



Government of West Bengal
Irrigation & Waterways Directorate
Central Tender Unit
Jalasampad Bhawan, 8th floor, Salt Lake, Kolkata-700091
E-Mail ID: ctuiwd@gmail.com

Dam Rehabilitation & Improvement Project (DRIP)

NATIONAL OPEN COMPETITIVE BIDDING

(Two-Envelope Bidding Process with e-Procurement)

(FOR ITEM RATE/ADMEASUREMENT CONTRACTS IN CIVIL WORKS)

REQUEST FOR BIDS NO.: WBIW/CTU/CE(ME)/DRIP/RFB-01/2026-27

NAME OF WORK: "Rehabilitation of gates & emergency gate and its hoisting system including all electrical works and CCTV surveillance system of Kangsabati-Kumari Dam in Block- Khatra & Indpur of Bankura district in West Bengal under the World Bank assisted scheme Dam Rehabilitation and Improvement Project, Phase-II (DRIP-II)."

PERIOD OF DOWNLOADING OF BIDDING DOCUMENT ONLINE	:	FROM	14.05.2026 10.00 Hrs.	TO	18.06.2026 14.00 Hrs.
LAST DATE AND TIME FOR RECEIPT OF CLARIFICATION BY BIDDERS	:	ON	25.05.2026	;	14.00 Hrs.
TIME AND DATE OF PRE-BID MEETING	:	ON	29.05.2026	;	14.00 Hrs.
START DATE AND TIME FOR SUBMISSION OF BID	:	ON	02.06.2026	;	14.00 Hrs.
LAST DATE AND TIME FOR RECEIPT OF BIDS	:	ON	18.06.2026	;	14.00 Hrs.
*TIME AND DATE OF OPENING OF BIDS TECHNICAL PART	:	ON	18.06.2026	;	16.00 Hrs.
VALIDITY REQUIRED FOR BANK GURANTEEE FOR BID SECURITY	:	AT LEAST UPTO 30/11/2026			
TIME AND DATE OF OPENING OF BIDS-FINANCIAL PART	:	The firms that qualify technically shall be notified subsequently for opening of the financial part of their bids.			
PLACE OF OPENING OF BIDS	:	Central Tender Unit Irrigation & Waterways Directorate, Government of West Bengal, Jalasampad Bhawan, 8 th floor, Salt Lake Kolkata-700091			
OFFICER INVITING BIDS	:	Central Tender Unit Irrigation & Waterways Directorate, Government of West Bengal, Jalasampad Bhawan, 8 th floor, Salt Lake Kolkata-700091			

REQUEST FOR BIDS

(RFB)



Government of West Bengal
Irrigation & Waterways Directorate
Central Tender Unit
Jalasampad Bhawan, 8th floor, Salt Lake, Kolkata-700091
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Dam Rehabilitation & Improvement Project (DRIP)

REQUEST FOR BIDS (RFB)

E-Procurement Notice

(Two-Envelope Bidding Process with e-Procurement)

NATIONAL OPEN COMPETITIVE PROCUREMENT

Name of Project: Dam Rehabilitation & Improvement Project (DRIP)

Contract Title: "Rehabilitation of gates & emergency gate and its hoisting system including all electrical works and CCTV surveillance system of Kangsabati-Kumari Dam in Block- Khatra & Indpur of Bankura district in West Bengal under the World Bank assisted scheme Dam Rehabilitation and Improvement Project, Phase-II (DRIP-II)."

Loan No./Credit No./ Grant No.: _____

RFB Reference No.: **WBIW/CTU/CE(ME)/DRIP/RFB-01/2026-27**

Date: _____

1. The Government of India has received/has applied for/intends to apply for financing from the World Bank toward the cost of the **Dam Rehabilitation & Improvement Project (DRIP)** and intends to apply part of the proceeds toward eligible payments under the contract¹ for construction of works as detailed below.
2. Bidding will be conducted through national open competitive procurement using a Request for Bids (RFB) as specified in the World Bank's "Procurement Regulations **for IPF Borrowers, July 2016, Revised August 2018**" ("Procurement Regulations"), and is open to all Bidders as defined in the Procurement Regulations.
3. Bidders from India having suitable experience of completing similar works under the **Government of West Bengal** or other State Governments/Government of India, or State/Central Government Undertakings may apply and they should have registration for participation in NIC operated e-tender portal of Government of West Bengal. 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 bidders². **Bidders are advised to note the clauses on eligibility (Section I Clause 4) and minimum qualification criteria (Section**

¹ Substitute "contracts" where Bids are invited concurrently for multiple contracts. Add a new para. 5 as follows: "Bidders may bid for one or several contracts, as further defined in the bidding document. Bidders wishing to offer discounts in case they are awarded more than one contract will be allowed to do so, provided those discounts are included in the Letter of Bid." and renumber paras 5 – 12.

² Modify or delete, based on registration requirement, if any for bidders from India.

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 Superintending Engineer, Central Tender Unit, Irrigation & Waterways Directorate**(*on behalf of implementing agency*) now invites online Bids from eligible Bidders for the **Rehabilitation& Modernization** 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 document at the address given below during office hours. **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 3.14 and 3.15 of the “Procurement Regulations” setting forth the World Bank’s policy on conflict of interest.**
5. The bidding document is available online on <https://wbtenders.gov.in> and <https://wbiwd.gov.in> (website) **from 14.05.2026; 10.00 Hrs. to 18.06.2026; 14.00 Hrs for free of cost.** Bidders will be required to register for participation in the e-tender portal of Government of West Bengal maintained by National Informatics Centre (NIC). The bidders would be responsible for ensuring that any addenda available on the website is also downloaded and incorporated.
6. For submission of the bid, the bidder is required to have Digital Signature Certificate (DSC) from one of the Certifying Authorities authorised by Government of India for issuing DSC. Aspiring bidders who have not obtained the user ID and password for participating in e-procurement in this Project, may obtain the same from the website: <https://wbtenders.gov.in>. There is no tender fee applicable for this bid.
7. Bids comprise two Parts, namely the Technical Part and the Financial Part, and both parts must be submitted simultaneously online on <https://wbtenders.gov.in>. (Website) on or before **14.00 hours on 18.06.2026 (date)** and the ‘Technical Part’ of the bids will be publicly opened online on the same day at **16.00 hours**, in the presence of the bidders designated representatives who wish to attend. The “Financial Part” shall remain unopened in the e-procurement system until the second public Bid opening for the financial part. Any bid or modifications to bid (including discount) received outside e-procurement system will not be considered. If the office happens to be closed on the date of opening of the bids as specified, the bids will be opened on the next working day at the same time and venue. The electronic bidding system would not allow any late submission of bids.
8. All Bids must be accompanied by a Bid Security of the amount specified for the work in the table below, drawn in favour of **the Executive Engineer, Kangsabati Mechanical Division, Khatra, Bankura**. 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. Procedure for **submission of bid security** is described in **Para 9**.
9. The bidders are required to submit **(a) original bid security (b) original affidavit** regarding correctness of information furnished with bid document with **the Superintending Engineer, Central Tender Unit, Jalasampad Bhawan, 8th floor, Salt Lake, Kolkata-700091** before the opening of technical part of the bid deadline i.e. **16.00 hours on 18.06.2026**, either by registered post/speed post/courier or by hand, failing which the bids will be declared non-responsive and will not be opened.

10. A pre-bid meeting will be held **on 29.05.2026 at 14.00 hours IST** at “Office of the Central Tender Unit, 8th floor, Jalsampad Bhaban, Saltlake City, Bidhannagar, Kolkata-700091” 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 download 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.
11. Other details can be seen in the bidding document. The Employer shall not be held liable for any delays due to system failure beyond its control. Even though the system will attempt to notify the bidders of any bid updates, the Employer shall not be liable for any information not received by the bidder. It is the bidders’ responsibility to verify the website for the latest information related to this bid.
12. The address for communication is as under:
- Name & Designation of Officer** Sri Kalyan Kumar Dey
Superintending Engineer
Central Tender Unit, Irrigation & Waterway Directorate,
Government of West Bengal.
- Official Address** 8th Floor, Jalsampad Bhawan, Salt Lake, Kolkata-700091
- Email** : ctuiwd@gmail.com
Telephone :
Mobile No : 9831101505

TABLE

Package No	Name of Work	Bid Security* (Rs.)	Cost of Document (Rs.)	Period of Completion
1	2	3	4	5
1.	"Rehabilitation of gates & emergency gate and its hoisting system including all electrical works and CCTV surveillance system of Kangsabati-Kumari Dam in Block-Khatra & Indpur of Bankura district in West Bengal under the World Bank assisted scheme Dam Rehabilitation and Improvement Project, Phase-II (DRIP-II)."	INR. ₹ 45.00 Lakh	NIL	540 days including Monsoon Period from the date of effectiveness of the contract

Superintending Engineer
Central Tender Unit, I&W Dte.

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PART 1 – Bidding Procedures

Section I - Instructions to Bidders

A. General	
1. Scope of Bid	1.1 In connection with the Specific Procurement Notice - Request for Bids (RFB), specified in the Bid Data Sheet (BDS), the Employer, as specified in the BDS, issues this bidding document for the provision of Works as specified in Section VII, Works' Requirements. The name, identification and number of lots (contracts) of this RFB are specified in the BDS.
	1.2 Throughout this bidding document: (a) the term "in writing" means communicated in written form (e.g. by mail, e-mail, and fax, including if specified in the BDS, distributed or received through the electronic-procurement system used by the Employer) with proof of receipt; (b) if the context so requires, "singular" means "plural" and vice versa; (c) "Day" means calendar day, unless otherwise specified as "Business Day". A Business Day is any day that is an official working day of the Borrower. It excludes the Borrower's official public holidays; (d) the term "ES" means environmental and social (including Sexual Exploitation, and Assault (SEA)); "Sexual Exploitation and Assault" "(SEA)" stands for the following: (i) Sexual exploitation is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. In Bank financed operations/projects, sexual exploitation occurs when access to or benefit from a Bank financed Goods, Works, Non-consulting Services or Consulting Services is used to extract sexual gain. (ii) Sexual assault is defined as sexual activity with another person who does not consent. It is a violation of bodily integrity and sexual autonomy and is broader than narrower conceptions of "rape", especially because (a) it may be committed by other means than force or violence, and (b) it does not necessarily entail penetration; and (e) "Contractor's Personnel" is as defined in Sub-Clause 9.1 of the General Conditions of Contract.
2. Source of Funds	2.1 The Borrower or Recipient (hereinafter called "Borrower") specified in the BDS has received or has 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, toward the project named in the BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this bidding document is issued.

	2.2 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 account for the purpose of any payment to persons or entities, or for any import of goods, equipment, plant, or materials, 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. Fraud and Corruption	3.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, 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), subcontractors, sub-consultants, service providers, suppliers, and their personnel, to permit the Bank to inspect all accounts, records and other documents relating to any initial selection process, prequalification process, bid submission, proposal 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, or a state-owned enterprise or institution subject to ITB 4.6, or any combination of them 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) 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 (f) 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; (g) 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; (h) 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 document or specifications of the contract, and/or the Bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Bank throughout the procurement process and execution of the contract.
	4.3 A firm that is a Bidder (either individually or as a JV member) shall not participate in more than one Bid, except for permitted alternative Bids. This includes participation as a Subcontractor in other Bids. Such participation shall result in the disqualification of all Bids in which the firm is involved. A firm that is not a Bidder or a JV member may participate as a subcontractor in more than one Bid.
	4.4 A Bidder may have the nationality of any country, subject to the restrictions pursuant to ITB 4.8. 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 subcontractors or sub-consultants for any part of the Contract including related Services.

	4.5 A Bidder that has been sanctioned by the Bank, pursuant to the Bank's Anti-Corruption Guidelines, in accordance with its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework as described in Section VI paragraph 2.2 d., shall be ineligible to be prequalified for, initially selected for, bid for, propose 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.
	4.6 Bidders that are state-owned enterprises or institutions in the Employer's Country may be eligible to compete and be awarded a Contract(s) only if they can establish, in a manner acceptable to the Bank, that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not under supervision of the Employer.
	4.7 A Bidder shall not be under suspension from Bidding by the Employer as the result of the operation of a Bid-Securing or Proposal-Securing Declaration.
	4.8 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. When the Works are implemented across jurisdictional boundaries (and more than one country is a Borrower, and is involved in the procurement), then exclusion of a firm or individual on the basis of ITB 4.8 (a) above by any country may be applied to that procurement across other countries involved, if the Bank and the Borrowers involved in the procurement agree. 4.9 A Bidder shall provide such documentary 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 consists of Parts 1, 2, and 3, which include all the sections specified below, and which 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 - Fraud and Corruption PART 2 Works' 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 Specific Procurement Notice - Request for Bids (RFB) issued by the Employer is not part of this bidding document.
	6.3 Unless obtained directly from the Employer or downloaded from the official website specified in the 'E-Procurement Notice', the Employer is not responsible for the completeness of the bidding document, responses to requests for clarification, the minutes of the pre-Bid meeting (if any), or Addenda to the bidding document in accordance with ITB 8. In case of any contradiction, documents obtained directly from the Employer or downloaded from the official website specified in the 'E-Procurement Notice' shall prevail.
	6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the bidding document and to furnish with its Bid all information and documentation as is required by the bidding document.
7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting	7.1 The electronic bidding system specified in the BDS provides for online clarifications. A Bidder requiring any clarification on the bidding document may notify the Employer online or raise its inquiries during the pre-Bid meeting if provided for in accordance with ITB 7.4. Clarifications requested through any

	other mode shall not be considered by the Employer. The Employer will respond to any request for clarification, provided that such request is received prior to the deadline for submission of Bids within a period specified in the BDS. Description of clarification sought and the response of the Employer shall be uploaded for information of all Bidders without identifying the source of request for clarification. Should the clarification result in changes to the essential elements of the bidding document, the Employer shall amend the bidding document following the procedure under ITB 8 and ITB 22.2. It is the bidder's responsibility to check on the e-procurement system, for any addendum/ amendment/ corrigendum to the bidding document.
	7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.
	7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter 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.
	7.4 If so specified in the BDS, 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.
	7.5 The Bidder is requested, to submit any questions only through the e-procurement portal, not later than one week before the meeting. Clarifications requested through any other mode shall not be considered by the Employer.
	7.6 Minutes of the pre-Bid meeting, if applicable, including the text of the questions asked by Bidders, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be uploaded online on e-procurement system. Any modification to the bidding document that may become necessary as a result of the pre-Bid meeting shall be made by the Employer exclusively through the issue of an addendum pursuant to ITB 8 and not through the minutes of the pre-Bid meeting. It is the bidder's responsibility to check on

	the e- procurement system, for any addendum/ amendment/ corrigendum to the bidding document. Non attendance at the pre-Bid meeting will not be a cause for disqualification of a Bidder.
8. Amendment of Bidding Document	8.1 At any time prior to the deadline for submission of bids, the Employer may amend the bidding document by issuing addenda.
	8.2 Any addendum issued shall be part of the bidding document and shall be deemed to have been communicated to all the bidders. The addenda will appear on the e-procurement system under “Latest Corrigendum”, and Email notification is also automatically sent to those bidders who have started working on the tender, unless otherwise specified in the BDS . The Employer shall not be liable for any information not received by the bidder. It is the bidders’ responsibility to verify the website for the latest information related to this bid.
	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 two Parts, namely the Technical Part and the Financial Part. These two Parts shall be submitted simultaneously. 11.2 The Technical Part shall contain the following: (a) Letter of Bid– Technical Part prepared in accordance with ITB 12 and ITB 14; (b) Bid Security or Bid-Securing Declaration in accordance with ITB 19.1; (c) Alternative Bid – Technical Part, if permissible, in accordance with ITB 13, the Technical Part of any Alternative

