the cost of rectification or replacement, as determined by the Project Manager, may be withheld until rectification or replacement has been completed. Failure to perform includes, but is not limited to the following:</p> <ul style="list-style-type: none"> <li>(i) failure to comply with any ESHS obligations or work described in the Works’ Requirements which may include: working outside site boundaries, excessive dust, failure to keep public roads in a safe usable condition, damage to offsite vegetation, pollution of water courses from oils or sedimentation, contamination of land e.g. from oils, human waste, damage to archeology or cultural heritage features, air pollution as a result of unauthorized and/or inefficient combustion;</li> <li>(ii) failure to regularly review C-ESMP and/or update it in a timely manner to address emerging ESHS issues, or anticipated risks or impacts;</li> <li>(iii) failure to implement the C-ESMP e.g. failure to provide required training or sensitization;</li> <li>(iv) failing to have appropriate consents/permits prior to undertaking Works or related activities;</li> <li>(v) failure to submit ESHS report/s (as described in Appendix C), or failure to submit such reports in a timely manner;</li> <li>(vi) failure to implement remediation as instructed by the Engineer within the specified timeframe (e.g. remediation addressing non-compliance/s).</li> </ul>
<b>GCC 41.1</b>	The following changes are applicable



	The Employer shall pay the Contractor the amounts certified by the Project Manager within 56 days of the date of each certificate.  The Interest rate for delayed payments beyond 56 days is 5%.								
GCC 45.1	Price Adjustment is not applicable.								
GCC 46.1	The proportion of payments retained (Retention Money) shall be 6% from each bill subject to the maximum of 5% of final contract price.								
GCC 47.1	The liquidated damages for the whole of the Works are <i>0.05 percent of the final contract cost per day</i> . The maximum amount of liquidated damages for the whole of the Works is <i>10%</i> of the final Contract Price.								
GCC 49.1	<p>The amount of the advance payment are:</p> <table><thead><tr><th><u>Nature of Advance</u></th><th><u>Amount (Rs.)</u></th><th><u>Conditions to be fulfilled</u></th></tr></thead><tbody><tr><td>1. Mobilization</td><td>10% of the Contract price</td><td>On submission of un-conditional Bank Guarantee in the prescribed format. <i>(to be drawn before end of 10% of Contract period)</i></td></tr></tbody></table> <p>(The advance payment will be paid to the Contractor no later than 15 days after fulfilment of the above conditions).</p> <p>Repayment of advance payment for mobilization and equipment:</p> <p>The advance shall be repaid with percentage deductions from the interim payments certified by the Engineer under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the contractor has reached not less than 15 percent of the Contract Price or three months from the date of payment of first instalment of advance, whichever period concludes earlier, and shall be made at the rate of 15 percent of the amounts of all Interim Payment Certificates until such time as the advance has been repaid, always provided</p>			<u>Nature of Advance</u>	<u>Amount (Rs.)</u>	<u>Conditions to be fulfilled</u>	1. Mobilization	10% of the Contract price	On submission of un-conditional Bank Guarantee in the prescribed format. <i>(to be drawn before end of 10% of Contract period)</i>
<u>Nature of Advance</u>	<u>Amount (Rs.)</u>	<u>Conditions to be fulfilled</u>							
1. Mobilization	10% of the Contract price	On submission of un-conditional Bank Guarantee in the prescribed format. <i>(to be drawn before end of 10% of Contract period)</i>							

	that the advance shall be completely repaid prior to the expiry of the original time for completion.
<b>GCC 50.1</b>	<p>An Environmental, Social, Safety and Health (ESHS) Performance Security <b><i>shall</i></b> be provided to the Employer.</p> <p>“GCC 50.1 is replaced with the following</p> <p>The Performance Security and an Environmental, Social, Safety and Health (ESHS) Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in the amounts <b>specified in the PCC</b> (for GCC 50.1), and shall be issued by a Nationalized or Scheduled bank in India. The Performance Security including additional security for unbalanced bids, and the ESHS Performance Security, shall be valid until a date 28 days from the date of issue of the Certificate of Completion.”</p>
<b>GCC 50.1</b>	<p>The Performance Security for 5 percent of contract price plus 50% of the amount of differential cost i.e. Difference between Engineer’s estimated cost and quoted rate of bidder as additional security for unbalanced bids and frontloaded items in the BOQ [<i>in terms of ITB Clause 34.5</i>]</p> <p>An Environmental, Social, Safety and Health (ESHS) Performance Security <b>‘shall’</b> be provided to the Employer. EQUAL TO 1% of accepted contract amount.</p> <p>The standard form of Performance Security acceptable to the Employer shall be an <u>unconditional</u> Bank Guarantee from a Scheduled or Nationalized bank in India of the type as presented in Section X of the Bidding Documents</p>
<b>E. Finishing the Contract</b>	
<b>GCC 56.1</b>	<p>* The date by which operating and maintenance manuals are required is within 28 days of issue of certificate of completion of whole or section of work, as the case may</p> <p>* The date by which “as-built” drawings including a compact disc containing digitized drawings in 2 sets are required is within 28 days of issue of certificate of completion of whole or section of the work, as the case may be</p>
<b>GCC 56.2</b>	The amount to be withheld for failing to produce “as built” drawings and/or operating and maintenance manuals *by the date required in G.C.C. 56.1 is Rs. Rs.10,00,000/=

<b>GCC 57.2 (g)</b>	The maximum number of days is: <i>200</i>
<b>GCC 58.1</b>	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is 20%.

## **Appendices**

## Appendix 1

### Salient Features of Labour & Environment Protection Laws<sup>33</sup>

#### SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK

- (a) Employees Compensation Act 1923: The Act provides for compensation in case of injury, disease or death arising out of and during the course of employment.
- (b) Payment of Gratuity Act 1972: gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- (c) Employees P.F. and Miscellaneous Provision Act 1952 (since amended): The Act provides for monthly contribution by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are:
  - (i) Pension or family pension on retirement or death, as the case may be.
  - (ii) Deposit linked insurance on the death in harness of the worker.
  - (iii) Payment of P.F. accumulation on retirement/death etc.
- (d) Maternity Benefit Act 1961: The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- (e) Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act, 2013: This Act defines sexual harassment in the workplace, provides for an enquiry procedure in case of complaints and mandates the setting up of an Internal Complaints Committee or a Local Complaints Committee
- (f) Contract Labour (Regulation & Abolition) Act 1970: The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.
- (g) Minimum Wages Act 1948: The Employer is supposed to pay not less than the

<sup>33</sup> This list is only illustrative and not exhaustive. Bidders and Contractors are responsible for checking the correctness and completeness of the list. The law as current on the date of bid opening will apply.

Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.

- (h) Payment of Wages Act 1936: It lays down the mode, manner and by what date the wages are to be paid, what deductions can be made from the wages of the workers.
- (i) Equal Remuneration Act 1976: The Act provides for payment of equal wages for work of equal nature to male and female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- (j) Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. Some of the State Governments have reduced this requirement from 20 to 10. The Act provides for payments of annual bonus subject to a minimum of 8.33% of the wages drawn in the relevant year. It applies to skilled or unskilled manual, supervisory, managerial, administrative, technical or clerical work for hire or reward to employees who draw a salary of Rs. 10,000/- per month or less. To be eligible for bonus, the employee should have worked in the establishment for not less than 30 working days in the relevant year. The Act does not apply to certain establishments.
- (k) Industrial Disputes Act 1947: the Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations, a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- (l) Trade Unions Act 1926: The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- (m) Child Labour (Prohibition & Regulation) Act 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in the Building and Construction Industry.
- (n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home upto the establishment and back, etc.

- (o) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996 and the Building and Other Construction Workers Welfare Cess Act, 1996 (BOCWW Cess Act): All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under these Acts. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be notified by the Government. The Employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as Canteens, First – Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
  
- (p) Factories Act 1948: the Act lays down the procedure for approval of plans before setting up a factory engaged in manufacturing processes, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power.
  
- (q) Weekly Holidays Act -1942
  
- (r) Bonded Labour System (Abolition) Act, 1976: The Act provides for the abolition of bonded labour system with a view to preventing the economic and physical exploitation of weaker sections of society. Bonded labour covers all forms of forced labour, including that arising out of a loan, debt or advance.
  
- (s) Employer's Liability Act, 1938: This Act protects workmen who bring suits for damages against employers in case of injuries endured in the course of employment. Such injuries could be on account of negligence on the part of the employer or persons employed by them in maintenance of all machinery, equipment etc. in healthy and sound condition.
  
- (t) Employees State Insurance Act 1948: The Act provides for certain benefits to insured employees and their families in case of sickness, maternity and disablement arising out of an employment injury. The Act applies to all employees in factories (as defined) or establishments which may be so notified by the appropriate Government. The Act provides for the setting up of an Employees' State Insurance Fund, which is to be administered by the Employees State Insurance Corporation. Contributions to the Fund are paid by the employer and the employee at rates as prescribed by the Central Government. The Act also provides for benefits to dependents of insured persons in case of death as a result of an employment injury.
  
- (u) The Personal Injuries (Compensation Insurance) Act, 1963: This Act provides for the employer's liability and responsibility to pay compensation to employees

where workmen sustain personal injuries in the course of employment.

- (v) Industrial Employment (Standing Order) Act 1946: It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.



## SALIENT FEATURES OF SOME OF THE MAJOR LAWS THAT ARE APPLICABLE FOR PROTECTION OF ENVIRONMENT.

1. The Environment (Protection) Act, 1986 and as amended: This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.
2. The Forest Conservation Act, 1980, as amended, and Forest (Conservation) Rules, 1981 as amended: These provides for protection of forests by restricting conversion of forested areas into non- forested areas and prevention of deforestation, and stipulates the procedures for cutting any trees that might be required by the applicable rules. Permissions under the Act also stipulates the norms and compliance requirements of the employer and any contractor on behalf of the employer.
3. State Tree Preservation Acts as may be in force: These provide for protection of trees of important species. Contractors will be required to obtain prior permission for full or partial cutting, uprooting, or pruning of any such trees.
4. The Wildlife (Protection) Act, 1972, and as amended: This provides for protection of wildlife through notifying National Parks and Sanctuaries and buffer areas around these zones; and to protect individuals of nationally important species listed in the Annex of the Act.
5. The Biological Diversity Act, 2002: This provides for conservation of biological diversity, sustainable use of components of biological diversity, and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto.
6. The Public Liability Insurance Act, 1991 as amended and The Public Liability Insurance Rules, 1991 as amended: These provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.
7. The Ancient Monuments and Archaeological Sites and Remains Act, 1958 and the Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010, the Ancient Monuments and Archaeological Sites and Remains Rules, 1959 amended 2011, the National Monuments Authority Rules, 2011 and the similar State Acts: These provide for conservation of cultural and historical remains found in India. Accordingly, area within the radii of 100m and 300m from the "protected property" are designated as "protected area" and "controlled area" respectively. No development activity (including building, mining,

excavating, blasting) is permitted in the “protected area” and development activities likely to damage the protected property is not permitted in the “controlled area” without prior permission of the Archaeological Survey of India (ASI) or the State Departments of Art and Culture or Archaeology as applicable.