	Bid; (d) Authorization: written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.3, and in accordance with ITB 20.4 in case of a JV; (e) Bidder's Eligibility: documentary evidence in accordance with ITB 17 establishing the Bidder's eligibility to Bid; (f) Qualifications: documentary evidence in accordance with ITB 17 establishing the Bidder's qualifications to perform the contract if its Bid is accepted; (g) Conformity: a technical proposal in accordance with ITB 16; (h) Construction methodology as detailed in Para 1.1 of Section III Evaluation Criteria; (i) Contractor Registration certificate (as per RFB); and (j) any other document required in the BDS. 11.3 The Financial Part shall contain the following: (a) Letter of Bid – Financial Part: prepared in accordance with ITB 12 and ITB 14; (b) Completed Schedules including priced Bill of Quantities in accordance with ITB 12 and ITB 14, as specified in BDS; (c) Alternative Bid - Financial Part: if permissible in accordance with ITB 13; and (d) any other document required in the BDS. 11.4 The Technical Part shall not include any information related to the Bid price. Where material financial information related to the Bid price is contained in the Technical Part the Bid shall be declared non-responsive. 11.5 In addition to the requirements under ITB 11.2, 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. 11.6 The Bidder shall furnish in the Letter of Bid – Financial Part information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid.
12. Process of Bid Submission	12.1 The Letter of Bid – Technical Part, Letter of Bid – Financial Part, Schedules including Bill of Quantities, and all documents listed under Clause 11, shall be prepared using the relevant forms furnished in Section IV, Bidding Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 20.3. All blank spaces shall be filled in with the information

	requested. 12.2 Entire Bid including the Letters of Bid and filled-up Bill of Quantity shall be submitted online on e-procurement system specified in ITB 7.1. Details and process of online submission of the tender and relevant documents are given in the website mentioned above. Scanned copies of documents listed in ITB Clauses 11 and 12.3 should also be uploaded on this website. 12.3 Submission of Original Documents: The bidders are required to separately submit (i) original payment documents towards the cost of bid document; and registration on e-procurement website (if applicable); (ii) original bid security or Bid-Securing Declaration in approved form; and (iii) original affidavit regarding correctness of information furnished with bid document, with the office specified in the BDS, before the Bid submission deadline, either by registered/speed post/courier or by hand, failing which the bids will be declared non-responsive and will not be opened. Hard copy of rest of the bid or any other document are not to be submitted.
13. Alternative Bids	13.1 Unless otherwise specified in the BDS, alternative Bids shall not be considered.
	13.2 When alternative times for completion are explicitly invited, a statement to that effect will be included in the BDS and the method of evaluating different alternative times for completion will be described in Section III, Evaluation and Qualification Criteria.
	13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the bidding document must first price the Employer's design as described in the bidding document and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the Bidder with the Most Advantageous Bid conforming to the basic technical requirements shall be considered by the Employer.
	13.4 When specified in the BDS, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be identified in the BDS and described in Section VII, Works' Requirements. The method for their evaluation will be stipulated in Section III, Evaluation and Qualification Criteria.
14. Bid Prices and	14.1 The prices and discounts quoted by the Bidder in the Letter of Bid –Financial Part and in the Schedules including Bill of

Discounts	Quantities shall conform to the requirements specified below.
	14.2 The Bidder shall submit a Bid for the whole of the Works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section 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. <u>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 can be carried out by editing the information before electronic submission on e-procurement portal.</u>
	14.3 The price to be quoted in the Letter of Bid – Financial Part, in accordance with ITB 12.1, shall be the total price of the Bid, excluding any discounts offered.
	14.4 The Bidder shall quote any discounts and indicate the methodology for their application in the Letter of Bid – Financial Part in accordance with ITB 12.1.
	14.5 Unless otherwise specified in the BDS and the Conditions of Contract, the prices quoted by the Bidder shall be fixed.
	14.6 If so, specified in ITB 1.1, Bids are invited for individual lots (contracts) or for any combination of lots (packages). Bidders wishing to offer discounts 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. 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 of 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 along with his bid a declaration to this effect in the Declaration Format provided in Section IV of the bidding document. 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.
15. Currencies of Bid and Payment	15.1 The unit rates and prices shall be quoted by the Bidder and shall be paid for, entirely in Indian Rupees.
16. Documents Comprising the Technical Proposal	16.1 The Bidder shall furnish a technical proposal in the Technical Part of the Bid, including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV, Bidding Forms, in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work's requirements and the completion time.
17. Documents Establishing the Eligibility and Qualifications of	17.1 To establish Bidder's eligibility in accordance with ITB 4, Bidders shall complete the Letter of Bid – Technical Part, included in Section IV, Bidding Forms.

the Bidder	17.2 In accordance with Section III, Evaluation and Qualification Criteria, to establish its qualifications to perform the Contract, the Bidder shall provide the information 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 the Bid Validity period specified in the BDS . The Bid Validity period starts from the date fixed for the Bid submission deadline (as 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, except as provided in ITB 18.3.
	18.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial Bid validity period, 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; or (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 The Bidder shall furnish as part of the Technical Part of its Bid, either a Bid-Securing Declaration or a Bid Security as specified in the BDS , in original form; and, in the case of a Bid security, for the amount specified in the BDS .
	19.2 A Bid Securing Declaration shall use the form included in Section IV, Bidding Forms.
	19.3 If a Bid Security is specified pursuant to ITB 19.1, the Bid Security shall be a demand guarantee in any of the following forms at the Bidder's option: (a) an unconditional bank guarantee issued by a Nationalized

	or 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 issued by a Nationalized or Scheduled bank located in India; (d) another security specified in the BDS, In the case of a bank guarantee, the Bid Security shall be submitted using the Bid Security Form included in Section IV, Bidding Forms. The form must include the complete 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.
	19.4 If a Bid Security or Bid Securing Declaration is specified pursuant to ITB 19.1, any Bid not accompanied by a substantially responsive Bid Security or Bid Securing Declaration shall be rejected by the Employer as non-responsive. 19.5 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 the Performance Security and if required in the BDS, the Environmental and Social (ES) Performance Security pursuant to ITB 50. 19.6 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 and Social (ES) Performance Security pursuant to ITB 50. 19.7 The Bid Security may be forfeited or the Bid-Securing Declaration executed: (a) if a Bidder withdraws/modifies/substitutes its Bid during the period of Bid validity specified by the Bidder on the Letter of Bid - Technical Part and repeated in Letter of Bid - Financial Part, or any extension thereto provided by the Bidder; or (b) if the Bidder does not accept the correction of its Bid Price pursuant to ITB 36; or (c) if the successful Bidder fails to: (i) sign the Contract in accordance with ITB 49; or (ii) furnish a Performance Security and if required in the BDS, the Environmental and Social (ES) Performance

	Security in accordance with ITB 50.
	19.8 The Bid Security or the Bid-Securing Declaration 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 or the Bid-Securing Declaration 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. 19.9 If a Bid Security is not required in the BDS, pursuant to ITB 19.1, and: (a) if a Bidder withdraws its Bid during the period of Bid validity specified by the Bidder in the Letters of Bid; or (b) if the successful Bidder fails to: sign the Contract in accordance with ITB 49; or furnish a Performance Security and if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with ITB 50; the Borrower may, if provided for in the BDS, declare the Bidder ineligible to be awarded a contract by the Employer for a period of time as stated in the BDS.
20. Format and Signing of Bid	20.1 The Bidder shall prepare the Bid as per details given in ITB 21.
	20.2 Bidders shall mark as “CONFIDENTIAL” information in their Bids which is confidential to their business.
	20.3 The Bid 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 uploaded along with the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature.
	20.4 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. Documents establishing authority to sign the bid on behalf of the JV shall be uploaded along with the bid. 20.5 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Bid.
D. Online Submission and Opening of Bids	
21. Preparation of	21.1 Bids, both Technical and Financial Parts, shall be submitted

Bids	online on the e-procurement system specified in BDS 7.1. Detailed guidelines for viewing bids and submission of online bids are given on the website. The Request for Bids under this Project is published on this website. Any citizen or prospective bidder can logon to this website and view the Request for Bids and can view the details of works for which bids are invited. A prospective bidder can submit its bid online; however, the bidder is required to have enrolment/registration in the website, and should have valid Digital Signature Certificate (DSC) in the form of smart card/e-token obtained from any certifying agency authorised by the Government of India (for class of DSC specified in BDS). The bidder should register in the website using the relevant option available. Then the Digital Signature registration has to be done with the e-token, after logging into the website. The bidder can then login the website through the secured login by entering the password of the e-token & the user id/ password chosen during registration. After getting the bid schedules, the Bidder should go through them carefully and submit the specified documents, along with the bid, otherwise the bid will be rejected.
	21.2 The completed bid comprising of documents indicated in ITB 12, should be uploaded on the e-procurement portal along with scanned copies of requisite certificates as are mentioned in different sections in the bidding document and scanned copy of the bid security.
	21.3 All the documents are required to be signed digitally by the bidder. After electronic online bid submission, the system generates a unique bid identification number which is time stamped as per server time. This shall be treated as acknowledgement of bid submission.
	21.4 Physical, e-mail, Telex, Cable or Facsimile bids will be rejected as non-responsive.
22. Deadline for Submission of Bids	22.1 Bids, both Technical and Financial Parts, must be uploaded online no later than the date and time specified in the BDS .
	22.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the bidding document in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.
23. Late Bids	23.1 The electronic bidding system would not allow any late submission of bids after due date & time as per server time.
24. Withdrawal, Substitution, and Modification of	24.1 Bidders may modify their bids by using the appropriate option for bid modification on e-procurement portal, before the deadline for submission of bids. For this the bidder need not make any

Bids	additional payment towards the cost of bid document. For bid modification and consequential re-submission, the bidder is not required to withdraw his bid submitted earlier. The last modified bid submitted by the bidder within the bid submission time shall be considered as the bid. For this purpose, modification/withdrawal by other means will not be accepted. In online system of bid submission, the modification and consequential re-submission of bids is allowed any number of times. A bidder may withdraw his bid by using the appropriate option for bid withdrawal, before the deadline for submission of bids, however, if the bid is withdrawn, re-submission of the bid is not allowed (or allowed if specified in BDS).
	24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall not be opened.
	24.3 NoBid 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 19.7.
E. Public Opening of Technical Parts of Bids	
25. Public Opening of Technical Parts of Bids	25.1 The Employer shall publicly open Technical Parts of 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, and this could also be viewed by the bidders online. The Financial Parts of the bids shall remain unopened in the e-procurement system, until the subsequent public opening, following the evaluation of the Technical Parts of the Bids. In all cases, original documents submitted as specified in ITB 12.3 shall be first scrutinized, and Bids that do not comply with the provisions of ITB 12.3 will be declared non-responsive and will not be opened. Thereafter, bidders' names, the presence or absence of a Bid Security or Bid Securing Declaration, if one was required, alternative bids – technical parts, if any, and such other details as the Employer may consider appropriate will be notified, online by the Employer at the time of bid opening. 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 The electronic summary of the bid opening will be generated and uploaded online. The Employer will also prepare minutes of the Bid opening, including the information disclosed and upload the same for viewing online. Only Technical Parts of Bids, and technical parts of Alternative Bids if any, that are opened at

	technical Bid opening shall be considered further for evaluation.
F. Evaluation of Bids – General Provisions	
26. Confidentiality	26.1 Information relating to the evaluation of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with the Bidding process until information on Intention to Award the Contract is transmitted to all Bidders in accordance with ITB 45. In cases where ITB 45 is not applicable, such information shall not be disclosed until Notification of Award is transmitted in accordance with ITB 47.
	26.2 Any effort by a Bidder to influence the Employer in the evaluation of the Bids or Contract award decisions may result in the rejection of its Bid.
	26.3 Notwithstanding ITB 26.2, from the time of Bid opening to the time of Contract award, if a Bidder wishes to contact the Employer on any matter related to the Bidding process, it shall do so in writing.
27. Clarification of Bids	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 a 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 36.
	27.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.
28. Deviations, Reservations, and Omissions	28.1 During the evaluation of Bids, the following definitions apply: (a) "Deviation" is a departure from the requirements specified in the bidding document; (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the bidding document; and (c) "Omission" is the failure to submit part or all of the information or documentation required in the bidding

	document.
29. Nonmaterial Nonconformities	29.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities in the Bid which do not constitute a material deviation, reservation or omission.
	29.2 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.
	29.3 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 nonconforming item or component in the manner specified in the BDS .
G. Evaluation of Technical Parts of Bids	
30. Evaluation of Technical Parts	30.1 In evaluating the Technical Parts of each Bid, the Employer shall use the criteria and methodologies listed in this ITB and Section III, Evaluation and Qualification Criteria. No other evaluation criteria or methodologies shall be permitted.
31. Determination of Responsiveness	31.1 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. 31.2 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. 31.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, in particular, to confirm that all requirements of Section VII, Works' Requirements have been met without any material deviation, reservation or

	omission.
	31.4 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.
32. Qualification of the Bidder	32.1 The Employer shall determine to its satisfaction whether the eligible Bidders that have submitted substantially responsive Bid - Technical Parts meet the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.
	32.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17. 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 different from the Bidder.
	32.3 If a Bidder does not meet the qualifying criteria specified in Section III, Evaluation and Qualification Criteria, its Bid shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.
	32.4 Only Bids that are both substantially responsive to the bidding document, and meet all Qualification Criteria shall have the Financial Parts of their Bids opened at the second public opening.
33. Subcontractors	33.1 Unless otherwise stated in the BDS , the Employer does not intend to execute any specific elements of the Works by subcontractors selected in advance by the Employer.
	33.2 The subcontractor's qualifications shall not be used by the Bidder to qualify for the Works unless their specialized parts of the Works were previously designated by the Employer in the BDS as can be met by subcontractors referred to hereafter as 'Specialized Subcontractors', in which case, the qualifications of the Specialized Subcontractors proposed by the Bidder may be added to the qualifications.
	33.3 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.
H. Public Opening of Financial Parts of Bids	
34. Public Opening of Financial Parts	34.1 Following the completion of the evaluation of the Technical Parts of the Bids, and the Bank has issued its no objection (if applicable), the Employer shall notify in writing those Bidders whose Bids were considered non-responsive to the bidding document or failed to meet the Qualification Criteria, advising

	them of the following information:
	(a) the grounds on which their Technical Part of Bid failed to meet the requirements of the bidding document; (b) their Financial Part of Bid shall not be opened; and (c) notify them of the date, time, and location for public opening of Financial Parts of the Bids.
	34.2 The Employer shall, simultaneously, notify in writing those Bidders whose Technical Part have been evaluated as substantially responsive to the bidding document and met all Qualifying Criteria, advising them of the following information: (a) their Bid has been evaluated as substantially responsive to the bidding document and met the Qualification Criteria; (b) their Financial Part of Bid will be opened at the public opening of the Financial Parts; and (c) notify them of the date, time and location for public opening of the Financial Parts of the Bids, as specified in the BDS.
	34.3 The opening date should allow Bidders sufficient time to make arrangements for attending the opening. The Financial Part of the Bids shall be opened publicly in the presence of Bidders' designated representatives and anyone who chooses to attend, and this could also be viewed by the bidders online. The bidder's names, the Bid prices, per lot (contract) if applicable, including any discounts and Alternative Bid - Financial Part if any, and such other details as the Employer may consider appropriate, will be notified online by the Employer at the time of bid opening. 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.
	34.4 The electronic summary of the bid opening will be generated and uploaded online. The Employer will also prepare minutes of the Bid opening, including the information disclosed and upload the same for viewing online. Only Financial Parts of Bids, Financial Parts of Alternative Bids, and discounts that are opened at Bid opening shall be considered further for evaluation.
I. Evaluation of Financial Parts of Bids	
35. Evaluation of Financial Parts	35.1 To evaluate the Financial Part, the Employer shall consider the following:
	(a) the Bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurements contracts;

	(b) price adjustment for correction of arithmetic errors in accordance with ITB 36.1;
	(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 29.3;and
	(f) the additional evaluation factors are specified in Section III, Evaluation and Qualification Criteria.
	35.2 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.
	35.3 If this bidding document allows Bidders to quote separate prices for different lots (contracts), the methodology to determine the lowest evaluated cost of the contract combinations, including any discounts offered in the Letter of Bid – Financial Part, is specified in Section III, Evaluation and Qualification Criteria
36. Correction of Arithmetical Errors	36.1 In evaluating the Financial Part of each Bid, the Employer shall correct arithmetical errors on the following basis: (a) only for admeasurement contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected; (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.
	36.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 36.1, shall result in the rejection of the Bid and the Bid Security may be forfeited in accordance with ITB Sub-Clause 19.6.
37. Conversion to Single Currency	37.1 Not used.
38. Margin of Preference	38.1 Not applicable.
39. Comparison of Financial Parts	39.1 The Employer shall compare the evaluated costs of all responsive and qualified Bids to determine the Bid that has the lowest evaluated cost.

40. Abnormally Low Bids	40.1 An Abnormally Low Bid is one where the Bid price, in combination with other constituent elements of the Bid, appears unreasonably low to the extent that the Bid price raises material concerns as to the capability of the Bidder to perform the Contract for the offered Bid price. 40.2 In the event of identification of a potentially Abnormally Low Bid, the Employer, unless otherwise specified in the BDS, shall seek written clarifications from the Bidder, including detailed price analyses of its Bid price in relation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the bidding document. 40.3 After evaluation of the price analyses, in the event that the Employer determines that the Bidder has failed to demonstrate its capability to perform the Contract for the offered Bid Price, the Employer shall reject the Bid.
41. Unbalanced or Front-Loaded Bids	41.1 If the Bid for an admeasurement contract, which results in the lowest evaluated cost is, in the Employer's opinion, seriously unbalanced or, front-loaded, the Employer may require the Bidder to provide written clarifications. Clarifications may include detailed price analyses (with breakdown of unit rates) to demonstrate the consistency of the Bid prices with the scope of works, proposed methodology, schedule and any other requirements of the bidding document. 41.2 After the evaluation of the information and detailed price analysis presented by the Bidder, the Employer may as appropriate: (a) accept the Bid without any additional Performance Security; or (b) require that the amount of the Performance Security be increased at the expense of the Bidder to a level not exceeding twenty percent (20%) of the Contract Price to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract; or (c) reject the Bid if the risk cannot be mitigated through additional performance security.
42. Most Advantageous Bid	42.1 Having compared the evaluated costs of Bids, the Employer shall determine the Most Advantageous Bid. The Most Advantageous Bid is the Bid of the Bidder that meets the Qualification Criteria and whose Bid has been determined to be: (a) substantially responsive to the bidding document; and (b) the lowest evaluated cost.

43. Employer's Right to Accept Any Bid, and to Reject Any or All Bids	43.1 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 documents submitted and specifically, Bid securities, shall be promptly returned to the Bidders.
44. Standstill Period	44.1 Standstill Period shall not apply. <i>[Note 1: where it is proposed to permit Standstill Period, incorporate all changes as indicated in Attachment 1 at the end of this document.</i> <i>Note 2: Standstill period shall not apply where only one bid is submitted or where the bidding process is in response to an emergency situation recognized by the Bank].</i>
45. Notice of Intention to Award	45.1 Not used.
J. Award of Contract	
46. Award Criteria	46.1 Subject to ITB 43, the Employer shall award the Contract to the successful Bidder. This is the Bidder whose Bid has been determined to be the Most Advantageous Bid as specified in ITB 42.
47. Notification of Award	47.1 Prior to the expiration of the Bid Validity Period, the Employer shall transmit the Letter of Acceptance to the successful Bidder. The Letter of Acceptance shall specify the sum that the Employer will pay the Contractor in consideration of the execution of the contract (hereinafter and in the Conditions of Contract and Contract Forms called "the Contract Price"). 47.2 Within ten (10) Business Days after the date of transmission of the Letter of Acceptance, the Employer shall publish the Contract Award Notice which shall contain, at a minimum, the following information: (a) name and address of the Employer; (b) name and reference number of the contract being awarded, and the selection method used; (c) names of all Bidders that submitted Bids, and their Bid prices as read out at Bid opening, and as evaluated; (d) names of all Bidders whose Bids were rejected either as nonresponsive or as not meeting qualification criteria, or were not evaluated, with the reasons therefor; and (e) the name of the successful Bidder, the final total contract price, the contract duration and a summary of its scope.

	47.3 The Contract Award Notice shall be published on a National website (GoI website http://tenders.gov.in or GoI Central Public Procurement Portal https://eprocure.gov.in/cppp/) or on the Employer's website, and on the e-procurement system.
	47.4 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.
48. Debriefing by the Employer	48.1 Not used.
49. Signing of Contract	49.1 Promptly upon Notification of Award, the Employer shall prepare the Contract Agreement, and keep it 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. The Contract Agreement shall incorporate all agreements between the Employer and the successful Bidder.
	49.2 Within twenty-one (21) days of receipt of the Letter of Acceptance, the successful Bidder shall (a) furnish the performance security and if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with ITB Clause 50 and revised construction methodology; (b) 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 alongwith the bid; and (c) shall sign, date and return the Agreement to the Employer alongwith the documents stated at (a) and (b) above.
50. Performance Security	50.1 Within twenty-one (21) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the Performance Security and if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with the General Conditions of Contract, subject to ITB 41.2 (b), using for that purpose the Performance Security and ES Performance Security Forms included in Section X, Contract Forms. The performance security and if required in the BDS, the Environmental and Social (ES) Performance Security of a Joint Venture shall be in the name of the Joint Venture specifying the names of all members.
	50.2 Failure of the successful Bidder to submit the above-mentioned Performance Security and if required in the BDS, the Environmental and Social (ES) 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 Bidder offering the next Most Advantageous Bid.

	50.3 Upon the successful Bidder's signing the Agreement and furnishing of the Performance Security and if required in the BDS, the Environmental and Social (ES) Performance Security pursuant to ITB Clause 50.1, 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 19.5 and 19.6.
51. Adjudicator	51.1 The Employer proposes the person named in the BDS to be appointed as Adjudicator under the Contract, at the daily fee specified in the BDS, plus reimbursable expenses (actual boarding, lodging, travel and other incidental expenses). If the Bidder disagrees with this proposal, the Bidder should so state in his Bid. 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 Particular Conditions of Contract (PCC) pursuant to Clause 23.1 of the General Conditions of Contract (GCC), to appoint the Adjudicator.

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.

ITB Reference	Description
A. General	
ITB 1.1	The number of the Request for Bids is: 1 (ONE) The Employer is: [Chief Engineer-(M & E), Irrigation & Waterways Directorate, 2nd Floor, Jalsampad Bhaban, Saltlake, Kolkata-91, email-cemeiwd@gmail.com on behalf of Irrigation & Waterways Department, Govt. of West Bengal] The reference number of the Request for Bids (RFB) is: WBIW/CTU/CE(ME)/DRIP/RFB-01/2026-27 The name of the RFB is: "Rehabilitation of gates & emergency gate and its hoisting system including all electrical works and CCTV surveillance system of Kangsabati-Kumari Dam in Block- Khatra & Indpur of Bankura district in West Bengal under the World Bank assisted scheme Dam Rehabilitation and Improvement Project, Phase-II (DRIP-II)." The number and identification of lots (contracts) comprising this RFB is: Number. of Lot- ONE(1) Identification: WBIW/CTU/CE(ME)/DRIP/RFB-01/2026-27
ITB 1.2	The Employer shall use the e-procurement system specified in BDS 7.1.
ITB 2.1	The Borrower is: Government of India. The sub-Borrower is Irrigation & Waterways Department, Government of West Bengal. Loan or Financing Agreement amount: US\$ 4.58 million The name of the Project is: Dam Rehabilitation & Improvement Project, Phase-II (DRIP-II)
ITB 4.1	Bids from Joint ventures are acceptable. Where Joint Ventures are permitted: (a) Maximum number of members in the Joint Venture (JV) shall be: 2 (Two) (b) Place where the agreement to form JV to be registered in anywhere in India (c) A statement to the effect that all members of the joint venture shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms, shall be included in the authorization nominating a Representative or member in charge, as well as in the Bid and in the Agreement [<i>in case of a successful bid</i>]. (d) The joint venture agreement should define precisely the division of assignments to each member of JV. All members of JV should have active

ITB Reference	Description
	participation in the execution during the currency of the contract. This should not be varied/ modified subsequently without prior approval of the Employer.
ITB 4.5	A list of debarred firms and individuals is available on the Bank's external website: http://www.worldbank.org/debarr .
ITB 4.7	Deleted
B. Contents of Bidding Document	
ITB 7.1	Electronic –Procurement System The Employer shall use the following electronic-procurement system to manage this Bidding process: West Bengal Government e-procurement system, the e-tender portal of Government of West Bengal operated by NIC viz National Informatics Centre. URL : https://www.wbtenders.gov.in/ Requests for clarification should be received by the Employer no later than: 20days prior to the deadline for submission of bids
ITB 7.4	A Pre-Bid meeting <i>shall</i> take place. Pre-Bid meeting will take place, at the following date, time and place: Date: 29.05.2026; Time: 14.00 Hrs; Place- Office of the Central Tender Unit, 8thFloor, Jalsampad Bhaban, Saltlake City, Bidhannagar, Kolkata-700091, A site visit conducted by the Employer shall not be organized. However, the bidder is expected to make themselves thoroughly acquainted with the local conditions prevailing at site of implementation by undertaking field inspection and take into consideration all probable likely factors and difficulties involved during execution of the work as per specification, in all respects (e.g. - transportation of materials, communication facilities, Climate conditions, nature of soil, availability of local labour, market rate prevailing in the locality etc) and no claims whatsoever will be entertained on any such grounds in future. Executive Engineer, Kangsabati Mechanical Division, Khatra, Bankura-722140 (eMail ID: kmd.khatra@gmail.com, Mob. No. 9832967509) may be contacted, for any assistance in this matter. <i>[The pre-bid meeting should be held not later than 2 weeks before the deadline for submission].</i>
ITB 8.2	The Corrigendum / addendum will appear on the e-procurement system under https://www.wbtenders.gov.in/ under “Latest Corrigendum” and email notification is also automatically sent to those bidders who have started working on this tender. The same may also be seen in the Departmental website wbiwd.gov.in.
C. Preparation of Bids	
ITB	The Bidder shall submit the following additional documents in its Bid: <i>/list any</i>

ITB Reference	Description			
11.2(j)	<i>additional documents not already listed in ITB 11.2 that must be submitted with the Bid – Technical Part. The list of additional documents should include the following:</i>			
	SI. No.	Folder name	File Description	Details
	I.	Certificates	1. certificates.pdf 2. GST_registration_certificates.pdf	1. Latest Professional Tax Payment Certificate (PTPC) or, PT deposits challan for current financial year or Government Order for exemption in other States where ever applicable. 2. Valid PAN Card in the name of bidder/organization. 3. Income Tax Return of current Assessment year or, IT Return of immediate preceding Assessment year whichever latest available. 4. Valid GSTIN under GST Act & Rules
	II.	Company Details	companydetails.pdf 1 companydetails.pdf 2	1. For Proprietorship Firms, Partnership Firms, Registered Companies, Registered Co-operative Societies, valid Joint Venture or Consortiums Valid Trade License/ acknowledgement or Receipt of application for Trade License/ Revalidation
				2. <u>OTHER REQUIREMENTS:-</u> For Partnership Firms: Legally valid Partnership Deed, Form-VIII/ Memorandum of Registration of Registrar of Firms
				3. <u>For Companies:</u> Incorporation Certificate, Memorandum of Articles of ROC, List of current owners/ Directors/Board Members
				4. <u>For State Registered Co-operative Societies:</u> Society Registration certificate from ARCS of the State, Society By-Laws, latest available Auditor's Report of Directorate of Co-operative Audit within proceeding five years as per Societies Act & Rules.

ITB Reference	Description			
				5. <u>For legally constituted Consortiums/ Joint Venture of Firms/ Companies:</u> Registered MoU or Agreement for Consortium /JV, Registration under ACRS/ROC in addition to satisfying requirements stated earlier for individual constituent Firms/Companies forming the Consortium/JV
	III.	Credential of work	Credential pdf 1 Credential pdf 2	1. BOQ/SoR and Work Order/ Award of Contract of LOA/LOI duly authenticated by issuing authority. 2. Pre-Qualification (PQ) Work credential of one 100% completed work as desired in the RFB as the Credential Certificate (CC) duly authenticated by competent authority.
	IV.	Financial Information	1. P/L and audited Balance sheet for year-1.pdf 2. P/L and audited Balance sheet for year-2.pdf 3. P/L and audited Balance sheet for year-3.pdf	1-3. Profit & Loss accounts and audited balance sheets along with relevant annexures containing the designated Forms 3CA/ 3CB/3CD, as applicable under IT Act, in the name of the bidder for any three financial years within the zone of preceding five financial years from date of publication of RFB
(i) Contractor Registration certificate:Not Required, However, the bidder is required to submit the scanned copy of Contractor GST Registration Certificate, PF, ESIC and other relevant registration required for running the business. (ii) Code of Conduct for Contractor's Personnel (ES) The Bidder shall submit its Code of Conduct that will apply to Contractor's Personnel (as defined in Sub-Clause 9.1 of the General Conditions of Contract), to ensure compliance with the Contractor's Environmental and Social (ES) obligations under the Contract. The Bidder shall use for this purpose the Code of Conduct form provided in Section IV. No substantial modifications shall be made to this form, except that the Bidder may introduce additional requirements, including as necessary to take into account specific Contract issues/risks. The Bidder shall submit the following additional documents in its Bid: (i) Provide undertaking attached as U-I for abiding by the Model Code of Conduct (wherein provisions of SBD have been incorporated) and				

ITB Reference	Description
	submitting Code of Conduct for Contractor's Personnel on SEA and SH and also supplementary CoC within 14 days of LOA, in case the bidder succeeds to become a contractor. (ii) Provide undertaking attached as U-II for submitting ESHS-MSIP in the prescribed format with all details, within 14 days of LOA, in case the bidder succeeds to become a contractor. (iii) Provide a brief narrative on the implementation of ES-MSIP attached as Appendix to Technical Part, immediately after U-II to demonstrate the understanding and earnestness of the bidder at the bidding stage. (iv) Scanned copy of valid PAN card in the name of bidder/organization (v) Scanned copy of income Tax Return of latest Assessment year or IT Return of immediately preceding Assessment year whichever latest available of Sole Bidder OR all JV partners, as applicable.
ITB 11.3 (b)	The following schedules shall be submitted with the bid: (i) Letter of Bid for Technical Part (ii) Technical Proposal forms (iii) Letter of Bid for Financial Part (iv) The Priced Bill of Quantities (v) Scanned copy of Registration on e-procurement website (vi) Scanned copy of affidavit regarding the correctness of information furnished with the bid document (vii) Scanned copy of bid security in approved form Other relevant document required as per Bid
ITB 11.3 (d)	The Bidder shall submit the following additional documents in its Bid: No alternative bid is required. No additional document is required.
ITB 12	Note for Bidders: Bidders have to submit the bids on the e-procurement portal along with the relevant required documents. For this purpose, the bidders shall fill up online, the forms that are available for online filling on the e-portal. The rest of the forms shall be download by the bidders and filled up. The filled up pages shall then be scanned and uploaded on the e-procurement portal along with the scanned copies of the supporting documents.
ITB 12.3	For submission of original documents, the address is: Central Tender Unit, Irrigation & Waterways Directorate Government of West Bengal.] Street Address: [Jalasampad Bhawan, Salt Lake City, Bidhannagar, Kolkata-700091] Floor/ Room number:[8th floor, Central Tender Unit] City:[KOLKATA]