8. The Environmental Impact Assessment Notification, 2006 and as amended: This provides for prior environmental clearance for new, modernization and expansion projects listed in Schedule 1 of the Notification. Contractors will be required to ensure that no work starts until applicable clearances under the Notification is not available. Contractors will be responsible for implementation of any environmental management plan stipulated as per the permission under this Notification; and will be required to prepare and submit to the employer and compliance report stipulated in the permission under the Notification.
9. The Water (Prevention and Control of Pollution) Act, 1974 as amended, and the Water (Prevention and Control of Pollution) Rules, 1975 as amended: These provide for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. ‘Pollution’ means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms. Contractors will need to obtain consent for establishment and consent for operation of any item of work or installation of equipment that generates waste water, and observe the required standards of establishment and operation of these items of work or installations; as well as install and operate all required waste water treatment facilities.
10. The Water (Prevention and Control of Pollution) Cess Act, 1977 and The Water (Prevention and Control of Pollution) Cess Rules, 1978: These provide for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution under the Water (Prevention and Control of Pollution) Act, 1974.
11. The Air (Prevention and Control of Pollution) Act, 1981 as amended, and the Air (Prevention and Control of Pollution) Rules, 1982: These provides for prevention, control and abatement of air pollution. ‘Air Pollution’ means the presence in the atmosphere of any ‘air pollutant’, which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. Contractors will need to obtain consent for establishment and consent for operation of any item of work or installation of equipment that generates air pollution such as batching plants, hot mix plants, power generators, backup power generation, material handling processes, and observe the required standards of establishment and operation of these items of work or installations.
12. Noise Pollution (Control and Regulation) Rules, 2000, and as amended: This provides for

standards for noise for day and night for various land uses and specifies special standards in and around sensitive receptors of noise such as schools and hospitals. Contractors will need to ensure compliance to the applicable standards, and install and operate all required noise control devices as may be required for all plants and work processes.

13. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996: This provides for Requirement of preparation of on-site and off-site Disaster Management Plans for accident-prone areas.
14. The Explosives Act 1884 and the Explosives Rules, 2008: These provide for safe manufacture, possession, sale, use, transportation and import of explosive materials such as diesel, Oil and lubricants etc.; and also for regulating the use of any explosives used in blasting and/or demolition. All applicable provisions will need compliance by the contractors.
15. The Petroleum Rules, 2002: This provides for safe use and storage of petroleum products, and will need to be complied by the contractors.
16. The Gas Cylinder Rules 2004 and amendments: This provides for regulations related to storage of gas, and possession of gas cylinder more than the exempted quantity. Contractors should comply with all the requirements of this Rule.
17. Manufacture, Storage and Import of Hazardous Chemical Rules of 1989 and as amended: These provide for use and storage of hazardous material such as highly inflammable liquids like HSD/LPG. Contractors will need to ensure compliance to the Rules; and in the event where the storage quantity exceeds the regulated threshold limit, the contractors will be responsible for regular safety audits and other reporting requirements as prescribed in the Rules.
18. Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016: These provide for protection of general public from improper handling storage and disposal of hazardous waste. The rules prescribe the management requirement of hazardous wastes from its generation to final disposal. Contractors will need to obtain permission from the State Pollution Control Boards and other designated authorities for storage and handling of any hazardous material; and will to ensure full compliance to these rules and any conditions imposed in the permit.
19. The Bio Medical Waste Management Rules, 2016: This provides for control, storage, transportation and disposal of bio-medical wastes. As and where the contractor has any first aid facility and dispensaries, established in either temporary or permanent manner, compliance to these Rules are mandatory.
20. Construction and Demolition Waste Management Rules, 2016: This provides for management of construction and demolition waste (such as building materials possible to be reused, rubble and debris or the like); and applies to all those waste resulting from construction, re-modelling, repair or demolition of any civil structure. Contractor will need to prepare a waste disposal plan and obtain required approval from local authorities, if waste

generation is more than 20 tons in any day or 300 tons in any month during the contract period; and ensure full compliance to these rules and any conditions imposed in the regulatory approval.

21. The E-Waste (Management) Rules, 2016: This provides for management of E-wastes (but not covering lead acid batteries and radio-active wastes) aiming to enable the recovery and/or reuse of useful material from e-waste, thereby reducing the hazardous wastes destined for disposal and to ensure the environmentally sound management of all types of waste of electrical and electronic equipment. This Rule applies to every manufacturer, producer, consumer, bulk consumer, collection centers, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment listed in Schedule I, including their components, consumables, parts and spares which make the product operational.
22. Plastic waste Management Rules, 2016: This provides for control and management of the plastic waste generated from any activity. Contractors will ensure compliance to this Rule.
23. The Batteries (Management and Handling) Rules 2001: This provides for ensuring safe disposal and recycling of discarded lead acid batteries likely to be used in any equipment during construction and operation stage. Rules require proper control and record keeping on the sale or import of lead acid batteries and recollection of the used batteries by registered recyclers to ensure environmentally sound recycling of used batteries. Contractors will ensure compliance to this Rule.
24. The Ozone Depleting Substances (Regulation and Control) Rules, 2000 and as amended: This provides for regulation of production and consumption of ozone depleting substances in the country, and specifically prohibits export to or import from countries not specified in the Rules, and prohibits unless specifically permitted, any use of ozone depleting substance.
25. The Coastal Regulation Zone Notifications, 1991 and as amended: This provides for regulation of development activities within the 500m of high tide line in coastal zone and 100m of stretches of rivers and estuaries influenced by tides. Contractors will be required to ensure that no work starts until applicable clearances under the Notification is not available. Contractors will be responsible for implementation of any plan stipulated as per the permission under this Notification; and will be required to prepare and submit to the employer and compliance report stipulated in the permission under the Notification.
26. The Motor Vehicle Act 1988 as amended (and State Motor Vehicle Acts as may be in force) and the Motor Vehicle Rules, 1989, and as amended (and State Motor Vehicle Rules as may be in force): To minimize the road accidents, penalizing the guilty, provision of compensation to victim and family and check vehicular air and noise pollution. Contractors will be required to ensure full compliance to these rules.
27. Easement Act, 1882: This provides for the rights of landowners on groundwater. Contractors will need to ensure that other landowners' rights under the Act is not affected by any groundwater abstraction by the contractors.

28. State Groundwater Acts and Rules as may be in force and the Guidelines for Groundwater Abstraction for drinking and domestic purposes in Notified Areas and Industry/Infrastructure project proposals in Non-Notified areas, 2012: These provide for regulating extraction of ground water for construction/industrial and drinking and domestic purposes. Contractors will need to obtain permission from Central/State Groundwater Boards prior to groundwater abstraction through digging any bore well or through any other means; and will to ensure full compliance to these rules and any conditions imposed in the permit.
29. The Mines Act, 1952 as amended; the Minor Mineral and concession Rules as amended; and the State Mineral (Rights and Taxation) Acts as may be in force: These provide for for safe and sound mining activity. The contractors will procure aggregates and other building materials from quarries and borrow areas approved under such Acts. In the event the contractors open any new quarry and/or borrow areas, appropriate prior permission from the State Departments of Minerals and Geology will need to be obtained. Contractors will also need to ensure full compliance to these rules and any conditions imposed in the permit.
30. The Insecticides Act, 1968 and Insecticides Rules, 1971 and as amended: These provide for regulates the manufacture, sale, transport, distribution, export, import and use of pesticides to prevent risk to human beings or animals, and for matters connected therewith. No one should import or manufacture; sell, stock or exhibit foe sale; distribute, transport, use: (i) any misbranded insecticides, (ii) any insecticide the sale, distribution or use of which is for the time being prohibited under the Act; and (iii) any insecticide except in accordance with the condition on which it was registered under the Act.
31. National Building Codes of India, 2005 and as amended: This provides guidelines for regulating the building construction activities in India. The code mainly contains administrative regulations, development control rules and general building requirements; stipulations regarding materials, structural design and construction; and building and plumbing services. Contractors will be required to comply with all Bureau of Indian Standards Codes dealing with: (i) use and disposal of asbestos containing materials in construction; (ii) paints containing lead; (iii) permanent and temporary ventilations in workplace; (iv) safety, and hygiene at the workplace; (v) prevention of fire; (vi) prevention of accidents from faulty electrical gadgets, equipment and accessories; and all other such codes incidental to the Contract.

## Appendix -3<sup>34</sup>

### Appointment of Adjudicator

#### Suggested Draft of Letter of Appointment of Adjudicators in civil works contracts

Sub: \_\_\_\_\_ (Name of the Contract)

**To**

Name and address of the Adjudicator

We hereby confirm your appointment as Adjudicator for the above contract to carry out the assignment specified in this Letter of Appointment.

For administrative purpose \_\_\_\_\_ (*name of the officer representing the Employer*) has been assigned to administer the assignment and to provide the Adjudicator with all relevant information needed to carry out the assignment on behalf of both the Employer and the contractor. The services will be required during the period of contract for the work of (Name of the Contract) \_\_\_\_\_.

The Adjudicator shall visit the worksite once in 3 (three) months till the completion of the work indicated above or as specifically requested by Employer/ Contractor for the period upto the end of defects liability period with prior intimation to the Employer and the contractor. The duration of each visit shall ordinarily be for one day only. These durations are approximate and (*Name of the Employer and Name of the Contractor*) may find it necessary to postpone or cancel the assignment and/or shorten or extend the duration.

The appointment will become effective upon confirmation of letter by you. The appointment of Adjudicator shall be liable for termination under a 30 (thirty) days written notice from the date of issue of the notice, if both Employer and the Contractor so desire. Also the appointment shall automatically stand terminated 14 days after the defect notice / correction period as stated in Clauses 23 and 24 of the Conditions of Contract is over.

The Adjudicator will be paid a fee of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) per each day of visit at the worksite. The actual expenses for boarding and traveling in connection with the assignment will be reimbursed to the Adjudicator. The Adjudicator will submit a pre-receipted bill in triplicate to the Employer indicating the date of the visit, fees for the visit and a proof in support of the actual expenditure [only for items valued above Rs. 200 each] incurred by him against boarding, lodging and traveling expenses after performing the visit on each occasion. The Employer will make the admissible payment (both the Employer's and the Contractor's share) to the Adjudicator within 30

<sup>34</sup> If ITB 43 makes provision of an Adjudicator from list provided by an institution, kindly modify Appendix 3 to state that the fee and reimbursable payable to the adjudicator shall be as per the rules of the Institution.

days of the receipt of the bill. The Contractor's share on this account (half the paid amount) will be recovered by the Employer from the Contractor's bills against the work.

In accepting this assignment, the Adjudicator should understand and agree that he is responsible for any liabilities and costs arising out of risks associated with travel to and from the place of emergency repatriation, loss or damage to personal/professional effects and property. The Adjudicator is advised to effect personal insurance cover in respect of such risks if he does not already have such cover in place. In this regard, the Adjudicator shall maintain appropriate medical, travel, accident and third-party liability insurance. The obligation under this paragraph will survive till termination of this appointment.

Procedures for resolution of disputes by the Adjudicator is described in the contract of \_\_\_\_\_ (name of the contract) between the Employer and the contractor vide clause no.24 of the General Conditions of Contract. Your recommendation should be given in the format attached, within 28 days of receipt of a notification of dispute.

The Adjudicator will carry out the assignment in accordance with the highest standard of professional and ethical competence and integrity, having due regard to the nature and purpose of the assignment, and will conduct himself in a manner consistent herewith. After visiting the worksite, the Adjudicator will discuss the matter with the Employer and if necessary with the Contractor before arriving at any decision.

The Adjudicator will agree that all knowledge and information not within the public domain, which may be acquired while carrying out this service shall be all time and for all purpose, regarded as strictly confidential and held in confidence, and shall not be directly or indirectly disclosed to any party whatsoever, except with the permission of the Employer and the contractor. The Adjudicator's decision should be communicated in the form of a speaking order specifying the reasons.

The Adjudicator will agree that any manufacturing or construction firm with which he might be associated with, will not be eligible to participate in bidding for any goods or works resulting from or associated with the project of which this consulting assignment forms a part

Read and Agreed

Name of Adjudicator  
Signature

Place:

Date:

Name of Employer

Signature of authorized representative of Employer

Name of the Contractor

Signature of authorized representative of Contractor

Attachment: Copy of contract document between the Employer and contractor and format for recommendation.

## **SUMMARY OF ADJUDICATOR'S RESPONSIBILITIES**

The Adjudicator has the following principal responsibilities:

1. Visit the site periodically.
2. Keep abreast of job activities and developments.
3. Encourage the resolution of disputes by the parties.
4. When a dispute is referred to it, conduct a hearing (no legal presentation), complete its deliberations, and prepare a recommendations in a professional and timely manner(as per sample format)



# Sample Format of Adjudicator's Recommendation

## [Project Name] Recommendation of Adjudicator

Dispute No. XX [NAME OF DISPUTE]

Hearing Date: \_\_\_\_\_

### **Dispute**

Description of dispute. A one or two sentence summation of the dispute.

### **Contractor's Position**

A short summation of the contractor's position as understood by the Adjudicator.

### **Employer's Position**

A short summation of the Employer's position as understood by the Adjudicator.

### **Recommendation**

The Adjudicator's specific recommendation for settlement of the dispute. (*The recommended course is consistent with the explanation*).

### **Explanation**

(*This section could also be called Considerations, Rationale, Findings, Discussion, and so on.*)

The Adjudicator's description of how each recommendation was reached.

Respectfully submitted,

Date : \_\_\_\_\_

Date : \_\_\_\_\_

Date : \_\_\_\_\_

## **Section X - Contract Forms**

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

# Letter of Acceptance

*[letterhead paper of the Employer]*

*[The Letter of Acceptance shall be the basis for formation of the Contract as described in ITB Clause 40. This Standard Form of Letter of Acceptance shall be filled in and sent to the successful Bidder only after evaluation of bids has been completed, subject to any review by the World Bank required under the Loan Agreement.]*

*[insert date]*

Identification No and Title of Contract: *[insert identification number and title of the Contract]*

To: *[insert name and address of the Contractor]*

This is to notify you that your Bid dated *[insert date]* for execution of the *[insert name of the Contract and identification number, as given in the PCC]* for the Contract Price .....  
*[insert amount in numbers and words]* as corrected and modified<sup>35</sup> in accordance with the Instructions to Bidders is hereby accepted by our Agency.

*[insert one of the following (a) or (b) options]*

- (a) We accept that *[insert name proposed by bidder]* be appointed as the Adjudicator.<sup>36</sup>
- (b) We do not accept that *[insert name proposed by bidder]* be appointed as Adjudicator, and by sending a copy of this Letter of Acceptance to *[insert name of the Appointing Authority]*, we are hereby requesting *[insert name]*, the Appointing Authority, to appoint the Adjudicator in accordance with GCC 23.<sup>37</sup>

We note that as per your bid, you do not intend to subcontract any component of work.

[OR]

We note that as per your bid, you propose to employ M/s. .... as sub-contractor for executing .....

*[Delete whatever is inapplicable]*

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<sup>35</sup> Delete "corrected and" or "and modified" if not applicable. See Notes on Standard Form of Agreement, next page.

<sup>36</sup> To be used only if the Contractor disagrees in the Bid with the Adjudicator proposed by the Employer in the Instructions to Bidders, and has accordingly offered another candidate.

<sup>37</sup> To be used only if the Contractor disagrees in the Bid with the Adjudicator proposed by the Employer in the ITB, has accordingly offered another candidate, and the Employer does not accept the counterproposal.

You are hereby requested to furnish Performance Security, plus additional security for unbalanced bids in terms of ITB clause 35.5, and ESHS Performance Security ***[Delete ESHS Performance Security if it is not required under the contract]*** in the form detailed in ITB Clause 42 for amounts<sup>38</sup> of Rs. \_\_\_\_ and Rs. \_\_\_\_ within 21 days of the receipt of this letter of acceptance, and visit this office to sign the contract, failing which action as stated in ITB Clause 42.2 will be taken. The securities shall be valid up to 28 days from the date of completion i.e. up to ..... and shall be as per the Performance Security Form and the ESHS Performance Security Form ***[Delete reference to the ESHS Performance Security Form if it is not required under the contract]***, included in Section X - Contract Forms, of the bidding document.

We have reviewed the construction methodology submitted by you along with the bid in response to ITB Clause 16 and our comments are given in the attachment. You are requested to submit a revised Program including ESHS requirements as per Clause 26 of General Conditions of Contract within 14 days of receipt of this letter of acceptance.

Yours faithfully,

Authorized Signature.....

Name and Title of Signatory.....

Name of Agency.....

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<sup>38</sup> Insert amounts for (i) Performance Security, plus additional security for unbalanced bids; and (ii) ESHS Performance Security respectively.

## Issue of Notice to proceed with the work

(letterhead of the Employer)

\_\_\_\_\_ (date)

To

\_\_\_\_\_ (name and address of the Contractor)

\_\_\_\_\_

\_\_\_\_\_

Dear Sirs:

Pursuant to your furnishing the requisite securities as stipulated in ITB clause 42.1, insurance policy as per GCC 13, construction methodology as stated in letter of acceptance and signing of the contract agreement for the construction of \_\_\_\_\_ @ a Bid Price of Rs. \_\_\_\_\_, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

(Signature, name and title of signatory  
authorized to sign on behalf of Employer)

**Attachment: Contract Agreement**

## Contract Agreement

THIS AGREEMENT made the . . . . . day of . . . . ., . . . . ., between . . . . . *[name of the Employer]*. . . . . (hereinafter “the Employer”), of the one part, and . . . . . *[name of the Contractor]*. . . . . (hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as . . . . . *[name of the Contract]*. . . . . should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.
  - (a) this Agreement
  - (b) the Letter of Acceptance
  - (c) the Contractor’s Bid including completed schedules and priced bill of quantities,
  - (d) the Addenda No’s . . . . . *[insert addenda numbers if any]*. . . . .
  - (e) the Particular Conditions of contract
  - (f) the General Conditions of contract;
  - (g) the Specifications
  - (h) the Drawings; and
  - (i) Construction Program, Methodology, Quality Assurance Program, ESHS Management Strategies and Implementation Plans, and Code of Conduct (ESHS)
  - (j) Joint Venture Agreement [for JVs only]
  - (k) Any other document listed in PCC as forming part of the Contract
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

Signed by: \_\_\_\_\_  
for and on behalf the Contractor

in the  
presence of: \_\_\_\_\_  
Witness, Name, Signature, Address, Date

in the  
presence of: \_\_\_\_\_  
Witness, Name, Signature, Address, Date

## Performance Security - Bank Guarantee

[including Additional Performance Security for unbalanced bids]

*[Guarantor letterhead or SWIFT identifier code]*

Performance Guarantee No.....*[insert guarantee reference number]*

Date.....*[insert date of issue of the guarantee]*

To: \_\_\_\_\_ *[name of Employer]*  
 \_\_\_\_\_ *[address of Employer]*

WHEREAS \_\_\_\_\_ *[name and address of Contractor<sup>39</sup>]* (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. \_\_\_\_\_ dated \_\_\_\_\_ to execute \_\_\_\_\_ *[name of Contract and brief description of Works]* (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, upto a total of \_\_\_\_\_ *[amount of guarantee<sup>40</sup>]* \_\_\_\_\_ *[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of \_\_\_\_\_ *[amount of guarantee]* as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

<sup>39</sup> In the case of a JV, insert the name of the Joint Venture

<sup>40</sup> An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract less provisional sum if any, plus additional performance security for unbalanced bids if any, and denominated in Indian Rupees.