ITB Reference	Description
	PIN/Postal Code:[West Bengal -700091] Country:[INDIA]
ITB 13.1	Alternative Bids <i>shall not be</i> permitted.
ITB 13.2	Alternative times for completion <i>shall not be</i> permitted.
ITB 13.3	Not Applicable
ITB 13.4	Alternative technical solutions shall be permitted for the following parts of the Works: Not Applicable
ITB 14.5	The prices quoted by the Bidder “ shall not be allowed ” subject to adjustment during the performance of the Contract. The adjustment of contract price, if provided, will be done in accordance with GCC Clause 49 and corresponding provisions under PCC and Appendix 2 to PCC.
ITB 18.1	The Bid validity period shall be 120 days .
ITB 18.3 (a)	The Bid price shall be adjusted by the following factor: Not applicable .
ITB 19.1	<i>[If a Bid Security shall be required, a Bid-Securing Declaration shall not be required, and vice versa.]</i> A Bid Security “ <i>shall be</i> ” required. A Bid-Securing Declaration “ <i>shall not be</i> ” required If a Bid Security shall be required, the Bidder shall furnish a Bid Security in the amount of INR 45.00 lakh
ITB 19.3	The Bid Security shall be a demand guarantee in any of the following forms at the Bidder’s option: (a) an unconditional bank guarantee issued by a Nationalized or Scheduled bank located in India; (b) Deleted; (c) Deleted; (d) Other types of acceptable securities are: NA <i>In the case of a bank guarantee, the Bid Security shall be submitted using the Bid Security Form included in Section IV, Bidding Forms. The form must include the complete 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.</i>
ITB 19.9	Deleted
ITB 20.3	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: <i>(a) Legally valid Power of Attorney is required to demonstrate the authority of the signatory to sign the Bid; and</i>

ITB Reference	Description
	<i>(b) 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>
D. Online Submission and Opening of Bids	
ITB 21.1	Class of DSC required is: Class 3 Bidders willing to take part in the e-Tender are required to obtain a valid Digital Signature- Certificate (DSC) from any of the authorized ‘Certifying Authorities’ (CA) under Controller of Certifying Authorities (CCA), Department of Electronics & Information Technology (DEIT), Govt. of India. (viz. NIC, n-Code Solution, Safescrypt, e-Mudhra Consumer Services Ltd, TCS, MTNL, IDRBT) or as notified by the CA /Finance Department, GoWB from time to time. DSC is given as a USB e-Token. After obtaining the Class 2 or Class 3 Digital Signature Certificate (DSC) from any of the above CA, they are required to register the fact of possessing the DSC through the registration system available in the above-mentioned websites. A list of such licensed CAs’ is also available in the CCA website cca.gov.in. The prospective contractors / bidders may contact the Departmental e-Tendering Help desk located at the 7th Floor of Jalasampad Bhavan at Bidhannagar, Sector-II, Kolkata, through e-mails irrigationhelpdesk@gmail.com and dvcsc6816@gmail.com or Telephone No. 033-23346098 and the State Level e-Procurement Help Desk located at the Ground Floor of Jalasampad Bhavan through e-mail wbehelpdesk@gmail.com or Ph:(033)-2334 5161 on any working day between 10.30AM-5.30PM for any query on e-Tendering procedure, obtaining DSC and free of cost training on e-Procurement procedure.
ITB 22.1	The deadline for uploading the Bids is: Date: 18.06.2026 Time: 14:00 Hours IST <i>[The date and time should be the same as those provided in the Specific Procurement Notice - Request for Bids, unless subsequently amended pursuant to ITB 22.2]</i> <i>[The time allowed for the preparation and submission of Bids shall be determined with due consideration to the particular circumstances of the project and the magnitude and complexity of the procurement.]</i>
ITB 24.1	Re-submission of the bid is “Not allowed” , if withdrawn
E. Public Opening of Technical Parts of Bids	
ITB 25.1	The online Bid opening of Technical Parts of Bids shall take place at: Central Tender Unit, Irrigation & Waterways Directorate, Government of West Bengal. Street Address: : Jalasampad Bhawan, Salt Lake City, Bidhannagar,

ITB Reference	Description
	Kolkata-700091]. Floor/Room number: [8th floor, Central Tender Unit] City: Kolkata, West Bengal., Country: INDIA Date: 18.06.2026 Time: 16:00 Hrs. <i>[Note: this date should be the same as the deadline for submission of bids; and the time should also be the same as the deadline for submission of bids or promptly thereafter]</i>
F. Evaluation of Bids – General Provisions	
ITB 29.3	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.
G. Evaluation of Bids - Technical Parts	
ITB 33.1	The Employer <i>“does not intend”</i> to execute any specific elements of the Works by subcontractors selected in advance <u>by the employer</u>.
ITB 33.2	<i>[N/A]</i>
ITB 33.3	(a) Contractor’s proposed subcontracting: Maximum percentage of subcontracting permitted is: 20% of the total contract amount. (b) Bidders planning to subcontract more than 10% of total volume of work shall specify, in the Letter of Bid, the activity (ies) or parts of the Works to be subcontracted along with complete details of the subcontractors and their qualification and experience. The qualification and experience of the subcontractors must meet the minimum criteria for the relevant work to be subcontracted failing which such sub-contractors will not be permitted to participate. (c) Subcontractors’ 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. <i>[Note-Work should not be split into small parts and sub-contracted].</i>
H. Public Opening of Financial Parts	
ITB 34.2 (c)	Following the completion of the evaluation of the Technical Parts of the Bids, the Employer will notify all Bidders of the date, time, and location of the public opening of Financial Parts. The online bid opening of Financial Parts of Bids shall take place at: Central Tender Unit, Irrigation & Waterways Directorate, Government of West Bengal. Street Address: : Jalasampad Bhawan, Salt Lake City, Bidhannagar, Kolkata-700091].

ITB Reference	Description
	Floor/Room number: [8th floor, Central Tender Unit] City: Kolkata, West Bengal., Country: INDIA Date: XX/XX/2026 Time: xx:00 Hours <i>[Note: The Financial Parts of the bids shall not be opened earlier than seven (7) days from the communication of technical evaluation results to the bidders]</i> In addition to the above the Employer shall publish a notice of the public opening of the Financial Parts of the Bid on its website https://www.wbtenders.gov.in/
I. Evaluation of Bids - Financial Parts	
ITB 40.2	Provisions related to Abnormally Low Bids <i>shall apply</i> .
ITB 41.2(b)	Require that the amount of the Performance Security be fixed at the expense of the Bidder @ 5% of the Contract Price plus Environmental Social, Health and Safety (ESHS) performance Security @ 1% of the Contract price plus @ 10% of Contract price as additional security for unbalanced bids, if the accepted bid value is below 20% of the Estimated amount to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.
ITB 44.1	Standstill Period shall not apply as stated in ITB
J. Award of Contract	
ITB 47.3	The Contract Award Notice shall be published on the Employer's website https://www.wbtenders.gov.in/
ITB 51	The Adjudicator proposed by the Employer is: Sri Kausik Chattopadhyay, Ex- Secretary Irrigation & Waterways Department, Government of West Bengal. Address: 19, Salimpur lane, Dhakuria, Kolkata- 700031 The daily fee for this proposed Adjudicator shall be: Rs 10,000 per day. The biographical data of the proposed Adjudicator is as follows: Education: B.E. Civil, (Shibpur C.U.) M.Tech (IIT Madras.) Experience: Worked in Irrigation & Waterways Department, GoWB for 36 years in the capacity of AE, EE, SE, CE, and Secretary to the GOWB in Design & Research, Construction etc. within I&WD. Age: 66 years Nationality: Indian Present Position: Retired Secretary to the Govt. of W.B, I&WD, GoWB

Section III - Evaluation and Qualification Criteria

This section contains all the criteria that the Employer shall use to evaluate Bids and qualify Bidders through post-qualification. No other factors, methods or criteria shall be used other than specified in this bidding document. The Bidder shall provide all the information requested in the forms included in Section IV, Bidding Forms.

1. Technical Part

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 Contractor's Environmental and Social Management Strategies and Implementation Plans (C-ESMP), 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 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].

(iii) Bidders shall submit an undertaking from each proposed subcontractor to confirm that they have read, understand and will comply with the ES obligations and code of conduct for Contractor's Personnel.

1.2 Alternative Technical Solutions for specified parts of Works(ITB 13.4)– Not Applicable

1.3 Specialized Subcontractors – Not Applicable:

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2.1 Qualification Criteria

Pursuant to ITB 32.1, the Employer shall assess each Bid against the following Qualification Criteria. Requirements not included in the text below shall not be used in the evaluation of the Bidder's qualifications.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)where permitted			Submission Requirements
				All members Combined	Each Member	At least one Member	
1. Eligibility							
1.1	Nationality	Nationality in accordance with ITB 4.4	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.2	Conflict of Interest	No conflicts of interest in accordance with ITB 4.2	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
1.3	Bank Eligibility	Not having been declared ineligible by the Bank, as described in ITB 4.5.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
1.4	State-owned enterprise or institution of the Borrower country	Meets conditions of ITB 4.6	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.5	United Nations resolution or Borrower’s country law	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 4.8 and Section V.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
2. Historical Contract Non-Performance							
2.1	History of Non-Performing Contracts	Non-performance of a contract ³ did not occur as a result of contractor default since 1 st April 2021.	Must meet requirement ^{7&8}	Must meet requirements	Must meet requirement ⁴	N/A	Form CON-2

³ Non-performance, as decided by the Employer, shall include all contracts where (a) non-performance 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.

⁴ This requirement also applies to contracts executed by the Bidder as JV member.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended) where permitted			Submission Requirements
				All members Combined	Each Member	At least one Member	
2.2	Suspension Based on Execution of Bid/ Proposal Securing Declaration by the Employer or withdrawal of the Bid within Bid validity period	Not under suspension based on execution of a Bid/ Proposal Securing Declaration pursuant to ITB 4.7 or withdrawal of the Bid pursuant ITB 19.9	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
2.3	Pending Litigation	Bidder's financial position and prospective long-term profitability sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Bidder	Must meet requirement	N/A	Must meet requirement	N/A	Form CON – 2
2.4	Litigation History	No consistent history of court/arbitral award decisions against the Bidder ⁵ since 1st April 2021	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2
2.5	Declaration: Environmental and Social (ES) past performance	Declare any civil work contracts that have been suspended or terminated and/or performance security called by an employer for reasons of breach of environmental, or social (including Sexual Exploitation, and Assault) contractual obligations in the past five years ⁶ .	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 Subcontractor/s, the Specialized Subcontractor/s must also make the declaration.	N/A	Form CON-3 ES Performance Declaration
3. Financial Situation and Performance							

⁵The 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.

⁶The Employer may use this information to seek further information or clarifications in carrying out its due diligence.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended) where permitted			Submission Requirements
				All members Combined	Each Member	At least one Member	
3.1	Financial Capabilities	(i) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit ⁷ , and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as Rs. 3.72 Crore for the subject contract(s) net of the Bidder's other commitments	Must meet requirement	Must meet Requirement	Must meet at least 25% of the requirement as a minimum	Must meet at least 50% of the requirement as a minimum	Form FIN – 3.1, with attachments
		(ii) 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.	Must meet requirement	Must meet requirement	N/A	N/A	
		(iii) The audited balance sheets or, if not required by the laws of the Bidder's country, other financial statements acceptable to the Employer, for the last five years shall be submitted and must demonstrate the current soundness of the Bidder's financial position and indicate its prospective long-term profitability.	Must meet requirement	N/A	Must meet requirement	N/A	
Note: The construction cash flow requirement should be for a number of months determined as the total time needed to pay contractor invoice by the employer . The cash flow should not normally exceed 3 months peak contract requirements and availability should be certified by Bank (Nationalized or Scheduled Bank In India) in form Fin 3.3							

⁷In case the bidder submits a letter of intent from a commercial bank with the bid, firm commitment from the bank to provide line of credit shall be required before contract signing.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended) where permitted			Submission Requirements
				All members Combined	Each Member	At least one Member	
3.2	Average Annual Construction Turnover	Minimum average annual construction turnover of INR. 33.44 Crore (Indian Rupees Thirty Three crore Forty Four Lakh) calculated as total certified payments received for contracts in progress and/or completed within the last available five financial years, divided by five financial years, 2020-21, 2021-22, 2022-23, 2023-24, 2024-25	Must meet requirement	Must meet requirement	Must meet 25%, (twenty five percent) of the requirement	Must meet 50%, (fifty percent) of the requirement	Form FIN – 3.2
Note: The amount stated should normally not be less than twice the estimated annual turnover or cash flow in the proposed Works contract (based on a straight-line projection of the Employer's estimated cost, over the contract duration).							
4. Experience							
4.1 (a)	General Construction Experience	Experience under construction contracts Construction or Rehabilitation or Special or Major repair to major or medium Dams/Barrages/other hydraulic structures with Hydro Electrical Mechanical works in the role of prime contractor, JV member, subcontractor, or management contractor for at least the last five years, starting 1st April 2021	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1
4.2 (a)	Specific Construction & Contract Management Experience	I. A minimum number ⁸ of similar contracts specified below that have	Must meet requirement	Must meet requirement ¹²	Must meet the requirement for one contract of	Must meet the requirement	Form EXP 4.2(a)

⁸ Bidder should have completed at least one contract for similar work of value **not less than 80% of the estimated contract value** of the work for which bids are invited, during the last five years. Cost of completed works of previous years shall be given weight-age @5% per year based on rupees value to bring them to the price level of the financial year in which bids are received.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)where permitted			Submission Requirements
				All members Combined	Each Member	At least one Member	
		been satisfactorily and substantially⁹completed as a prime contractor, joint venture member¹⁰, management contractor or sub-contractor¹¹ between 1stApril 2021 and bid submission deadline: i) ONE contract of minimum value INR 17.83 Crore.; Or ii) TWO contracts, each of minimum value INR 13.38 Crore.; Or iii)THREE contracts, each of minimum value INR 8.92 Crore. II. The similarity of the contracts shall be based on the following: Construction / Rehabilitation / Special / Major repair of Major or Medium Dams / Barrages / other hydraulic structures involving Hydro Electrical Mechanical works			25% value	for one contract of 50% value	

⁹ Substantial completion shall be based on 80% or more works completed under the contract.