This guarantee shall be valid until .....<sup>41</sup>, and any demand for payment under it must be received by us at this office on or before that date.

Signature and seal of the guarantor \_\_\_\_\_

Name of Bank \_\_\_\_\_

Address \_\_\_\_\_

Date \_\_\_\_\_

***Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.***

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<sup>41</sup> *Insert the date twenty-eight days after the expected completion date as described in GC Clause 53.1. The Employer should note that in the event of an extension of this date 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 [six months][one 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."*

**Environmental, Social, Health and Safety (ESHS)**  
**Performance Security - Bank Guarantee**  
*[Guarantor letterhead or SWIFT identifier code]*

ESHS Performance Guarantee No.....*[insert guarantee reference number]*  
 Date.....*[insert date of issue of the guarantee]*

To: \_\_\_\_\_ *[name of Employer]*  
 \_\_\_\_\_ *[address of Employer]*

WHEREAS \_\_\_\_\_ *[name and address of Contractor<sup>42</sup>]* (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. \_\_\_\_\_ dated \_\_\_\_\_ to execute \_\_\_\_\_ *[name of Contract and brief description of Works]* (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with Environmental, Social, Health and/or Safety (ESHS) obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of \_\_\_\_\_ *[amount of guarantee<sup>43</sup>]* \_\_\_\_\_ *[in words]*, such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of \_\_\_\_\_ *[amount of guarantee]* as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until .....<sup>44</sup>, and any demand for payment under it must be received by us at this office on or before that date.

<sup>42</sup> In the case of a JV, insert the name of the Joint Venture

<sup>43</sup> An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract less provisional sum if any, and denominated in Indian Rupees.

<sup>44</sup> Insert the date twenty-eight days after the expected completion date as described in GC Clause 53.1. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to

Signature and seal of the guarantor \_\_\_\_\_

Name of Bank \_\_\_\_\_

Address \_\_\_\_\_

Date \_\_\_\_\_

***Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.***

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*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 [six months][one 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.*

## Advance Payment Security

### Demand Guarantee

*[Guarantor letterhead or SWIFT identifier code]*

Advance Payment Guarantee No.....*[insert guarantee reference number]*

Date.....*[insert date of issue of the guarantee]*

To: \_\_\_\_\_ *[name of Employer]*  
 \_\_\_\_\_ *[address of Employer]*  
 \_\_\_\_\_ *[name of Contract]*

Gentlemen:

In accordance with the provisions of the Conditions of Contract, Sub-clause 49.1 ("Advance Payment") of the above-mentioned Contract, \_\_\_\_\_ *[name and address of Contractor<sup>45</sup>]* (hereinafter called "the Contractor") shall deposit with \_\_\_\_\_ *[name of Employer]* a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of \_\_\_\_\_ *[amount of guarantee<sup>46</sup>]* \_\_\_\_\_ *[in words]*.

We, the \_\_\_\_\_ *[bank or financial institution]*, as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to \_\_\_\_\_ *[name of Employer]* on his first demand without whatsoever right of objection on our part and without his first claim to the Contractor, in the amount not exceeding \_\_\_\_\_ *[amount of guarantee]* \_\_\_\_\_ *[in words]*.

We further agree that no change or addition to or other modification of the terms of the Contract or of Works to be performed thereunder or of any of the Contract documents which may be made between \_\_\_\_\_ *[name of Employer]* and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until \_\_\_\_\_ *[name of Employer]* receives full repayment of the same amount from the Contractor. Consequently any demand for payment under this guarantee must be received by us at this office on or before that date.

<sup>45</sup> In the case of a JV, insert the name of the Joint Venture

<sup>46</sup> An amount shall be inserted by the bank representing the amount of the Advance Payment, and denominated in Indian Rupees.

Yours truly,

Signature and seal: \_\_\_\_\_

Name of Bank: \_\_\_\_\_

Address: \_\_\_\_\_

Date: \_\_\_\_\_

*Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.*

## Retention Money Security

### Demand Guarantee

*[Guarantor letterhead or SWIFT identifier code]*

\_\_\_\_\_ *[Bank's name and address of issuing branch or office]*

**Beneficiary:** \_\_\_\_\_ *[Name and Address of Employer]*

**Date:** \_\_\_\_\_

**RETENTION MONEY GUARANTEE NO.:** \_\_\_\_\_

We have been informed that \_\_\_\_\_ *[name of contractor<sup>47</sup>]* (hereinafter called "the Contractor") has entered into Contract No. \_\_\_\_\_ *[reference number of the contract]* dated \_\_\_\_\_ with you, for the execution of \_\_\_\_\_ *[name of contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment, payment of \_\_\_\_\_ *[insert the second half of the Retention Money]* is to be made against a Retention Money guarantee.

At the request of the contractor, we \_\_\_\_\_ *[name of Bank]* hereby irrevocably undertake to pay you the sum or sums not exceeding in total an amount of \_\_\_\_\_ *[amount in Rupees]* (\_\_\_\_\_) *[amount in words<sup>48</sup>]* 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 without cavil or argument.

It is a condition for any claim and payment under this guarantee to be made that the payment of the second half of the Retention Money referred to above must have been received by the Contractor on its account number \_\_\_\_\_ at \_\_\_\_\_ *[name and address of Bank]*.

This guarantee shall expire, at the latest, 21 days after the date when the Employer has received a copy of the Defects Liability Certificate issued by the Project Manager. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

\_\_\_\_\_  
*[Signature(s) and seal of the guarantor]*

<sup>47</sup> In the case of a JV, insert the name of the Joint Venture

<sup>48</sup> The Guarantor shall insert an amount representing the amount of the second half of the Retention Money or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security.

## **ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

### **1.1. Introduction**

Environmental Management Plan has been prepared which mainly centered on the understanding of the interactions between the environmental setting and the project activities and the assessment of the likely impacts. Mitigation measures for anticipated environmental impacts have been elaborated as specific actions which would have to be implemented during the project implementation. The EMP would help the contractors/PIU to implement the project in an environmentally sustainable manner and where contractors, understand the potential environmental impacts arising from the project roads and take appropriate actions/ mitigation measures to properly mitigate/manage such environmental impacts. EMP can thus be considered to be an overview document for contractors that will guide environment management of all anticipated impacts in Bijbehara – Karihama Road and Sangam - Khudwani Road in District Anantnag. This EMP may also be considered as flexible and will be further developed by the Contractor in the Contractor's Environment Management Plan.

### **1.2. Proposed Works of Road Subprojects under Package- 4 (Kashmir)**

The proposed subproject components of road package 4 (Kashmir) consist of the following strengthening / improvement and up-gradation work:

1. Bijbehara – Karihama Road in District Anantnag
2. Sangam - Khudwani Road in District Anantnag

### **1.3. Outline of EMP and its Implementation Strategy**

The EMP is a guiding tool which discusses the potential environmental impacts and specific mitigation/management measures for the proposed roads under package- 4 (Kashmir). It refers to the responsibilities ensuring commitment for implementation and means of verifying/ supervision whether the same has been implemented properly. The timing and frequency of monitoring along with the supervision responsibility and reporting requirements are also provided in the Environmental Management Plan. As a part of the EMP, the contractors will commit to the identification of the environmental and, social impacts at the individual sub-project sites. In case of any future changes in the sub-project design, the EMP will need to be updated to reflect the new scope of the activities. Such revisions will be finalized in consultation with the World Bank.

The PIU will be responsible to ensure implementation of EMP for the performance of all by the contractors with the overall accountability resting with the JTFRP-PMU. Whereas, the TAQAC will ensure periodic quality audit/ guidance to the PIU and by imparting regular training, monitoring, and ensuring that all EMP provisions and requirements are translated into contract documents and that these requirements are implemented to their full intent and extent.

The overall responsibility will be of Contractor for effective implementation of EMP and adherence to all the mitigation measures as outlined in this EMP associated with their respective activities. The Contractor will be required to comply with the provisions of the EMP.

#### **1.4. Environmental Management Plan**

The Environmental Management Plan (EMP) will guide the environmentally-sound construction of the subprojects roads under Package 4 (Kashmir) namely, “Strengthening / Improvement & Upgradation of- (i) Bijbehara - Karihama Road” in District Anantnag and (ii) “Sangam – Khudwani Road” in District Anantnag and ensure efficient lines of communication/ coordination between the PIU, Contractor, PMU and TAQAC. The EMP has been prepared for three stages of road subprojects construction activities as (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage. EMP for above road subprojects under Package-4 (Kashmir) have been prepared and presented in (Table 1.1). Various guidelines, checklists, strip mapping plans and reporting formats for implementation of EMP will be part of EIA report as Annexures.

The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impacts of the subprojects; and (iv) ensure that safety recommendations are complied with.

Budgetary provisions for the implementation of EMP shall be integrated with part of the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP shall be incidental to the civil works and therefore, no separate environment budget/cost will be provided to the contractor for implementation of EMP. The contractor will ensure effective implementation of EMP during pre-construction, construction, and demobilization/ operation stages.