¹⁰ 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

¹¹ 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

¹³ 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.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation						
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)where permitted			Submission Requirements						
				All members Combined	Each Member	At least one Member							
4.2 (b)		For the above and any other contracts [substantially completed and under implementation] as prime contractor, joint venture member, or sub-contractor between 1st April 2021 and Application submission deadline, a minimum construction experience in the following all key activities successfully completed¹³: <table><tr><td>Concrete work(RCC, PCC, Micro Conc. etc.)</td><td>110Cu.M.</td></tr><tr><td>Earthwork</td><td>420 Cu.M.</td></tr><tr><td>Repair / Erection of hydraulic gates (without parts).</td><td>300 MT</td></tr></table> Under 4.2(a), specified requirements define similarity of contracts, whereas the key activities or production rates to be specified under 4.2 (b) define the required capability of the Applicant to execute the Works. There shall not be any inconsistency or repetition of requirement between 4.2(a) and 4.2(b).For the rate of production, specify that the rate of production shall be on the basis of either the average during the entire specified period OR the rate of annual production in any 12-month period in the specified period,]¹⁴	Concrete work(RCC, PCC, Micro Conc. etc.)	110Cu.M.	Earthwork	420 Cu.M.	Repair / Erection of hydraulic gates (without parts).	300 MT	Must meet requirements <i>[Specify activities that may be met through a specialized subcontractor, if permitted in accordance with ITB 33.2]</i>	Must meet requirements <i>[Specify activities that may be met through a Specialized Subcontractor, if permitted in accordance with ITB 33.2]</i>	N/A	N/A	Form EXP – 4.2 (b)
Concrete work(RCC, PCC, Micro Conc. etc.)	110Cu.M.												
Earthwork	420 Cu.M.												
Repair / Erection of hydraulic gates (without parts).	300 MT												
4.2 (c)	Specific Experience in managing ES aspects	For the contracts in 4.2 (a) above and/or any other contracts [substantially completed and under implementation]	Must meet requirements	Must meet requirement	NA	NA	Form EXP – 4.2 (c)						

¹³ Volume, number or rate of production of any key activity can be demonstrated in one or more contracts combined if executed during same time period.

¹⁴ The minimum experience requirement for multiple contracts will be the sum of the minimum requirements for respective individual contracts, unless specified otherwise.

Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended) where permitted			Submission Requirements
				All members Combined	Each Member	At least one Member	
		as prime contractor, joint venture member, or Subcontractor between 1 st April 2021 and Application submission deadline, experience in managing ES risks and impacts in the following aspects: <i>[Based on the ES assessment, Construction/rehabilitation / special repair of Major / Medium dams, barrages and other hydraulic structures as appropriate, specific experience requirements to manage ES aspects.]</i>					
NOTE: List the monthly or annual production rate for the key construction activity (or activities) in the proposed contract or works, e.g., “one million M³ of rock placed in rock fill dams in one year; X tons of asphalt concrete per month placed in road paving; Y M³ of concrete placed in ... etc.” The rates should be a percentage (say about 80 percent) of the estimated production rate of the key activity (or activities) in the contract or Works as needed to meet the expected construction schedule with due allowance for adverse climatic conditions. Borrower should fill this after careful review of the requirements for the work. Where the elements of work are specialized, and it is proposed to accept employment of specialist sub-contractors, this could be so specified for that activity and bidders may be requested to name the sub-contractors and furnish their qualification and experience.							
4.2 (d)	Bid Capacity: Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity for construction work is equal to or more than the total bid value of the work. The available bid capacity will be calculated as under: Assessed Available bid capacity = $(A * N * 1.15 - B)$ Where, A = Maximum value of civil engineering works executed in any one year during the last five years (updated to the price level of the financial year 2022-23 at the rate of 5% per year), taking into account the completed as well as works in progress). N = Number of years prescribed for completion of the works for which bids are invited (Here N = 1.5). B = Value, at the current price level, of existing commitments on on-going works to be completed during the period of completion of the works for which bids are invited. Note: the statements in Section IV showing the value of existing commitments of on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer in charge, not below the rank of an Executive Engineer or equivalent.						

Note: [For Multiple lots (contracts) specify financial and experience criteria for each lot under 3.1, 3.2, 4.2(a) and 4.2(b)]

Note: In case bids are being invited simultaneously for multiple packages (under separate IFB and Bid Documents), the Employer reserves the right to assess cumulative qualification of the bidders participating in multiple packages.

3. Key Personnel

[Note: Insert in the following table the minimum key specialists required to execute the contract, taking into account the nature, scope, complexity and risks of the contract.]

The Bidder must demonstrate that it will have suitably qualified (and in adequate numbers) minimum Key Personnel, as described in the Table below, that are required to perform the Contract.

The Bidder shall provide details of the Key Personnel and such other Key Personnel that the Bidder considers appropriate, together with their academic qualifications and work experience. The Bidder shall complete the relevant Forms in Section IV, Bidding Forms.

The Contractor shall require the Employer's consent to substitute or replace the Key Personnel (reference the Particular Conditions of Contract 9.1).

Key Personnel

Item No.	Position/ specialization	Relevant academic qualifications	Minimum years of relevant work experience
1	<i>Project / Construction Manager- 1(One)No.</i>	<i>B.E Civil</i>	<i>10 Years</i>
2	<i>Project Engineer- 1(One) No.</i>	<i>B.E Civil/ B.E Mechanical</i>	<i>07 Years</i>
3	<i>Site Engineer- 2(Two)Nos.</i>	<i>Diploma /Degree Civil Engineering</i>	<i>05 Years</i>
4	<i>Site Engineer- 1 (One) No.</i>	<i>Diploma / Degree Mechanical Engineering</i>	<i>05 Years</i>
5	<i>Quality Control Engineer- 1(One)No.</i>	<i>BE (Civil)</i>	<i>05 Years</i>
6	<i>Quality Control Engineer – 1(One)No.</i>	<i>BE (Mechanical)</i>	<i>03 Years</i>
7	<i>Safety Supervisor / Safety Engineer</i>	<i>A bachelor's degree with certificate course at concerned discipline</i>	<i>at least 3 years</i>
8	<i>Surveyors- 2 Nos.</i>	<i>Diploma, ITI or equivalent</i>	<i>05 Years</i>
<u>Suitable experts in the following specializations</u>			
8.	<i>Mechanic - 02 nos.</i>	<i>ITI in Mechanic</i>	<i>05 Years</i>
9.	<i>Fitter - 04 nos.</i>	<i>ITI in Fitter.</i>	<i>05 Years</i>
10.	<i>Instrumentation Expert (Need Based)</i>	<i>Degree or Diploma in Electrical or Electronics Engineering</i>	<i>05 Years</i>
11.	<i>Environment & Social Expert (Need Based)</i>	<i>BE Civil/Graduate in Environment/ Health</i>	<i>1 year insimilar work project</i>

The Bidder must not have in his employment:

- [i] the near relations (defined as first blood relations, and their spouses, of the bidder or the bidder's spouse) of persons of the following Government Departments.
1. Irrigation & Waterways Departments, Govt. of West Bengal.
 2. Water Resources Investigation & Development Department, GOWB
- [ii] without Government permission, any person who retired as gazetted officer within the last two years.

[Note:

The managerial and technical competence of a contractor is largely related to the key personnel on site. The extent to which the Bidder should demonstrate having staff with extensive experience should be limited to those requiring critical operational or technical skills. The criteria should therefore refer to a limited number of such key personnel, for instance, the project or contract manager and others working under the project manager who will be responsible for major components (e.g. specialized in dredging, piling, earthworks, ES obligations, as required for each particular project). Criteria of acceptability should be based on:

- (a) *a minimum number of years of experience in a similar position; and*
- (b) *a minimum number of years of experience and/or number of comparable projects carried out in a specified number of preceding years.]*

4. Equipment

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

PART-A: FOR CIVIL WORK

No.	Equipment Type and Characteristics	Minimum Number required
1	Road Rollers (10-15Tonnes) and other compaction equipment	02
2	Standard Excavators: (Crawler)(20-40Tons, 150 – 275 HP)	02
3	Pontoon mounted Long boom excavator (20-25Ton)	02
4	Pontoon (20-25 feet)	02
5	Back Hoe Loader General type (Power:40KW/55HP)	02
6	Dumper trucks : Medium (16 Ton – 31 Ton)	03
7	Tractor with trolley	03
8	Water Browsers (Tankers)(Capacity 2000Lt)	02
9	Boat	02
10	Grader	01
11	Vibratory Roller (8/10 Tonne)	02
12	Vibrating Plate Compactor earth Rammers	01
13	Vibro Sinker	01
14	Hot mix Plant	01
15	Boiler	02
16	Self loading mini mobile batching plant(10 to 20 m ³ /Hr)	02
17	Mini Batching Plant/Digital Weigh Batcher(capacity20m ³ /Hr)	02
18	Concrete Mixer (5 m ³ /Hr)	01
19	Truck-mounted concrete mixers (2 m ³ drum capacity)	03
20	Paver for construction of concrete road Capacity:20m ³ /Hr	01

21	<i>Vibrator</i>	<i>10</i>
22	<i>Bar bending machine</i>	<i>02</i>
23	<i>Bar Cutting Machine</i>	<i>02</i>
24	<i>Cement Grouting machine</i>	<i>01</i>
25	<i>Extrusion Grout pump</i>	<i>02</i>
26	<i>Hand pressure Grout pump</i>	<i>01</i>
27	<i>Grout mixers Packers</i>	<i>01</i>
28	<i>Equipments of Shotcrete</i>	<i>1 Set</i>
29	<i>Survey Instruments</i>	<i>2 Sets</i>

PART B – HYDROMECHANICAL WORKS

Required Machinery for Fabrication and Erection

Based on the requirement, Contractor shall provide the comprehensive list of major equipment to attain the completion of works in accordance with the prescribed construction schedule. The bidders should, however, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with layout and necessary drawings and calculations allow the employer to review their proposals. The numbers, types and capacities of each plant/equipment shall be shown in the proposals along with the cycle time for each operation for the given production capacity to match the requirements.

The application shall have the following minimum fabrication and erection equipment, measuring/Testing instruments exclusively available for this work.(Either own or under lease with the applicant)

No.	Equipment Type and Characteristics	Minimum Number required
1	<i>Arc welding equipment(400A-Three phase)</i>	<i>02</i>
2	<i>Mig welding equipment</i>	<i>02</i>
3	<i>Hydra Crane (Max 15 MT)</i>	<i>02</i>
4	<i>Power saw</i>	<i>02</i>
5	<i>Magnet Drilling Machine</i>	<i>02</i>
6	<i>3 phase DG set(Min. 15 KVA)</i>	<i>01</i>
7	<i>Power operated Hand Grinder</i>	<i>02</i>
8	<i>Gas cutting equipment</i>	<i>04</i>
9	<i>Chain Pulley Block</i>	<i>02</i>
10	<i>Airless spray painting machine</i>	<i>01</i>
11	<i>Measuring Instruments</i>	<i>01 Set</i>

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

5. Multiple Contracts['Not Applicable']

2. Financial Part

- 2.1 Margin of Preference - Not Applicable.**
- 2.2 Multiple Contracts- Not Applicable.**
- 2.3 Sustainable procurement(Section VII - Specifications) – Not Applicable**
- 2.4 Alternative Completion Times (ITB 13.2)- Not Applicable**
- 2.5 Alternative Technical Solutions for specified parts of the Works(ITB 13.4)- Not Applicable**
- 2.6 Other criteria(if permitted under ITB 35.1(f)):Not Applicable**

Section IV - Bidding Forms

Letter of Bid – Technical Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

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

Note: All italicized text is to help Bidders in preparing this form.

Date of this Bid submission: *[insert date (as day, month and year) of Bid submission]*

RFB No.: *[insert number of RFB process]*

Alternative No¹: **[NOT APPLICABLE]**

To: *[insert complete name of Employer]*

We, the undersigned, hereby submit our Bid, in two parts, namely:

- (a) the Technical Part, and
- (b) the Financial Part

In submitting our Bid, we make the following declarations:

- (a) **No reservations:** We have examined and have no reservations to the bidding document, including Addenda issued in accordance with ITB 8;
- (b) **Eligibility:** We meet the eligibility requirements and have no conflict of interest in accordance with ITB 4;
- (c) **Bid-Securing Declaration:** We havenot been suspended nor declared ineligible by the Employer based on execution of a Bid-Securing Declaration or Proposal-Securing Declaration in the Employer's Country in accordance with ITB 4.7
- (d) **Conformity:** We offer to execute in conformity with the bidding document the following Works: *[insert a brief description of the Works]*
- (e) **Bid Validity Period:** Our Bid shall be valid for a period specified in BDS ITB 18.1 (or as amended if applicable) from the date fixed for the Bid submission deadline specified in BDS 22.1 (or as amended if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (f) **Performance Security:** If our Bid is accepted, we commit to obtain a performance security *[and an Environmental and Social (ES) Performance Security, **Delete if not applicable**]* in accordance with the bidding document;

¹ Delete if not applicable

- (g) **One Bid Per Bidder:** We are not submitting any other Bid(s) as an individual Bidder or as a subcontractor, and we are not participating in any other Bid(s) as a Joint Venture member, and meet the requirements of ITB 4.3, other than alternative Bids submitted in accordance with ITB 13;
- (h) **Suspension and Debarment:** We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Employer's Country laws or official regulations or pursuant to a decision of the United Nations Security Council;
- (i) **State-owned enterprise or institution:** We are not a state-owned enterprise or institution/ We are a state-owned enterprise or institution but meet the requirements of ITB 4.6²;
- (j) **Binding Contract:** We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;
- (k) **Not Bound to Accept:** We understand that you are not bound to accept the lowest evaluated cost Bid, the Most Advantageous Bid or any other Bid that you may receive; and
- (l) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf engages in any type of Fraud and Corruption; and
- (m) **Adjudicator:** We accept the appointment of *[insert name proposed in Bid Data Sheet]* as the Adjudicator.

[or]

We do not accept the appointment of *[insert name proposed in Bid Data Sheet]* as the Adjudicator, and propose instead that *[insert name]* be appointed³ as Adjudicator, whose daily fees and biographical data are attached.

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]*

²Use one of the two options as appropriate

³ In case appointment of Adjudicator was proposed from the list provided by an Institution in ITB 51, the replacement should also be proposed from the list of same institution.

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

Technical Proposal

Technical Proposal Forms

- **Key Personnel Schedule**
- **Equipment**
- **Site Organization**
- **Method Statement**
- **Mobilization Schedule**
- **Construction Schedule**
- **ES Management Strategies and Implementation Plans**
- **Code of Conduct for Contractor's Personnel (ES)**
- **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**
- **Bidder's Qualification**
- **Form of Bid Security - Bank Guarantee**
- **Form of Bid-Securing Declaration**

Appendix to Technical Part: Personnel

Forms for Personnel

Form PER – 1: Key Personnel Schedule

Bidders should provide the names and details of the suitably qualified Key Personnel to perform the Contract. The data on their experience should be supplied using the Form PER-2 below for each candidate.

Key Personnel

1.	Title of position:	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
2.	Title of position: <i>[Environmental Specialist]</i>	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
3.	Title of position: <i>[Health and Safety Specialist]</i>	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
4.	Title of position: <i>[Social Specialist]</i>	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>

	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
5.	Title of position: <i>[Gender Based Violence Expert]</i> <i>[Where a Project SEA risks are assessed to be high, Key Personnel shall include a gender-based violence expert with relevant experience in addressing sexual exploitation, and assault cases]</i>	
	Name of candidate:	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
6.	Title of position:	
	Name of candidate	
	Duration of appointment:	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	Time commitment: for this position:	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	Expected time schedule for this position:	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>

Appendix to Technical Part

Form PER-2:

Resume and Declaration

Key Personnel

Name of Bidder

Position [#1]: <i>[title of position from Form PER-1]</i>		
Personnel information	Name:	Date of birth:
	Address:	E-mail:
	Professional qualifications:	
	Academic qualifications:	
	Language proficiency: <i>[language and levels of speaking, reading and writing skills]</i>	
details	Address of employer:	
	Telephone:	Contact (manager / personnel officer):
	Fax:	
	Job title:	Years with present employer:

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

Project	Role	Duration of involvement [From - To]	Relevant experience
<i>[main project details]</i>	<i>[role and responsibilities on the project]</i>	<i>[time in role]</i>	<i>[describe the experience relevant to this position]</i>

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:

Commitment	Details
Commitment to duration of contract:	<i>[insert period (start and end dates) for which this Key Personnel is available to work on this contract]</i>
Time commitment:	<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) result in my disqualification from participating in the Bid;
- (c) result in 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): _____

Appendix to Technical Part: Equipment

Forms for Equipment

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). A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder. The Bidder shall provide all the information requested below, to the extent possible. Fields with asterisk (*) shall be used for evaluation.

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

The following information shall be provided only for equipment not owned by the Bidder.

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

Appendix to Technical Part

Site Organization

[insert Site Organization information]

Appendix to Technical Part

Method Statement

[insert method Statement – A detailed note should be submitted outlining bidders proposed methodology and program of construction including Contractor’s Environmental and Social Management Strategies and Implementation Plans (C-ESMP), 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 period of completion as per milestones]

Appendix to Technical Part

Mobilization Schedule

[insert Mobilization Schedule]

In accordance with the Particular Conditions, Sub-Clause 16.2, the Contractor shall not carry out mobilization to Site unless the Project manager gives consent that appropriate measures are in place to address environmental and social risks and impacts, which as a minimum shall include applying the Management Strategies and Implementation Plans (MSIPs) and Code of Conduct for Contractor's Personnel, submitted as part of the Bid and agreed as part of the Contract.

Appendix to Technical Part

Construction Schedule

[insert Construction Schedule]

The construction schedule shall include the following key milestone - No-objection to the Contractor's MSIPs, which collectively form the C-ESMP, in accordance with the Particular Conditions of Contract Sub-Clause 16.2.

Appendix to Technical Part

ES Management Strategies and Implementation Plans

(ES-MSIP)

The Bidder shall submit comprehensive and concise Environmental and Social Management Strategies and Implementation Plans (ES-MSIP) as required by ITB 11.2 (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 ES provisions of the contract including those as may be more fully described in the Works Requirements in Section VII.

Appendix to Technical Part

Code of Conduct for Contractor’s Personnel(ES) Form

Note to the Employer:

The following minimum requirements shall not be modified. The Employer may add additional requirements to address identified issues, informed by relevant environmental and social assessment.

The types of issues identified could include risks associated with: labour influx, spread of communicable diseases, and Sexual Exploitation and Assault (SEA) etc.

Delete this Box prior to issuance of the bidding documents.

Note to the Bidder:

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

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

CODE OF CONDUCT FOR CONTRACTOR’S PERSONNEL

We are the Contractor, [enter name of Contractor]. We have signed a contract with [enter name of Employer] for [enter description of the Works]. These Works will be carried out at [enter the Site and other locations where the Works will be carried out]. Our contract requires us to implement measures to address environmental and social risks related to the Works, including the risks of sexual exploitation and assault and gender-based violence.

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

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

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

REQUIRED CONDUCT

Contractor's Personnel shall:

1. carry out his/her duties competently and diligently;
2. comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
3. maintain a safe working environment including by:
 - a. ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
 - b. wearing required personal protective equipment;
 - c. using appropriate measures relating to chemical, physical and biological substances and agents; and
 - d. following applicable emergency operating procedures.
4. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health;
5. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;
6. not engage in any form of sexual harassment including unwelcome sexual advances, requests for sexual favors, and other unwanted verbal or physical conduct of a sexual nature with other Contractor's or Employer's Personnel;
7. not engage in Sexual Exploitation, which means any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. In Bank financed projects, sexual exploitation occurs when access to or benefit from Bank financed Goods, Works, Consulting or Non-consulting services is used to extract sexual gain;
8. not engage in Sexual Assault, which means sexual activity with another person who does not consent. It is a violation of bodily integrity and sexual autonomy and is broader than narrower conceptions of "rape", especially because (a) it may be committed by other means than force or violence, and (b) it does not necessarily entail penetration.
9. not engage in any form of sexual activity with individuals under the age of 18, except in case of pre-existing marriage;
10. complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation, and Assault (SEA);
11. report violations of this Code of Conduct; and
12. not retaliate against any person who reports violations of this Code of Conduct, whether to us or the Employer, or who makes use of the [Project Grievance [Redress] Mechanism].

RAISING CONCERNS

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

1. Contact [*enter name of the Contractor's Social Expert with relevant experience in handling gender-based violence, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters*] in writing at this address [] or by telephone at [] or in person at []; or
2. Call [] to reach the Contractor's hotline (*if any*) and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

CONSEQUENCES OF VIOLATING THE CODE OF CONDUCT

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

FOR CONTRACTOR'S PERSONNEL:

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

Name of Contractor's Personnel: [insert name]

Signature: _____

Date: (day month year): _____

Countersignature of authorized representative of the Contractor:

Signature: _____

Date: (day month year): _____

ATTACHMENT 1: Behaviors constituting Sexual Exploitation and Abuse (SEA) and behaviors constituting Sexual Harassment (SH)

ATTACHMENT 1 TO THE CODE OF CONDUCT FORM
BEHAVIORS CONSTITUTING SEXUAL EXPLOITATION AND ABUSE (SEA) AND
BEHAVIORS CONSTITUTING SEXUAL HARASSMENT (SH)

The following non-exhaustive list is intended to illustrate types of prohibited behaviors:

(1) Examples of sexual exploitation and abuse include, but are not limited to:

- A Contractor's Personnel tells a member of the community that he/she can get them jobs related to the work site (e.g. cooking and cleaning) in exchange for sex.
- A Contractor's Personnel that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A Contractor's Personnel rapes, or otherwise sexually assaults a member of the community.
- A Contractor's Personnel denies a person access to the Site unless he/she performs a sexual favor.
- A Contractor's Personnel tells a person applying for employment under the Contract that he/she will only hire him/her if he/she has sex with him/her.

(2) Examples of sexual harassment in a work context

- Contractor's Personnel comment on the appearance of another Contractor's Personnel (either positive or negative) and sexual desirability.
- When a Contractor's Personnel complains about comments made by another Contractor's Personnel on his/her appearance, the other Contractor's Personnel comment that he/she is "asking for it" because of how he/she dresses.
- Unwelcome touching of a Contractor's or Employer's Personnel by another Contractor's Personnel.
- A Contractor's Personnel tells another Contractor's Personnel that he/she will get him/her a salary raise, or promotion if he/she sends him/her naked photographs of himself/herself.

Others

Appendix to Technical Part

Sub-Contracting

SCHEDULE OF SUBCONTRACTORS

Item	Element of work	% 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 proposed 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).

Appendix to Technical Part Others

Appendix to Technical Part

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

Appendix to Technical Part

Form ELI -1.1: Bidder Information Form

Date: _____
 RFB No. and title: _____
 Page _____ of _____ pages

Bidder's legal name
In case of Joint Venture (JV), legal name of each member:
Bidder's actual or intended country of registration: <i>[indicate country of Constitution]</i>
Bidder's actual or intended year of incorporation:
Bidder's legal address [in country of registration]:
Bidder's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITB 4.4. ☐ Authorization to represent the firm or JV named in above, in accordance with ITB 20. ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1. ☐ In case of state-owned enterprise or institution, in accordance with ITB 4.6 documents establishing: • Legal and financial autonomy • Operation under commercial law • Establishing that the Bidder is not under the supervision of the Employer 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Appendix to Technical Part

Form ELI -1.2: Information Form for JV Bidders

(Where permitted as per BDS ITB 4.1)
(to be completed for each member of Joint Venture)

Date: _____
RFB No. and title: _____
Page _____ of _____ pages

JV Information
Bidder's Joint Venture legal name:
JV member's legal name:
JV member's country of registration:
JV member's year of constitution:
JV member's legal address in country of constitution:
JV member's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
1. Attached are copies of original documents of ☐ 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. ☐ Authorization to represent the firm or JV named in above, in accordance with ITB 20. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and is not under the supervision of the Employer, in accordance with ITB 4.6. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Appendix to Technical Part

Form ELI -1.2 A

Specialized Subcontractor's Information Form (to be completed for each Specialized Subcontractor)

Date: _____

RFB No. and title: _____

Page _____ of _____ 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

- ☐ 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.
- ☐ Authorization to represent the Specialized Subcontractor.

Appendix to Technical Part

DETAILS OF PARTICIPATION IN THE JOINT VENTURE

PARTICIPATION DETAILS	FIRM ‘A’ (Lead Member)	FIRM ‘B’	FIRM ‘C’
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.

Appendix to Technical Part

Form CON – 2: Historical Contract Non-Performance, Pending Litigation and Litigation History

[to be completed for the Bidder and for each member of a Joint Venture]

Bidder's Name: _____

Date: _____

Joint Venture Member's Name _____

RFB No. and title: _____

Page _____ of _____ pages

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria			
☐ Contract non-performance did not occur since 1 st January <i>[insert year]</i> specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.1.			
☐ Contract(s) not performed since 1 st January <i>[insert year]</i> specified in Section III, Evaluation and Qualification Criteria, requirement 2.1			
Year	Non-performed 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 non-performance: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
Pending Litigation, in accordance with Section III, Evaluation and Qualification Criteria			
☐ No pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.			
☐ Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3 as indicated below.			

Year of dispute	Amount in dispute (Rs.)	Contract Identification	Total Contract Amount (Rs.)
<i>[insert year]</i>	<i>[insert amount]</i>	Contract Identification: [indicate complete contract name, number, and any other identification] 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>
<i>[insert year]</i>	<i>[insert amount]</i>	Contract Identification: [indicate complete contract name, number, and any other identification] 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 ☐ No Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4. ☐ Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4 as indicated below.			

Year of award	Outcome as percentage of Net Worth	Contract Identification	Total Contract Amount (Rs.)
<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: [indicate complete contract name, number, and any other identification] 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>	<i>[insert amount]</i>

Appendix to Technical Part

Form CON – 3: Environmental and Social 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: _____ *[insert full name]*
 Date: _____ *[insert day, month, year]*
 Joint Venture Member's or Specialized Subcontractor's Name: _____ *[insert full name]*
 RFB No. and title: _____ *[insert RFB number and title]*
 Page _____ *[insert page number]* of _____ *[insert page number]* pages

Environmental and Social Performance Declaration in accordance with Section III, Qualification Criteria, and Requirements			
☐ No suspension or termination of contract: An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental or Social (ES) performance since the date specified in Section III, Qualification Criteria, and Requirements, Sub-Factor 2.5.			
☐ Declaration of suspension or termination of contract: The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental or Social (ES) performance since the date specified in Section III, Qualification Criteria, and Requirements, Sub-Factor 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. forgery-based violence; sexual exploitation or assault 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 main reason(s)]</i>	<i>[insert amount]</i>
...	...	<i>[list all applicable contracts]</i>	...

Performance Security called by an employer(s) for reasons related to ES performance		
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 gender-based violence; sexual exploitation or assaultbreaches]</i>	<i>[insert amount]</i>

Appendix to Technical Part

Form CCC: Current Contract Commitments / Works in Progress

Bidders and each member of 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 ¹ 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)

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

—

¹Attach certificate(s) from the Engineer(s)-in-Charge.

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)

Appendix to Technical Part

Form FIN – 3.1: Financial Situation and Performance

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

Bidder's Legal Name: _____

Date: _____

Joint Venture Member's Legal Name _____

RFB No. and title: _____

Page _____ of _____ pages

1. Financial data

Type of Financial information in (Rs.)	Historic information for previous _____ years, (amount in Rs.)				
	Year 1	Year 2	Year 3	Year 4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Total Equity/Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (WC)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Cash Flow Information					
Cash Flow from Operating Activities					

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.

2. Sources of Finance

Specify sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.

No.	Source of finance	Amount (Rs.)
1		
2		
3		

3. Financial documents

The Bidder and its parties shall provide copies of financial statements for _____ years pursuant Section III, Evaluation and Qualifications Criteria, Sub-factor 3.2. The financial statements shall:

- (a) reflect the financial situation of the Bidder or in case of JV member, and not an affiliated entity (such as parent company or group member).
- (b) be independently audited or certified in accordance with local legislation. In case of Indian bidders, the financial statements shall be audited by a certified chartered accountant.
- (c) be complete, including all notes to the financial statements.
- (d) correspond to accounting periods already completed and audited.

☐ Attached are copies of financial statements¹(balance sheets, including all related notes, and income statements) for the _____ years required above; and complying with the requirements

¹ 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.

Appendix to Technical Part

Form FIN - 3.2: Average Annual Construction Turnover

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

Bidder's Legal Name: _____

Date: _____

Joint Venture Member's Legal Name _____

RFB No. and title: _____

Page _____ of _____ pages

Annual turnover data (construction only)	
Year	Amount in Rs.
<i>[indicate year]</i>	<i>[insert amount]</i>
Average Annual Construction Turnover *	

- * See Section III, Evaluation and Qualification Criteria, Sub-Factor 3.2. Annual construction turnover calculated as total certified payments received for work in progress or completed, for 5 years. This should be certified by a Chartered Accountant.

Appendix to Technical Part

JOINT VENTURE

Names of all members of a joint venture
1. Member in charge
2. Member
3. Member

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

Annual Turnover Data (construction only; in Rs. *)							
Member	Form 3.2 page no.	Year 1	Year 2	Year 3	Year 4	Year 5	Average
1. Member in charge							
2. Member							
3. Member							
TOTALS							

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

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).

Appendix to Technical Part

Form FIN - 3.3: Financial Resources

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as specified in Section III, Evaluation and Qualification Criteria.

Source of financing	Amount (Rs.)
1.	
2.	
3.	
4.	

FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CASH FLOW

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

Clause 3.1(ii) of Section III – 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. equivalent _____ 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.]

Appendix to Technical Part

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 Legal Name: _____

Date: _____

Joint Venture Member's Legal Name _____

RFB No. and title: _____

Page _____ of _____ pages

[Identify contracts that demonstrate continuous construction work over the past [5] years pursuant to Section III, Qualification Criteria and Requirements, Sub-Factor 4.1. List contracts chronologically, according to their commencement (starting) dates.]

Starting Month/ Year	Ending Month/ Year	Contract Identification	Role of Bidder <i>["Contractor" or "JV Member" or "Subcontractor" or "Contract"]</i>
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	

Appendix to Technical Part

Form EXP - 4.2(a): Specific Construction and Contract Management 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 Legal Name: _____

Date: _____

Joint Venture Member's Legal Name _____

RFB No. and title: _____

Page _____ of _____ pages

Work performed as prime Contractor or JV Member 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 years². *[Attach certificate from the Engineer-in-charge.]*

Similar Contract No.	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub- contractor ☐
Total Contract Amount	Rs. *			
If member in a JV or subcontractor, specify participation in total Contract amount			*	
Employer's Name:				
Address:				
Telephone/fax number				
E-mail:				

²Immediately preceding the financial year in which bids are received.

Appendix to Technical Part
Form EXP - 4.2(a) (cont.)
Specific Construction and Contract Management Experience (cont.)

Similar Contract No.	Information
Description of the similarity in accordance with Sub-Factor 4.2(a) of Section III:	
1. Amount	
2. Physical size of required works items	
3. Complexity	
4. Methods/Technology	
5. Construction rate for key activities	
6. Other Characteristics	

Appendix to Technical Part

Form EXP - 4.2(b): Construction Experience in Key Activities

Bidder's Legal Name: _____

Date: _____

Joint Venture Member's Legal Name _____

Subcontractor's Legal Name³ (as per ITB 33.2 and 33.3): _____

RFB No. and title: _____

Page _____ of _____ pages

Subcontractor's Name (as per ITB 33.2 and 33.3): _____

All subcontractors for key activities must complete the information in this form as per ITB 33.2 and 33.3 and Section III, Qualification Criteria and Requirements, Sub-Factor 4.2.