The Contractor is deemed not to have complied with the EMP if; (i) within the boundaries of the project site/ ancillary sites, site extensions and haul/ access roads there is evidence of contravention of clauses and, (ii) if environmental damage ensues due to negligence and, the contractor fails to comply with corrective action measures or other instructions issued by the PIU / JTFRP-PMU within a specified timeframe, (iii) the Contractor fails to respond adequately to complaints from the public



**Table 1.1: Environmental Management Plan for Up-gradation of Road Subprojects under Package-4 (Kashmir):  
(Bijbehara- Karihama Road and Sangam- Khudwani Road in District Anantnag)**

S. No.	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning and Execution	Supervision/ Monitoring
<b>A.</b>	<b>Pre-Construction Stage</b>			
	<b>Pre-construction Activities By the Contractor</b>			
A.1	Appointment and Mobilization of Environment & Safety Officer	<ul style="list-style-type: none"> <li>The contractor will appoint 2 (two) qualified and experienced Environment &amp; Safety Officers (ESOs) for each subproject under Package 4 (Kashmir), who will dedicatedly work and ensure implementation of EMP including Occupational, Health and Safety measures.</li> <li>Separate appointment of qualified Environmental Safeguard Officer and his/her mobilization for each road under Package 4 (Kashmir).</li> <li>Contractor to inform the PIU for the appointment and mobilization of each Environmental Safeguard Officers (ESOs)</li> </ul>	Contractor	PIU TAQAC
A-2	Regulatory Approvals	<ul style="list-style-type: none"> <li>Permission from Irrigation &amp; Flood Control Department for any works related to culverts, embankment construction, protective works, etc. along or near water bodies especially</li> <li>Labour license from the Department of Labour.</li> <li>Prior permission will be taken from line department offices of Electricity (PDD), Telecommunications (for OFC underground cables, etc), water Pipeline (PHE), etc. Utility shifting required to be undertaken by the contractor in the supervision of PIU.</li> <li>If contractors open new stone quarry or borrow areas, prior Environmental Clearance will be obtained from SEIAA/DEIAA.</li> <li>For set-up of Stone Crusher Plant, HMM Plants, Batching Plant, D.G Sets- Consent to Establish and Consent to Operate will be obtained from J&amp;K State Pollution Control Board (J&amp;KSPCB) or if contractor intends to procure construction materials from local authorized third party agencies then contractor will collect and submit necessary clearance/approval from authorized third party agencies.</li> </ul>	PIU  Contractor	PIU PMU  PIU TAQAC

A-3	The orientation of Implementing Agencies	<ul style="list-style-type: none"> <li>The PIU shall organize orientation sessions for contractors during all stages of the project. This shall include on-site training (general as well as specific to the context of this subproject) as well. These sessions shall involve concerned PIU, project staff, contractors, consultants, etc.</li> </ul>	PIU	PMU, TAQAC
A-4	Utility Relocation and Common Property Resources (CPR's)	<ul style="list-style-type: none"> <li>All utilities and common property resources, if any shall be relocated and restored before the commencement of the road improvement activities.</li> <li>Before the commencement of works, a joint field Monitoring will be conducted by the Contractor, TAQAC, PIU to map out the alignments, to check if any utility is being impacted due to construction works. While relocating these utilities and facilities all concerned agencies including PIU shall take necessary precautions and shall provide barricades/delineation of such sites to prevent accidental fall of pedestrian and other road users into pits, drains both during demolition and construction/ relocation of facilities.</li> <li>Checking for accommodating utilities crossing the drains- rising, lowering or re-location if required.</li> </ul>	Contractor	PIU, TAQAC
A.5	Procurement of Machinery, Crushers, Batching Plants, etc	<ul style="list-style-type: none"> <li>Specifications of Machinery, crushers, and batching plants shall comply with the requirements of the relevant environmental legislation. Crusher, Batching plants and hot mix plant shall be located 250m away from settlements/ commercial establishments, preferably in the downwind direction.</li> <li>No plants should be set-up within 250m from the residential/ settlement locations. The Contractor shall submit a detailed layout plan for such sites and seek prior approval of PIU before entering into a formal agreement with a landowner for setting-up such sites.</li> <li>Actions by PIU/PMU against any non-compliance shall be borne by the Contractor at his own cost. Arrangements to minimize dust pollution through the provision of water spray shall have to be provided at such sites.</li> </ul>	Contractor	PIU, TAQAC
A.6	Construction Camp Locations - Selection, Design & Layout	<ul style="list-style-type: none"> <li>If the contractor decides to establish labour camp, siting of the camp will be as per the guidelines are given in Annexures- and layout of camp will be approved by PIU).</li> <li>Labour camp will not be established within 250 m from the nearest settlement to avoid conflicts and stress with the local community.</li> </ul>	Contractor	PIU, TAQAC

A.7	Arrangements for Temporary Land for Camp	The Contractor will obtain consent from landowners in writing for temporary use of land for labour camp, etc.	Contractor	PIU, TAQAC
A.8	Tree cutting	<ul style="list-style-type: none"> <li>Indigenous trees like Willow and Poplar trees between 20-30 numbers may be required to be cut down/pruned as they come close or may protrude towards road pavement. These may possess the visibility and safety issues for the traffic movement.</li> <li>Loss of trees will be compensated by a 1:3 ratio (i.e. for loss of 1 tree 3 trees will be planted) or greater and transplantation of the same trees may be envisaged wherever applicable.</li> </ul>	PIU/ Line Department and Contractor	PMU TAQAC
A.9	Safeguarding of Trees and Plantation	<ul style="list-style-type: none"> <li>The Chinar and Mulberry trees will be marked with horizontal reflective strips prior to commencement of works, if any.</li> <li>These trees in the construction zone will be covered/ wrapped with protective green mesh fiber cloth around base tree trunk area by 6 feet in height.</li> <li>No stockpiling of any construction will be allowed around or close to Chinar trees.</li> <li>Any other trees within the area near the construction site will be marked with same horizontal reflective strips and green mesh as per the above measures.</li> <li>No concreting shall be allowed around the Chinar trees or any other scheduled tree and all excavation activities shall be done only in consultation with the Environmental Specialist of PMU.</li> </ul>	Contractor	PMU, PIU, TAQAC

A.10	Construction Vehicles, Equipment, and Machinery	<ul style="list-style-type: none"> <li>All vehicles and equipment to be procured for the proposed up-gradation works of roads subprojects under Package-4 (Kashmir) will conform to the relevant Bureau of Indian Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 and Motor Vehicles Act, 2019 will be strictly adhered to.</li> <li>The silent/quiet equipment like DG set as per regulations will be used at the construction site or labour camp.</li> <li>The contractor will maintain records of Pollution under Control (PUC) certificates for all vehicles used during the contract period, which will be produced to PIU for Monitoring and whenever required.</li> </ul>	Contractor	PIU, TAQAC
A.11	Arrangement for Construction Water	<ul style="list-style-type: none"> <li>The contractor shall source construction water preferentially from surface water bodies/nearby rivers in the project area. The contractor shall be allowed to pump only from the surface water bodies. Boring of any tube wells shall be prohibited. Necessary permission for use of water will be obtained from the competent authority.</li> <li>To avoid disruption/disturbance to other water users, the contractor shall extract water from fixed locations. The contractor shall consult the local people before finalization the locations.</li> <li>The contractor can extract groundwater only in case surface water sources are not available and that too only after proper permission from Central Ground Water Authority.</li> </ul>	Contractor	PIU, TAQAC
A.12	Sand (all river beds used directly or indirectly for the project)	If the supplier of sand is another (third) party, the authentic copy of lease agreement that has been executed between the local Tehsildar and the supplier has to be submitted to PIU/PMU of the project, before any procurement is made from such a site. Environmental clearance for stone quarry and borrow area.	Contractor	PIU, PMU
A.13	Labour Requirement	The contractor preferably will use unskilled/semiskilled labour from local areas to give the maximum benefit to the local community to avoid any additional stress on the existing facilities (medical services, power, water supply, etc). At an average >80-150 labours/ day will be required during the construction stage depending upon the extent of construction work.	Contractor	PIU, PMU, TAQAC

A.14	Traffic Management Plan- Planning for Traffic Diversions and Detours	<ul style="list-style-type: none"> <li>Detailed traffic control plans shall be prepared by the contractor and the same shall be submitted to the PIU for approval. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic arrangement after cessation of work each day, safety measures undertaken for the transport of hazardous materials and arrangement of flagmen, etc to regulate traffic congestion.</li> <li>The contractor shall provide specific measures for the safety of pedestrians and workers as a part of traffic control plans. The contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</li> <li>The Contractor shall also inform the local community about diversion in traffic routes and pedestrian access arrangements with assistance from PIU.</li> </ul>	Contractor	PIU, TAQAC
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A-15	<sup>49</sup> Stockyard/ Storage of Construction Material and Establishing Equipment Lay- down Area	<ul style="list-style-type: none"> <li>• Contractor in consultation with PIU shall identify the site for temporary use of land storage of construction materials including pipes etc. These sites shall not cause an inconvenience to the local population/traffic movement. These locations shall be approved by the PIU.</li> <li>• Selection of location for material storage and equipment lay-down areas must take into account prevailing winds, distances to adjacent land uses, general on-site topography and water erosion potential of the soil. Impervious surfaces must be provided wherever necessary.</li> <li>• Protect material stockpiles from storm water (e.g. by excavating a cut-off ditch around stockpiles to keep away storm water).</li> <li>• Enclosed storage for fuel with non- permeable flooring.</li> <li>• Contractor shall cover material stockpiles with a tarpaulin or other materials.</li> <li>• Avoid stockpiling material near water bodies</li> <li>• Proper cover and stacking of loose construction material will be ensured during the construction of outfall structures at construction sites to prevent surface runoff and <sup>50</sup>contamination of receiving water body.</li> <li>• Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances like bitumen, diesel, used oil and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. Necessary training and awareness programs shall be carried out to make aware the contractor and its staff aware of the hazardous nature of substances.</li> </ul>	Contractor	PIU, TAQAC
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<sup>49</sup> These storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

<sup>50</sup> The most expected source of watercourse contamination is excavated soil or loose material being washed into water body during construction of drainage works

A-16	Information Dissemination and Communication Activities	<ul style="list-style-type: none"> <li>Prior to construction activity, information dissemination will be undertaken by the contractor at the project site. The wider dissemination of information to the public will be undertaken by PMU through the disclosure of EA / EMP reports on the website of PMU-JTFRP.</li> <li>Project information Board showing the name of work, project cost, duration, date of commencement, date of completion, executing agency and contact details (including telephone numbers) shall be displayed both sides of the roads.</li> <li>Information boards will also be set up at the sites of construction camps and labour camps, plants and stockyard site. Details of Nodal officer with telephone numbers will be displayed for registering complaint/grievances by stakeholder/general public</li> </ul>	PMU  Contractor	PMU, PIU, TAQAC  PIU
A-17	Environmental Monitoring-Baseline Data	Ambient air quality, noise levels, and water quality monitoring on a six-monthly basis as per environmental monitoring plan and in accordance with the instruction of Environmental Specialist of PMU.	PIU	PMU, TAQAC
<b>B. B.1</b>	<b>Construction Stage Site Clearance (Clearing and Grubbing)</b>			
B.1.1	Clearing, grubbing and Levelling	<ul style="list-style-type: none"> <li>If required vegetation will be removed from the construction zone before the commencement of construction.</li> <li>All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval of PIU.</li> <li>The Contractor, under any circumstances, will not cut or damage trees.</li> <li>Trees identified under the project will be cut only after receiving clearance from the Forest Dept (as applicable). Vegetation with a girth size of over 30 cm will be considered as trees and shall be compensated.</li> </ul>	Contractor	PIU, TAQAC
B.1.2	Dismantling of Culverts	All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials, and appendage as well as the method of operation from impeding cross-drainage at rivers, streams, water canals, and existing irrigation and drainage systems. Demolition wastes will be collected and disposed of as per the provision of Construction & Demolition Rule 2016.	Contractor	PIU, TAQAC