1. Key Activity No One: _____

Information				
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub- contractor ☐
Total Contract Amount	Rs. _____			
Quantity (Volume, number or rate of production, as applicable) performed under the contract per year or part of the year in the last 5 years	Total quantity in the contract (i)	Percentage participation (ii)	Actual Quantity Performed (i) x (ii)	
Year 1				
Year 2				
Year 3				
Year 4				
Year 5				

³ If applicable.

	Information
Employer's Name ⁴ :	
Address:	
Telephone/fax number	
E-mail:	

2. Activity No. Two

3.

	Information
Description of the key activities in accordance with Sub-Factor 4.2(b) of Section III:	

⁴Attach certificate from the Engineer-in-charge

Appendix to Technical Part

Form EXP - 4.2(c)

Specific Experience in Managing ES aspects

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

Bidder's Name: _____

Date: _____

Bidder's JV Member Name: _____

RFB No. and title: _____

Page _____ of _____ pages

1. Key Requirement no 1 in accordance with 4.2 (c): _____

Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Subcontractor ☐
Total Contract Amount			Rs.	
Details of relevant experience				

2. Key Requirement no 2 in accordance with 4.2 (c): _____

3. Key Requirement no 3 in accordance with 4.2 (c): _____

...

Appendix to Technical Part

Form.....

(Name of the Project)

(Declaration regarding tax/duty exemption for materials/construction equipment bought for the work)

(Bidder's Name and Address)

To:
(Name of the Employer & address)

Dear Sir:

Re: *[Name of Work]*.....

Certificate for Import/Procurement of Goods/Construction Equipment
 Government Order/Circular Number under which tax/duty Exemption is being sought: ...

1. We confirm that we are solely responsible for obtaining tax/duty waivers which we have considered in our bid and in case of failure to receive such waivers for reasons whatsoever, the employer will not compensate us.
2. We are furnishing below the information required by the Employer for issue of the necessary certificates in terms of the Government of India's relevant Notifications.
3. The goods/construction equipment for which certificates are required are as under:

Items <i>(modify the list suitably for each specific work)*</i>	Make/ Brand Name	Capacity <i>[where applicable]</i>	Quantity	Value	State whether it will be procured locally or imported <i>[if so from which country]</i>	Remarks regarding justification for the quantity and their usage in works.
Goods						
[a] Bitumen						
[b] Cement						
[c] Steel						
Construction Equipment						

4. We agree that no modification to the above list is permitted after bids are opened.

5. We agree that the certificate will be issued only to the extent considered reasonable by the Employer for the work, based on the Bill of Quantities and the construction program and methodology as furnished by us alongwith the bid.
6. We confirm that the above goods and construction equipment will be exclusively used for the construction of the above work and the construction equipment will not be sold or otherwise disposed of in any manner for a period of five years from the date of acquisition.

Date: _____

Place: _____

(Signature) _____

(Printed Name) _____

(Designation) _____

(Common Seal) _____

[This certificate will be issued within 60 days of signing of contract and no subsequent changes will be permitted.]

*** Modify the above to suit the requirements given in Government of India's Notifications as current of date of bidding.**

Appendix to Technical Part: Bid Security

Form of Bid Security - Bank Guarantee

[Guarantor letterhead or SWIFT identifier code]

Bank Guarantee No.....[insert guarantee reference number]

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

WHEREAS, _____ [name of Bidder]⁵ (hereinafter called "the Applicant") has submitted his Bid dated _____ [date] or will submit his Bid for the construction of _____ [name of Contract] (hereinafter called "the Bid") under Request for Bids No.....[insert number] (hereinafter called "the RFB")

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 _____ ⁶for 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 Applicant (a) withdraws his bid during the period of Bid validity specified in the Letter of Bid, ("the Bid Validity Period"); or (b) does not accept the correction of the Bid Price pursuant to ITB 36;

Or

(2) If the Applicant 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

⁵Insert 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 alongwith its bid.

⁶The Applicant 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.

- (b) fails or refuses to furnish the Performance Security and if required, the Environmental and Social (ES) Performance Security, in accordance with the Instruction to Bidders.

we undertake to pay to the Employer up to 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 up to and including the date _____⁷ 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.

⁷45 days after the end of the validity period of the Bid.

Appendix to Technical Part

Form of Bid-Securing Declaration

Date: *[insert date (as day, month and year)]*

RFB No.: *[insert number of Bidding process]*

Alternative No.: *[insert identification No if this is a Bid for an alternative]*

To: *[insert complete name of Employer]*

We, the undersigned, declare that:

We understand that, according to your conditions, bids must be supported by a Bid-Securing Declaration.

We accept that we will automatically be suspended from being eligible for bidding or submitting proposals in any contract with the Employer for the period of time of *[insert number of months or years]* starting on *[insert date]*, if we are in breach of our obligation(s) under the bid conditions, because we:

- (a) have not accepted the correction of the Bid Price pursuant to ITB 36; or
- (b) have withdrawn our Bid during the period of Bid validity specified in the Letter of Bid; or
- (b) having been notified of the acceptance of our Bid by the Employer during the period of bid validity, (i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security and, if required, the Environmental and Social (ES) Performance Security, in accordance with the ITB.

We understand this Bid-Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) forty-five days after the expiration of our Bid.

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 [*Note: In case of a Joint Venture, the Bid-Securing Declaration must be in the name of all members to the Joint Venture that submits the Bid.*]

Letter of Bid - Financial Part

INSTRUCTIONS TO BIDDERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE DOCUMENT

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

Note: All italicized text is to help Bidders in preparing this form.

Date of this Bid submission: *[insert date (as day, month and year) of Bid submission]*

Request for Bid No.: *[insert identification]*

Alternative No.⁸: *[insert identification No if this is a Bid for an alternative]*

To: *[insert complete name of Employer]*

We, the undersigned, hereby submit the second part of our Bid, the Bid Price and Bill of Quantities. This accompanies the Letter of Bid - Technical Part.

In submitting our Bid, we make the following additional declarations:

(a) **Bid Validity Period:** Our Bid shall be valid for a period specified in BDS 18.1 (or as amended if applicable) from the date fixed for the Bid submission deadline specified in BDS 22.1 (or as amended if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(b) **Bid Price:** The total price of our Bid, excluding any discounts offered in item (c) below is:
[Insert one of the options below as appropriate]

[Option 1, in case of one lot:] Total price is: *[insert the total price of the Bid in Rs. in words and figures]*;

Or

[Option 2, in case of multiple lots:] (a) Total price of each lot *[insert the total price of each lot in Rs. in words and figures]*; and (b) Total price of all lots (sum of all lots) *[insert the total price of all lots in Rs. words and figures]*;

(c) **Discounts:** The discounts offered and the methodology for their application are:

⁸Delete if not applicable

- (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]*;
- (d) **Commissions, gratuities and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the Bidding process or execution of the Contract: *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]*.

Name of Recipient	Address	Reason	Amount

(If none has been paid or is to be paid, indicate “none.”)

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 a 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. The power of attorney shall be attached with the Bid Schedules

Appendix to Financial Part: Schedules Sub-contracting

SCHEDULE OF SUBCONTRACTORS

[Note: Entries in this Schedule shall be the same as included in the same Schedule in the technical part of the bid, except for the column on 'Approximate value of subcontract' added in the table below]

Item	Element of work	Approximate value of subcontract	% 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 proposed 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 subcontractor 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 subcontracted; but subcontracting specialized elements of works is acceptable).

Appendix to Financial Part: Schedules

Bill of Quantities

1. Preamble to the BOQ

1.1 INTRODUCTION

The Bill of Quantities (BOQ) shall be read in conjunction with the Instructions to Bidders, General Conditions of Contract, Particular Conditions of Contract, Technical Specifications, Bid Data Sheets and Drawings. The rates quoted shall be inclusive of cost of all materials, transportation and carriage of material upto works site, labour, plant and equipment, tools and tackles, safety gadgets, incidentals etc. as may be required for that particular item in the BOQ which is to be read in conjunction in the specification.

The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be on the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities. If such rates are not available in the Bill of Quantities, this will be treated as extra work and such rates and prices will be fixed by the Engineer / Project Manager as per the terms of the Contract.

Mode of measurement, if not specified elsewhere shall be followed as per available codes of practice published by the Bureau of Indian Standards (BIS).

The rates and prices tendered in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the contract, include all temporary facilities, access, notices to maintain traffic prevailing in an accessible manner, as far as possible for similar flow existing and also including all construction of plant, labour, supervision, materials, erection, maintenance, insurance, overhead, profit, taxes and duties together with all general risk, liabilities and obligation set out or implied in the contract.

General directions and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. The Bidder must refer to the relevant sections of the bid documents including specifications, data sheets and drawings before quoting rates or prices against each item in the Bill of Quantities.

Provisional Sum as included and so designated in the Bill of Quantities shall be expended in whole or in part at the direction and discretion of the Project Manager/ Engineer in accordance with the General Conditions of Contract. Payment for work under provisional item shall be payable for statutory requirement by other agencies (if required) and for any unforeseen items of work. Payment for statutory requirement by the external agencies as above will be made as per bill raised by the other agency + 7.5% as Contractor's service charges. However, approval of the agency and their rates shall be done by the Project Manager. Provisional Sum for other works, not covered under statutory requirements of

other agencies stated above, will either be paid as per current Schedule of Rates of IWD/ PWD/ any other State /Central Government Department as may be applicable, without any additional service charge in case of scheduled items of works, or as per rates prescribed by other State Government Entities and accepted by the Project Manager + 7.5% as Contractor's service charges, in case of non-scheduled items. One such pertinent item would be payment of crop compensation for temporary occupation of land for temporary storage of de-silted bed materials.

The amount kept under this head is as decided by the Project Manager. The Contractor shall not change this figure or quote of his own. The amount is subject to variation as per requirement of project with approval of the Project Manager.

2. General Basis for Pricing,

- 2.1.** The Bidder shall be deemed to have read and examined the Bid Documents as well as inspected the project site thoroughly to conceive the work in totality to quote against each item of work as given in the BOQ.
- 2.2.** The Bidder shall be deemed to be fully conversant with the site conditions and the nature and complexity of the work to be undertaken and taking into account all eventualities which can arise before, during and after project execution.
- 2.3.** 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 finished according to the drawings or as may be ordered from time to time by the Engineer and the cost calculated for the respective prices. Necessary manpower will have to be provided by the Contractor during measurement of works and setting out alignment of the works, for which no extra payment will be made.
- 2.4.** Unless otherwise stated, all items shall be measured as executed as per drawing and specification and no allowance will be made for wastage, working space, bulking or shrinkage, and the like.
- 2.5.** The Contractor shall have to establish as per requirement office at site with adequate space for their personnel, inclusive of necessary furniture & furnishing, computers with printers, consumables etc., storage space for equipment, materials etc. Contractor's quoted rates and price shall be inclusive of this and no separate payment will be made on this account.
- 2.6.** The quoted rates and prices shall also be inclusive of communication system as per requirement to be established at site (tele, fax, internet facilities etc.), vehicles for movement at site etc. No extra cost against such items will be paid.

3. Miscellaneous

- 3.1 Temporary power connections, telephones, construction and drinking water shall be arranged by the Contractor at his own cost and shall be deemed to be included in their quoted rates. Alternative power arrangement shall be made by Contractor without any extra charge.
- 3.2 All underground and over ground utility items shall have to be suitably supported during the construction phase by the Contractor so that the existing utility services are not damaged. No extra payment will be made on this account.
- 3.3 The Contractor shall keep plumbers, technicians and electricians ready for repair/ shifting of existing underground/ over ground utilities and for crisis management.
- 3.4 During progress of work, convenient access to adjacent premises shall be made by the Contractor. No extra payment will be made on this account.
- 3.5 For speedy progress of work in case of exigency, while working along busy road etc., Contractor may have to do work round the clock at the instance of the Engineer/Project Manager. Arrangement for lighting and other safety requirements shall have to be done for night working. No extra payment shall be made to the Contractor except the items provided in the BOQ.
- 3.6 The construction and maintenance of temporary access road for haulage of construction materials and machineries at different locations will be the sole responsibility of the contractor for which the bidder should acquaint themselves with through survey of the proposed site and include the cost of the same in their rates. No extra payment/ claims for so ever on this ground will be entertainment.

The contractor will be required to make good all damages at his own cost, that would occur in the local village roads for plying of trucks carrying construction materials, plant and machinery, during the entire construction period or till such roads are restored permanently by the local authorities.

- 3.7 The item rates quoted by the Contractor shall, unless otherwise specified, also include compliance of/ supply of the following:
 - i. General works such as setting out, clearance of site before setting out and clearance of works after completion.
 - ii. A detailed programme for the construction and completion of the work.
 - iii. Samples of various materials proposed to be used on the work for conducting tests thereon as required as per the provisions of the Contract and approved Quality Assurance Plan (QAP).
 - iv. Any other item of work which is not specially provided in the Bill of Quantities (BOQ) but which is necessary for complying with the provisions of the Contract.
 - v. All temporary works, formwork and false work.

- vi. Arrangement of a laboratory with facilities for testing and testing of various items of works as specified in relevant clauses. Vii) Cost of in-built provisions for Quality Assurance.
 - vii. Cost of labour hutment, site office.
 - viii. Cost for implementation of the Contractor's ESHS-MSIP in particular, as detailed at Annexure-II of Section VII, in relation to those items that are neither covered as specific items of works nor included in the list of activities under the "Provisional Sum", in the BOQ.
- 3.8 Extra items of work – If during the progress of work any extra items need to be carried out, which in the opinion of the Engineer/ Project Manager is essentially required to be executed, then the extra item shall be analyzed as follows:
- i) Derived from rates of similar items of works stated in the tendered offer
 - ii) In the event an extra item of work that cannot be derived from (i) above, then the following shall be applicable.
 - iii) The actual cost of materials based on documentation including labour, transportation, overhead and profit as per State USoR of I&WD, PWD SOR Volume-I (For Building Works), PWD SOR Volume-II (For Sanitary & Plumbing Works, PWD SOR Volume-III (For Road & Bridge Works), I&WD, Mechanical Circle, SoR 2011, **I&WD USoR (M&E) 2022**, Government of India, Central Public Works Department, Delhi, SoR (E&M), 2018 norms including latest Addenda & Corrigenda.