B.1.3	Generation & disposal of Debris	<ul style="list-style-type: none"> <li>• Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction.</li> <li>• Scarified asphalts and the other construction wastes shall be appropriately re-used in road construction with the permission of PIU. The dismantled road and scarified bitumen waste shall be utilized for the paving of crossroads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the roads or in any other manner approved by the PIU.</li> <li>• The Contractor will suitably dispose off unutilized debris and waste materials either through filling up of borrows areas located in the wasteland or at pre-designated disposal locations, subject to the approval of the Environmental Expert of PIU.</li> <li>• At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the groundwater. The Contractor will ensure that the surface area of such disposal pits is covered with a layer of soil.</li> <li>• All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the Contractor as approved and directed by the Environmental Expert of PIU.</li> <li>• The pre-designed disposal locations will be a part of the Solid Waste Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of PIU.</li> <li>• Debris generated from pile driving or other construction activities shall be disposed of such that it does not flow into the surface water bodies or form mud puddles in the area.</li> </ul>	Contractor	PIU, TAQAC
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B.1.4	Stripping, stocking, and preservation of topsoil	<p>The topsoil from areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stockpiling will be pre-identified in consultation and with approval of Environmental Specialist of PIU. The following precautionary measures will be taken to preserve them till they are used:</p> <p>(a) The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing will protect the edges of the pile.</p> <p>(b) Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.</p> <p>(c) It will be ensured by the Contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles.</p> <p>Such stockpiled topsoil will be utilized for:</p> <ul style="list-style-type: none"> <li>• Covering all disturbed areas including borrow areas, only in a case where there are to be rehabilitation</li> <li>• Dressing of slopes of road embankment</li> <li>• Agricultural fields of farmers acquired temporarily land.</li> </ul>	Contractor	PIU/ TAQAC
B 1.5	Accessibility	<ul style="list-style-type: none"> <li>• The Contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road. The Contractor will also ensure that the existing accesses will not be undertaken without providing adequate provisions. The Contractor will take care that the crossroads are constructed in such a sequence that construction work on the adjacent crossroads is taken up one after one so that traffic movement in any given area not get affected much.</li> </ul>	Contractor	PIU/ TAQAC

B 1.6	Planning for Traffic Diversions And Detours	<ul style="list-style-type: none"> <li>• Temporary diversions will be constructed with the approval of the Environmental Specialist of PIU. Detailed Traffic Control Plans will be prepared by the Contractor and approved by Environmental Specialist, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures for night time traffic and precaution for transportation of hazardous materials and arrangement of flagmen.</li> <li>• The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</li> <li>• The Contractor will also inform the local community of changes to traffic routes, conditions, and pedestrian access arrangements. The temporary traffic detours will be kept free of dust by a sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).</li> </ul>	Contractor	PIU/ TAQAC
B.2	Procurement of Construction Materials			

B.2.1	Procurement for Aggregate and other construction materials	<ul style="list-style-type: none"> <li>No borrow area will be opened without permission of the Environmental Specialist and without obtaining necessary regulatory permission. The location, shape, and size of the designated borrow areas will be as approved by the Environmental Specialist and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations will be carried out as specified in the guidelines for siting and operation of borrow areas.</li> <li>The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust-free by the Contractor. A sprinkling of water will be carried out twice a day to control dust along such roads during their period of use.</li> <li>During dry seasons (autumn and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Specialist of PIU will decide the sprinkling time depending on the local requirements. The contractor will rehabilitate the borrow areas as soon as borrowing of soil is over from a particular borrow area in accordance with the approved borrow area Redevelopment Plan.</li> </ul>	Contractor	PIU, TAQAC
B.2.2	Transporting Construction Materials	<ul style="list-style-type: none"> <li>All vehicles delivering fine materials like aggregate, cement, earth, sand, etc, to the site will be covered by Tarpaulin to avoid spillage of materials.</li> <li>The existing road used by vehicles of the contractor or any of his subcontractors or suppliers of materials will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles.</li> <li>The contractor will make an effort to transport materials to the site in non- peak hours</li> </ul>	Contractor	PIU, TAQAC
B.2.3	Quarry Operations & Crushers	The Contractor shall obtain materials for approved quarries. The crushers will be operated after obtaining consent to establish and consent to operate from J&KSPCB.	Contractor	PIU, TAQAC
<b>B.3</b>	<b>Construction Work</b>			

B.3.1	Labour Site	Camp	<ul style="list-style-type: none"> <li>• A project information board will be displayed at the labour campsite.</li> <li>• Electrical cables and wires will be properly arranged with proper electrical safety. Loose electrical connections will not be allowed at the labour camp.</li> <li>• Red danger sign with bone &amp; skull will be displayed as per The Electrical Rules at three-phase motors, electrical panels and electrical machines, DG sets, etc.</li> <li>• Housekeeping at labour camp will be maintained properly. Daily sweeping and cleaning will be done at the labour camp.</li> <li>• HIV Aid awareness posters will be displayed at the campsite.</li> <li>• The solid waste generated at the campsite will be collected in covered waste bins. Then, it will be segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes will be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste will be disposed of in compost pit. Non-biodegradable inert wastes will be sent to landfill site of Anantnag Municipality.</li> <li>• Proper drinking water, well-ventilated accommodation, sanitation, canteen facilities will be provided to workers at the labour camp.</li> <li>• Suitable signages will be displayed at labour camps.</li> </ul>	Contractor	PIU, TAQAC
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B.3.2	Drainage and Flood control	<p>The Contractor shall ensure that no construction materials shall block the water flow or create water lodging at the worksite. The Contractor shall take remedies to remove accumulated water (if any) from the construction sites, campsites, storage yard, excavated areas, etc. Construction works should plan well in advance prior to the onset of monsoon to avoid water- pool besides providing temporary cross drainage systems. The contractor shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or runoff of sediments is controlled. Silt fencing shall be installed prior to the onset of the monsoon at all the required locations, as directed by PIU/PMU. Prior to the monsoon, the contractor shall provide either permanent or temporary drains to prevent water accumulation in surrounding residential, commercial and agricultural areas.</p>	Contractor	PIU, TAQAC
B 3.3	Siltation of Water Bodies and Degradation of Water Quality	<ul style="list-style-type: none"> <li>• The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction.</li> <li>• The contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the project road and around the stockpiles at the construction sites including ancillary sites close to water bodies. The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road.</li> <li>• The contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.</li> <li>• On completion of the construction of culverts and bridges, drainage channels will be cleared by collecting debris and disposed off suitably. Detours/diversions constructed for construction of culverts and bridges will also be cleared before onset of monsoon.</li> </ul>	Contractor	PIU, TAQAC

B 3.4	Slope Protection and Control of Soil Erosion	<ul style="list-style-type: none"> <li>• The Contractor will construct slope protection works as per design, or as directed by PIU to control soil erosion and sedimentation through use of Breast walls, Retaining Walls, Pilot Bioengineering methods, dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices.</li> <li>• All temporary sedimentation, pollution control works and the maintenance thereof will be deemed as incidental to the earthwork or other items of work and as such no separate payment will be made for them.</li> <li>• The contractor will ensure the following aspects:</li> <li>• After construction of road embankment, the side slopes will be covered with grass and shrubs as per design specifications.</li> <li>• Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drain immediately on completion of earthworks.</li> <li>• In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank.</li> <li>• Along sections abutting water bodies, pitching as per design specification will protect slopes.</li> </ul>	Contractor	PIU TAQAC
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B.3.5	Safeguarding of Trees	<ul style="list-style-type: none"> <li>• Scheduled trees, if any should be marked (dual horizontal strip- Yellow/ Red colour) with safe reflective strips prior to commencement of works.</li> <li>• Since Chinar tree\Mulberry tree\Walnut tree are sensitive to construction, all such trees in the construction zone will be covered/ wrapped with protective green mesh fiber cloth around base tree trunk area by 6 feet in height.</li> <li>• No stockpiling of any construction will be allowed around or close to Chinar, Walnut or Mulberry trees</li> <li>• Make-shift steel barricading should be provided around each Chinar, Mulberry, and Walnut trees in an active work zone where excavation takes place for the purpose of longitudinal drainage etc.</li> </ul>	Contractor	PIU, TAQAC
B.3.6	Pedestrian and Vehicular Traffic Movement Management	<ul style="list-style-type: none"> <li>• Detailed traffic control plans will be prepared and submitted to the PIU for approval one week prior to commencement of works.</li> <li>• The traffic control plans shall contain details of temporary diversion, details of arrangements for construction (road stretches, timing, and phases).</li> <li>• Provide the construction itinerary in advance so that the road users can use alternative routes</li> <li>• Erect warning and safety signs of ongoing works.</li> <li>• Suitable retro-reflective warning signs should be placed at near construction locations and should be visible at night.</li> <li>• Alternative access ways should be communicated to the community by way of announcement appropriately for the public information.</li> <li>• The contractor shall take all necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signs, markings, flagmen as proposed and approved by PIU/PMU. The contractor shall ensure that all signs, barricades, pavement markings are provided as per applicable IRC code and guidelines.</li> <li>• Install signage, barricading, fencing as required and include safety measures for the transport of materials/equipment, which shall be limited to certain times, and arrangements for flagmen at the intersection.</li> </ul>	Contractor	PIU, TAQAC

B.3.7	Excavation works for longitudinal drains along the road corridor	<ul style="list-style-type: none"> <li>• As per DPR, drainage has been proposed for the Package 4 (Kashmir) roads along with built-up areas, market area and beside the project road where ever the drain is necessary.</li> <li>• At the excavation site, warning signboards will be displayed in vernacular language and English.</li> <li>• The entry of general public/unauthorized persons will be restricted.</li> <li>• During excavation for laying of concrete (RCC) cover drains necessary safety measures will be taken by the contractor.</li> <li>• Excavation of 1.5 meters deep or greater requires side protection (Close Timbering and step cutting) unless the excavation is made entirely in stable rock/soil.</li> <li>• Contractor to follow strict protocol during construction/ excavation for longitudinal drainage especially along with sensitive receptors like schools, mosque, community centres, religious places, shrines, graveyard, etc.</li> <li>• Excavated earth will be collected and disposed of in pre-identified site with the approval of PIU. Excavated earth shall not be dump on the carriageway or shoulders.</li> <li>• Casted drain block and drain cover will not be stacked on the road.</li> <li>• To ensure the elimination of excavation hazards, excavation will be carried in the presence of a competent person.</li> <li>• Suitable barricading will be provided around the excavation site.</li> <li>• Suitable personal protective equipment will be provided to the workers.</li> </ul>	Contractor	PIU, TAQAC
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B.3.8	Handling of Cement Bags	<ul style="list-style-type: none"> <li>• Cement bags will be stored and emptied in covered areas to control fugitive dust emissions.</li> <li>• While handling and emptying cement bags, workers will wear masks, hand gloves, and protective goggles.</li> <li>• Manual transferring of cement bags from one place to another place will not be allowed. For this purpose, the trolley will be used.</li> </ul>	Contractor	PIU, TAQAC
B.3.9	Work-zone safety Management	<ul style="list-style-type: none"> <li>• The Contractor shall prepare the construction safety plan as per provisions under the IRC 67-2001, SP-55 for safe work zone to be duly approved by the environmental specialist of PIU/PMU prior to the start of road works.</li> <li>• Temporary barricades shall be provided to delineate the construction zone as well as material stacking areas. The construction site and the labour facility (if any) shall be appropriately barricaded to prevent entry and accidental trespassing of workers, staff, and others into the construction site.</li> <li>• All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor.</li> <li>• Proper retro-reflective warning signage will be installed on the access road next to the construction site about the movement of construction machinery and vehicles.</li> <li>• In excavations for longitudinal surface road drains, culverts, etc., a high visibility warning and retro-reflective signage shall be displayed in vernacular language and English. The entry of unauthorized persons should be restricted. Excavation of 1.5 meters deep or greater will be adequately barricaded.</li> <li>• There shall be adequate lighting arrangement at night to prevent mishaps after construction activity ceases for the day</li> <li>• All the retro safety signage as per IRC 55 will be erected at the construction site for generating awareness among the local community and road users during the construction.</li> </ul>	Contractor	PIU, TAQAC

B.3.10	Sensitive Receptors-Impact Management	<ul style="list-style-type: none"> <li>• At each sensitive receptor-like schools, mosques/ religious places, shrines, community centers, graveyards, etc and in general residential houses, the construction operations in these areas should be limited to the time period from 7:30 am to 6:00 pm.</li> <li>• Periodic maintenance and calibration of construction equipment/ vehicles to meet applicable CPCB emission standards.</li> <li>• Contractor to ensure regular dust suppression measures by way of standard and efficient water sprinkling through water tankers at these designated sensitive receptors.</li> <li>• Noise barriers shall be installed during the construction phase to protect the school from the noise from construction activities.</li> <li>• Adequate barricading and safety measures to protect dust pollution and noise impacts on sensitive receptors like schools and religious places etc. due to vehicle movement to be ensured prior to the start of work and their effectiveness to be checked during construction.</li> </ul>	Contractor	PIU, TAQAC
B.3.11	Occupational Health and Safety of Workers	<ul style="list-style-type: none"> <li>• The contractor will prepare and follow the OHS plan, including provisions for an emergency response plan.</li> <li>• All workers will be provided with required personal protective equipment</li> <li>• Emergency Telephone Numbers shall be displayed at camp and plant site.</li> <li>• Medical facilities shall be provided for workers at the Labour camp and plant site.</li> </ul>	Contractor	PIU, TAQAC
<b>B.4</b>	<b>Pollution</b>			
<b>B.4.1</b>	<b>Water Pollution</b>			
B.4.1.1	Water Pollution from construction material	<ul style="list-style-type: none"> <li>• The contractor will take all precautionary measures to prevent entering of wastewater into streams, water bodies or the irrigation system during construction. The contractor will avoid construction works close to the streams or water bodies during monsoon.</li> <li>• Contractor shall not wash his vehicles in river water and shall not enter riverbed for that purpose.</li> <li>• Any type of construction wastes will not be disposed off in rivers or water bodies.</li> </ul>	Contractor	PIU, TAQAC

B.4.1.2	Water Pollution from Fuel and Lubricants	<ul style="list-style-type: none"> <li>• The Contractor will ensure that all construction vehicle parking locations, fuel/lubricants storage sites, vehicle, machinery, and equipment maintenance, and refueling sites will be located at least 250 m away from rivers and irrigation canal/ponds. The Contractor will submit all locations and layout plans of such sites prior to their establishment and will be approved by the Environmental Specialist of PIU. The contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Wastewater from vehicle parking, fuel storage areas, workshops, wash down and refueling areas will be treated in an oil interceptor before discharging into on land or into surface water bodies or into another treatment system.</li> <li>• In all, fuel storage and refueling areas are located on areas supporting vegetation, the topsoil will be stripped, stockpiled and returned after cessation of such storage.</li> <li>• The contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites</li> <li>• All oil spills, used oil will be disposed off in accordance with J&amp;K State Pollution Control Board (JKSPCB) guidelines.</li> </ul>	Contractor	PIU, TAQAC
B.4.1.3	Waste from Camp      Water Labour	<ul style="list-style-type: none"> <li>• Wastewater generated from the sanitary facilities at labour camp will be treated in a septic tank followed by soak pit.</li> <li>• No untreated raw sewage/wastewater will be discharged into any water body.</li> <li>• Workers will not be allowed for open defecation. Proper toilets fitted with the septic tank and soak pit will be provided for workers at the campsite.</li> <li>• At the bridge construction site, portable toilets shall be provided for workers and sewage from portable toilets shall be passed through a septic tank followed by soak pit.</li> </ul>	Contractor	PIU, TAQAC
<b>B.4.2</b>	<b>Air Pollution</b>			

B.4.2.1	Dust Pollution	<ul style="list-style-type: none"> <li>• Frequent dust suppression will be planned for this stretch of the road by use of water tankers.</li> <li>• The contractor will procure the construction machinery, which conforms to the pollution control norms specified by the MoEF&amp;CC/CPCB/J&amp;KSPCB.</li> <li>• The excavated earth /construction materials will be stored properly so that it does not generate fugitive emissions.</li> <li>• Regular maintenance of vehicles to be used for material transportation and equipment will be carried and vehicular pollution check should be made mandatory.</li> <li>• Mask and other PPE should be provided as a mandatory effort to the construction workers in dust prone areas.</li> </ul>	Contractor	PIU, TAQAC
B.4.2.2	Emission from Construction Vehicles, Equipment, and Machinery	<ul style="list-style-type: none"> <li>• The contractor will ensure that all vehicles, equipment, and machinery used for construction works are regularly maintained and conform that pollution emission levels and comply with the requirements of CPCB and/Motor Vehicles Rules. The contractor will submit Pollution under Control (PUC) certificates for all vehicles for the project.</li> <li>• DG set will be provided with a chimney of adequate height as per CPCB guidelines (Height of stack in meter = Height of the building + <math>0.2 \sqrt{\text{KVA}}</math>). The environmental monitoring is to be conducted as per the monitoring plan.</li> </ul>	Contractor	PIU, TAQAC
<b>B.4.3</b>	<b>Noise Pollution</b>			

B.4.3.1	Noise Levels from Construction Vehicles and Equipment's	<p>The contractor will confirm the following:</p> <ul style="list-style-type: none"> <li>• All construction equipment used in excavation, concreting, etc, will strictly conform to the MoEF&amp;CC/CPCB/J&amp;KSPCB noise standards.</li> <li>• All vehicles and equipment used in construction works will be fitted with exhaust silencers/mufflers.</li> <li>• Maintenance and servicing of all construction vehicles and machinery will be done regularly.</li> <li>• Only acoustic enclosures fitted DG sets will be allowed at the construction site and labour camp. At the construction sites within 150 m of the nearest habitation, noisy construction work and use of high noise generation equipment will be stopped during the night time between 10.00 pm to 6.00 am.</li> <li>• Working hours of the construction activities will be restricted around educational institutes/health centres (silence zones) up to a distance of 100 m from the sensitive receptors.</li> <li>• Noise monitoring shall be carried out in construction areas through the approved monitoring agency.</li> </ul>	Contractor	PIU, TAQAC
<b>B.5</b>	Archaeological Resources and Cultural properties			
B.5.1	Chance Found Archaeological Property	<ul style="list-style-type: none"> <li>• All fossils, coins, articles of the value of antiquity, structures, and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.</li> <li>• The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaints the Environmental Expert of the PIU of such discovery and carry out the PIU instructions for dealing with the same, waiting which all work shall be stopped.</li> <li>• The PIU will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.</li> </ul>	Contractor	PIU, PMU TAQAC

B.5.2	Impacts on Cultural Properties	<ul style="list-style-type: none"> <li>• All necessary and adequate care shall be taken to minimize the impact on cultural properties which includes cultural sites and remains, places of worship including mosques, temples, shrines, etc., graveyards, monuments and any other important structures as identified during design stage.</li> <li>• Relocation and enhancement measures shall be taken up as per the design and in consultation with the local community. Access to such properties from the road shall be maintained clear and clean.</li> </ul>	Contractor	PIU, TAQAC
<b>B.6 Personal Safety</b>				
B.6.1	Personal Safety Measures for Labours and Staff	<p>The contractor will take necessary measures for the personal safety of workers:</p> <ul style="list-style-type: none"> <li>• Protective safety shoes, gumboots, hand gloves, protective goggles, etc (as required) will be provided to the workers employed in excavation, steel rebaring, and bending concrete works, erection of pump station, etc.</li> <li>• Welder's protective eye-shields will be provided to workers who are engaged in welding works.</li> <li>• Earplugs will be provided to the workers exposed to high noise levels.</li> <li>• Safety vests will be used by workers when on a construction site.</li> <li>• The Contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The contractor will make sure that during the construction work all relevant provisions of Building and other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</li> <li>• The Contractor will not employ any person below the age of 14 years for any work.</li> </ul>	Contractor	PIU, TAQAC

B.6.2	Traffic Safety and	<ul style="list-style-type: none"> <li>• The Contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the traffic control plan/drawings and as required by the Environmental Expert for the information and protection of traffic approaching or passing through the section of any existing crossroads.</li> <li>• The Contractor will ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications.</li> <li>• Before taking up construction, a Traffic Control Plan will be devised and implemented to the satisfaction of the Environmental Expert of PIU.</li> </ul>	Contractor	PIU TAQAC
B.6.3	Emergency Management	<ul style="list-style-type: none"> <li>• Emergency numbers will be displayed at the construction sites and campsite,</li> <li>• First boxes will be made available at the construction site and campsite,</li> <li>• Fire extinguishers for petroleum oil fire and electrical fire will be made available at the campsite, fuel storage site, construction site, etc.</li> <li>• Designated vehicles, which can be used as an ambulance, will be available at the construction sites all the time.</li> </ul>	Contractor	PIU, TAQAC
B.6.4	Risk Measure Force	<ul style="list-style-type: none"> <li>• The contractor will make required arrangements so that in case of any mishap during, operation of machinery/ construction vehicles, dismantling, excavation, concrete pouring, hot asphalt handling and erection of pumps, all necessary steps can be taken for prompt first aid treatment.</li> <li>• Construction Safety Plan for all the road stretches, embankment development, protection works, works road longitudinal drains, ancillary sites to be prepared by the contractor and will identify necessary actions in the event of an emergency.</li> </ul>	Contractor	PIU, TAQAC

B.6.5	First Aid Facility	<p>The contractor will arrange for :</p> <ul style="list-style-type: none"> <li>• A readily available first aid unit including an adequate supply of sterilized dressing materials, burn ointment and appliances as per the state Factories Rules will be maintained all the time by the contractor.</li> <li>• The availability of first aid trained persons will be ensured at the project site during the construction phase.</li> <li>• Availability of suitable transport will be ensured at all times to take an injured or sick person(s) to the hospital.</li> </ul>	Contractor	PIU, TAQAC
B.6.6	Informatory Signs and Hoardings	The Contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Specialist of PIU.	Contractor	PIU TAQAC
B.7	<b>Labour Camp and Project Site Management</b>			



B.7.1	Accommodation for Labourers	<ul style="list-style-type: none"> <li>• The contractor will follow all relevant provisions of the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.</li> <li>• The location, layout and basic facility provision of each labour camp will be submitted to Environmental Expert of PIU prior to their construction.</li> <li>• The construction will commence only upon the written approval of the Environmental Expert of PIU.</li> <li>• The contractor will maintain necessary well ventilated living accommodation, toilets, bathrooms and ancillary facilities in a functional and hygienic manner.</li> <li>• Proper ventilation along with standard exhaust fans will be provided in labour accommodation rooms.</li> <li>• Regular cleaning and sweeping will be ensured at the labour campsite.</li> <li>• Systematic waste collection management at labour camp to be managed as per SWM Rules 2016.</li> <li>• Standard First Aid Kits/units including an adequate of sterilized dressing materials.</li> </ul>	Contractor	PIU, TAQAC
B.7.2	HIV/AIDS Prevention Measures	<ul style="list-style-type: none"> <li>• Necessary HIV/AIDS prevention measures will be taken at labour camp</li> <li>• HIV/AIDS awareness program will be organized by the contractor's Environment &amp; Safety Officer.</li> </ul>	Contractor	PIU, TAQAC

B.7.3	Potable Water for Workers	<ul style="list-style-type: none"> <li>The contractor will construct and maintain labour accommodation in such a fashion that uncontaminated clean water is available for drinking, cooking, bathing, and washing. The contractor will also provide potable water facilities within the precincts of workplace/pump stations in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.</li> <li>The contractor will also provide the following: <ul style="list-style-type: none"> <li>a) Supply of sufficient quantity of potable water (as per IS) at construction site/labour camp (site at suitable and easily accessible places and regular maintenance of such facilities).</li> <li>b) If any water storage tank is provided that will be kept such that the bottom of the tank at least 1 meter above the surrounding ground level.</li> <li>c) If water is drawn from any existing well/ hand pump, which is within 30 meters proximity of any toilet, drain or another source of pollution, the well will be disinfected before water is used for the drinking.</li> </ul> </li> <li>Environmental Expert of PIU will be required to inspect the labour camp once in a week to ensure the compliance of the EMP.</li> </ul>	Contractor	PIU, TAQAC
B.7.4	Sanitation and Sewage System at Labour Camp	<p>The contractor will ensure that :</p> <ul style="list-style-type: none"> <li>The sewage system for the camp will be designed, built and operated in such a fashion that no health hazard occurs and no pollution to the air, groundwater or adjacent watercourses take place,</li> <li>Separate toilets/bathrooms, as required, will be provided for men and women, marked in vernacular language,</li> <li>Toilets will be provided with a septic tank followed by a soak pit.</li> <li>Adequate water supply will be provided in all toilets and urinals,</li> <li>Night soil can be disposed of with the help of municipality or disposed of by putting a layer of it at the bottom of a permanent pit prepared for the purpose and covered with 15 cm layer of waste or refuse and then covered with a layer of earth for a fortnight.</li> </ul>	Contractor	PIU, TAQAC

B.7.5	Waste Disposal	<ul style="list-style-type: none"> <li>The contractor will provide garbage bins in the camp &amp; construction site and ensure that these are regularly emptied and disposed off in a hygienic manner according to Solid Waste Management Plan as per Solid Waste Management Rule 2016.</li> <li>Burning of wastes at construction sites, labour camp and roadside will not be allowed.</li> <li>The solid waste generated at the construction site &amp; labour camp will be collected in covered waste bins and segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes will be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste will be disposed off in the compost pit.</li> </ul>	Contractor	PIU, TAQAC
<b>B.8</b>	<b>Environmental Monitoring</b>			
B.8.1	Environmental Monitoring- Construction Stage	<ul style="list-style-type: none"> <li>The PIU will carry out environmental monitoring for Ambient Air Quality, Noise levels, and Water Quality on a six-monthly basis as per the environmental monitoring plan and in accordance with instruction of Environmental Specialist of PMU.</li> </ul>	PIU	PMU, TAQAC
B.8.2	Compensatory Plantation	<ul style="list-style-type: none"> <li>Indigenous trees like Willow and Poplar trees in between 20-30 may be required to be cut down/pruned as they come close or protrude towards the road pavement.</li> <li>Loss of trees will be compensated by a 1:3 ratio (i.e. for loss of 1 tree 3 trees will be planted) or greater and transplantation of the same trees may be envisaged wherever applicable. Compensatory plantation will be taken in the Parimpora-Soibugh area.</li> <li>Regular monitoring will be carried out for plantation along the project road for cutting of trees.</li> <li>Regular monitoring will be carried out for plantation along the project road for cutting of trees.</li> </ul>	PIU	PMU, TAQAC
<b>C.</b>	<b>Contractor's Demobilization</b>			

C.1	Clean-up Operations, Restoration and Rehabilitation	<ul style="list-style-type: none"> <li>The contractor will prepare the project and labour campsite restoration plan, which will be approved by the PIU / Environmental Expert. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization from the construction site and labour camp. The contractor will clear all temporary structures, debris, construction wastes, garbage, night soils, etc in environmental sound manner.</li> <li>All disposal pits or trenches will be filled in and effectively sealed off.</li> <li>Construction places including camp and any other area used/affected due to the project operations will be left clean and tidy at the contractor's expense to the entire satisfaction to the PIU.</li> </ul>	Contractor	PIU, TAQAC
C.2	Land Rehabilitation	<ul style="list-style-type: none"> <li>All surfaces hardened due to construction activities will be ripped &amp; imported materials thereon removed.</li> <li>All rubbles to be removed from the site to an approved disposal site. Burying of rubble on-site is prohibited.</li> <li>Surfaces are to be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the Engineer.</li> <li>All embankments are to be trimmed, shaped and replanted to the satisfaction of the PIU.</li> <li>Borrow pits are to be closed and rehabilitated in accordance with the pre-approved management plan for each borrow pit. The Contractor shall liaise with the PIU regarding these requirements.</li> </ul>	Contractor	PIU, TAQAC
<b>D Post Construction Stage</b>				
D.1	Environmental Monitoring- Post Construction Stage	<ul style="list-style-type: none"> <li>The environmental monitoring laboratory of JTFRP-PMU will carry out environmental monitoring for Ambient Air Quality, Noise levels, and Water Quality on a six-monthly basis as per environmental monitoring plan and in accordance to instruction of Environmental Specialist of PMU.</li> </ul>	PIU	PMU, TAQAC
D.2	Monitoring of Afforested and Landscape areas	Continuous watch and monitoring of afforested and landscape shall be done for its performance and survival rate. The plantation will be properly guarded by watch and ward personnel. Provision will be made for manure application and watering on a schedule.	PIU	PMU

D.3	Soil Erosion and Monitoring of Borrow Areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, will be carried out once in every three months.	PIU	PMU
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### 1.5. Clause for Nonconformity to Environmental Management Plan (EMP) - Protection of the Environment

The Contractor will implement necessary mitigation measures for which responsibility is assigned to him as stipulated in the EMP. Any lapse in implementing the same will attract the damage clause as detailed below:

- Any complaints of public, within the scope of the Contractor, formally registered with the PIU and communicated to the Contractor, which is not properly addressed within the time period intimated by the PIU shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures like unsafe conditions, non-collection of excavated material (during the laying of drainage pipes) regularly and other unattended Health, Safety & Environment (HSE) issues, as stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.
- On observing any lapses, PIU shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, in the subsequent interim payment certificate.
- For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.
- If the lapse is not rectified within one month after withholding the payment, **the amount withheld shall be forfeited immediately.**