Appendix to Financial Part: Schedules Bill of Quantities

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
MECHANICAL PART						
1	Supply of Gear Oil as per direction of Engineer in charge. Filling of H.P Gear Oil 140 grade in new Double reduction gear box to complete the job..	60.00	LTR			
2	Cost for dismantling different types rubber seal from gate shutter as per direction of E.I.C. The cost includes cost of man power employed for dismantling, hire charges of tools & tackles, scaffolding and safety equipmentsetc including carriage loading & unloading..					
	i) Gate shutter size above 20 sq.mupto 50 Sq.m	354.86	MTR			
	ii) Gate shutter size above 70 Sq.m	68.30	MTR			
3	Cost for supplying and fitting fixing of Flat rubber seal (Make : Universal Moulders& Engineer/Popular Rubber Works (Pvt) Ltd/ SAB Industries/Unique Polymer Works/equivelant approved make conforming to IS : 11855 - 2011/Latest Revision) for different types of gate shutter as per direction of E.I.C. The cost includes cost of man power employed for fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipmentsetc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.(as per sample/drawing).	225.38	MTR			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
4	Cost for supplying and fitting fixing of bulb/musical node/J-type rubber seal (Make : Universal Moulders& Engineer/Popular Rubber Works (Pvt) Ltd/SAB Industries/Unique Polymer Works/equivelant approved make conforming to IS : 11855 -2011/Latest Revision) for different types of gate as per direction of E.I.C. The cost includes cost of man power employed for fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipmentsetc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.(as per sample/drawing). (i) Solid Bulb:- size- 40Ø 140 x 12 mm.	86.36	MTR			
5	Cost for supplying and fitting fixing of angle type rubber seal (Make: Universal Moulders& Engineer/Popular Rubber Works (Pvt) Ltd/ SAB Industries/Unique Polymer Works/equivelant approved make conforming to IS : 11855 - 2011/Latest Revision) for different types of gate as per direction of E.I.C. The cost includes cost of man power employed for dismantling & fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipmentsetc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.(as per sample/drawing).					
	i) size: (75 x 75mm) x14mm(thick)	261.72	MTR			
6	Cost for supplying and fitting fixing of corner rubber seal (Make: Universal Moulders& Engineer/Popular Rubber Works (Pvt) Ltd/ SAB Industries/Unique Polymer Works/equivelant approved make conforming to IS : 11855 -					

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	2011/Latest Revision) for different types of gate as per direction of E.I.C. The cost includes cost of man power employed for dismantling & fitting fixing, cost of rubber seal, hire charges of tools & tackles, scaffolding and safety equipments etc including carriage loading & unloading but excluding supply of ms clamp/ flat plate, bolts, nuts and washer.(as per sample/drawing).					
	i) Rubber Corner Seal size 40Φ 140 X 12 mm	36.00	EACH			
7	Supplying of M.S flat for clamping Rubber seal with hole as per direction of EIC.	3193.16	KG			
8	Supplying of M.S bolts with nut for clamping Rubber seal as per direction of EIC.	1250.00	KG			
9	Supply and fabrication of new stainless steel plate/flat (AISI - 304) of suitable size on seal beam / roller track/ slide track/ side seal seats/ top seal seat by welding (SS) as per direction of the Engineer- in-charge including cost of Materials, Machinaries, Manpower, Cutting, Aligning, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification.	9078.69	KG			
10	Dismantling and fixing only of trunion assembly and guide roller assembly of radial gate of barrage/dam gate. The cost includes cost of manpowers, hire charges of T&P, chain pulley blocks, scaffolding, and overhead cost etc to complete the job as per direction of Engineer in charge.	33.00	EACH			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
11	Dismantling rope drum hoisting system completely of Dam/ Barrage gate, consisting of geared motor/motor, gear box, manual operating system, chain & sprocket, couplings, braking arrangement, power transmission shafts, spur gears, rope drum, rope, rope clamps, trunion etc part by part for repairing/replacement of gates and staking suitable place upto lead of 500 metre or as per direction of E.I.C. The cost includes cost of man power employed for dismantling of hoisting system, hire charges of mechanical devices for hanging the gate properly for repairing works, hire charges of tools & tackles, scaffolding and safety equipments etc including carriage loading & unloading.i) Width of Gate shutter size upto 12 metre	15.00	EACH			
12	Supply & fitting fixing of round strand (steel core/fibre core) steel wire rope (ungalvanised, IWRC) of 6x36 construction of 1960 tensile designation as per IS-2266 (make: Usha Martin, Bharat Wire Ropes Ltd or BIS approved makes), rope clamp with Dishakle and fitting fixing of said material with correct alignment and position inclusive of all cost of labour, T&P, scaffolding charges & all other incidental charges as necessary to complete the job in all respect upto the satisfaction of E.I.C.					
12.01	i) 22 mm dia (steel core)	168.00	RM			
12.02	ii) 24 mm dia (steel core)	1449.06	RM			
13	Cost for arrangement of holding the Dam / Barrage gate and its counter weight by special fixtures, tools and tackles, chain pulley block and heavy scaffolding etc as per requirement for performing repairing works at the site. The cost includes					

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	cost of mampowers, hire charges of T&P, chain pulley blocks, scaffolding, and overhead cost etc to complete the job as per direction of Engineer in charge.					
13.01	i) Gate shutter size above 10 sq.m upto 20 Sq.m	4.00	EACH			
13.02	ii) Gate shutter size above 70 Sq.m	22.00	EACH			
14	Supply, installation, testing and commissioning of following items for hoisting system and gear box as mentioned below as per direction including cost of Materials, Machineries, Manpower, Cutting, Machining, aligning, anchoring, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting).					
14.01	Rope Drum-Required of size P.C.D-342mm, ID-110mm.Flange OD-435mm, Flange thk-25mm, Length-406mm dismantling of wire rope and refitting the same to complete at site up to satisfaction of E.I.C.(as per sample/drawing).c) Cast Steel	1418.45	KG			
14.02	Shaft /Pin with key ways made of size (diameter) =50 mm, length = 500 mm made up by forged steel C-45, IS-1570, with keyway and splined cutting at required position of the shaft having depth of keyway splined groove=5 mm as per drawing/sample, at site and up to satisfaction of E.I.C. a) Forged Steel	135.58	KG			
14.03	Plumber Block/Pillow Block/Bearing Housing (FG 400)-make with SKF- bearing no-1210 ETN-9, ID=50mm to accommodate 50 mm dia shaft Including oil seal.(as per sample/drawing).	160.00	KG			
14.04	Self-aligning ball Bearing (S.K.F) for shaft size b) Self	8.00	EACH			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	aligning ball Bearing (S.K.F) for shaft size = 50 mm dia (1210 ETN-9)					
14.05	Self-aligning ball Bearing (S.K.F) for shaft size e) Self aligning ball Bearing (S.K.F) for shaft size = 80 mm dia (1216 K)	44.00	EACH			
14.06	Jaw/Clutch Coupling (Mat: C45)-Required of size OD-120mm, ID-50mm, L-180mm, accommodate with suitable splined shaft (size dia.-50mm) including operating handle and lever arrangement complete as per direction of E.I.C. (as per sample/drawing).	221.75	KG			
14.07	Manual operating mechanism a) chain-Required of double strand & triplex chain IS. No. 10B series RENOLD make chain to be fitted in two pair of chain sprocket shaft to shaft distance about 0.75m and 1.2m and P.C.D of two pair of sprocket are 157mm &157mm and 157mm &117mm total 4.3m length including all necessary fixture to complete the job at site as per direction of E.I.C (as per sample/drawing).	133.50	RM			
14.08	b) sprocket (Aloy Steel)- double strand & triplex chain IS. No. 10B series chain sprocket of size P.C.D-117mm. OD-125mm. ID-40mm, size P.C.D-157mm. OD-165mm. ID-50mm At site up to satisfaction of E.I.C. (as per sample/drawing).	524.20	KG			
14.09	Position Indicator including its Coupling and Gearing-Required of dial gauge indicator compraising of pinion of P.C.D-50mm, No. of Teeth-50Nos, Gear of P.C.D-200mm, No. fo Teeth-200Nos, Sheet metal graduated dial board of dia-300mm framed in a M.S structure complete assembly to complete at site up to satisfaction of E.I.C.	3.00	EACH			
14.10	Supply of brake shoe assembly for following sizes of AC	15.00	EACH			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	Solenoid brake. c) Drum size 7", (make BCH or eqv.)					
15	Oiling greasing of hoisting gear boxes (for rope drum and chain hoist) of dam /barrage gates and head regulator gates of dam/barrages by cleaning, checking, greasing /lubricating the gears, plummer bocks, bearings, manual drive etc including all charges of man & materials which include oiling, greasing, refilling of gear oil excluding supply of gear oil and grease and fixing of damaged oil seals & missing nut & bolts etc complete as per direction of EIC.(Gear oil & Grease provided extra.).					
15.01	(a) Width of Gate shutter size upto 9 metre.	4.00	EACH			
15.02	(b) Width of Gate shutter above 9 metre.	11.00	EACH			
16	Supply of Grease -make Servo MP3	200.00	KG			
17	Cleaning gates / hoists / embedded parts/lifting beams etc, to expose fresh metal surface for painting by sand blasting method as per specifications including cost of all materials, labour, machinery, scaffolding, etc., complete with initial lead for sand upto 1 km and all lifts.	1848.81	M²			
18	Painting of embedded parts, all types of gates, stoplogs and barscreen/ gratings etc on prepared surfaces with one coat of inorganic zinc silicate primer (airless spray preferred)70+/- 5 micron and two super coats with a total thickness of 300 microns (each 150+/- 5) of solventless coaltar epoxy paint each coat 150 microns (total 300 microns) including cost of all materials, labour, scaffolding etc., complete with all leads and all lifts.	9146.62	M²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
19	Surface cleaning of metal surfaces by chemical cleaners and then by hand with emery paper, wire brush and power tool cleaners and removing dust and preparation of surface including cost of all materials, labour, machinery, scaffolding, etc., complete with initial lead for sand upto 1 km and all lifts.	3473.04	M ²			
20	Painting hoist structural components, trestle bridge, crane, lifting beam, cat work bridge and other similar structure on prepared surfaces with two coats of zinc phosphate primer (airless spray preferred) 40 microns/coat and one coat 65+/-5 micron of alkyd based micaceous iron oxide paint followed by two coats of synthetic enamel paint 25 microns/coat including cost of all materials, labour, scaffolding etc., complete with all leads and all lifts.	4987.21	M ²			
21	Cost for repairing of radial gate shutter of Dam / Barrage including dismantling the damaged portion at lower part (skin plate, horizontal/ vertical girder/stiffener etc. as per IS : 2062 - 2011 /latest revision) not more than 25% of gate height from bottom by gas cutting and fitting, fixing and fabricated by welding as per direction including cost of Materials, Machineries , Manpower, Cutting, aligning, anchoring, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting).	279679.06	KG			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
22	Fabrication,Supply,erection and commissioning of new Radial Head Regulator service gate of Dams and Barrages as perIS:4623-2000/Latest Revision consisting of skinplate, vertical, horizontalgrider, radial arm and stiffener, trinnion assemblies etc.made of MS material consisting of angle , channel,beam,plate, flat, etc. conforming toIS :2062-2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machineries, Manpower, Cutting, Bending, Aligning, drilling, Welding, Finishing, Consumables, Carriages and all overheads with all leads and lifts complete as per specification (without painting).	21040.72	KG			
23	Repairing/replacement/strengtheningof damaged/heavily corroded portion of cross/horizontal/ vertical steel members, chequered plate, stair case, hand railing etc. of MS hoist trestle bridge, catwalk/walkway bridge and other similar MS structure on dam/barrage and canal/rivers which includes dismantling of damaged portion of structural members and fabrication and finishing to the required shape & size as per direction. The Cost includes cost of Materials, Machineries, Manpower, Cutting, aligning, drilling, Welding, Finishing, Consumables, Carriages and all overheads with all leads and lifts complete as per specification (without painting).	205232.16	KG			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
24	Fabrication , supply, erection and commissioning of embedded parts consisting of seal beam, roller track, side seal seats, and yoke girder etc. with all accessories for spillway Radial service gate of dams and barrages made of MS material consisting of angle , channel, beam, plate, flat, etc. conforming to IS : 2062 -2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machineries , Manpower, Cutting, aligning, anchoring, Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting). Remarks: Cost for civil works to be taken from PWD (R) directorate separately.					
24.01	i) Insert plate welded with J hook	25650.91	KG			
24.02	ii) Seal beam	2389.07	KG			
24.03	iii) Roller Track/ Side seal seat/ Yoke Girder	14892.49	KG			
25	Dismantling all types of plain cement concrete works, stacking serviceable materials at site and removing rubbish as directed within a lead of 75 m. above 150 mm. Thick.	380.00	M ³			
26	Supply and fitting fixing of foot mounted Optimax geared motor of size R83ZDB 100L-4BS suitable for 2.2 KW at 36RPM, 415(+/-) 10% Volt, 50(+/-)5% Hz. Class F Insulation, IP-55 Protection 150 starts per hour 45 Degree Centigrade Amb. Tem, DOL starts & fitted with manual release arrangement.	1.00	JOB			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
27	Cost for Welding charges on existing gate shutter in site by skilled welder at the vulnerable location as per direction and as per IS 4622 - 2003.	1300.00	MTR			
28	Supplying to site empty cement polythene bags (capacity 50kg) in good condition including stacking, incidental charges etc. all complete (capacity 50 kg).	15840.00	NOS.			
29	Dumping in position earth / sand filled gunny / poly bags (capacity 50 kg) within a lead of 30 metre inclusive of all lifts.	15840.00	NOS.			
30	Labour charges for filling empty cement gunny bag / polythene bag (capacity 50 kg) with all kinds of earth (wet or dry), sand or aggregates(stone / brick) and sewing as done in case of cement bags ,(tying with a knot after filling will not be accepted) , and stacking within a lead of 30 metre as per direction of Engr-in-charge (cost is excluding the cost of any types of filling materials).NB:- Volume of earth/ sand filled bags should not be less than 0.028 cum/ bag.	15840.00	NOS.			
31	Removing earth/sand filled poly bags/gunny bags from the channel bed/slope and initially depositing the same near channel bank at bed/slope and initially depositing the same near channel bank at a place as directed by the enginner - in charge for measurement of bag & then disposing off the same at a distance not less than 150 metre from the channel site.	15840.00	NOS			
32	Bailing out water by pump including all leads and lifts and including making all arrangements for disposal, where continuous flow or seepage of water is encountered and rating of pumps and hours of operation is specifically ascertained as per direction of the Engineer-in-charge.	2805.00	HP-Hrs			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
33	Carriage of Steel materials over pucca road, Above 5 km up to 10 km (per km). (Zone-A).	556.58	MT			
34	Loading, unloading and stacking by Manual Means. A. Loading in to trucks at the lifting point, unloading at destination, stacking properly in go downs or yard etc. as directed including carriage by head load up to a lead of 50.00 m at each of the two points. (h) Steel.	556.58	TONNE			
35	Plain / Reinforced Cement Concrete in Substructure with coarse aggregates of appropriate nominal size and grading, fine aggregate (sand) conforming to proper grading zone, both of approved quality, cement and water reducing admixtures, as necessary, including labour, cost and carriage of all materials and including preparation of design mix, approval of the same by the Engineer-in-Charge and cost for quality control, sampling, testing etc. all complete as per drawing and technical specification including the cost of necessary form work and staging complete as per drawing and technical specifications. FRCCGradeM30 (i) Height upto 5m I) Using concrete Mixer Aggregate source- Bankura railway stackyard (58 Km).	466.87	M ³			
36	Design, drawing, fabrication, supply, erection, testing and commissioning of 25 tonne capacity Class- II type moving gantry crane consisting of rail mounted gantry frame, top platform with hand railing, long / cross travel arrangements, rope drums, gear systems, electric motors, electromagnetic brake system, cabin, control panel, wire rope, ladder, motorised cable reeling drum etc.,	1.00	EACH			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figur es	In Words	
	with all accessories for operating spillway stop log gate elements and river sluice / canal sluice emergency gates including cost of all materials,machinery, labour, etc.					
37	Design, drawing, fabrication, supply, erection, testing and commissioning of structural steel hoist bridge, Rail support Girder(for Gantry crane) & cat walk/walkway bridge on dam/barrages and canal/rivers consisting of foundation bolt assembly, base plate, columns,beams, bracings, stiffeners, ties, chequered plate covering, hand railing, staircase etc., with all accessories including cost of all materials, machinery, labour, welding, finishing, etc.,complete as per specifications and drawings with all leads and lifts (without painting)	161261.29	KG			
38	Design, drawing, fabrication, supply, erection, testing and commissioning of rail track (pair of rails) using 45 kg /m standard rails on spillway bridge for movement of gantry crane for handling and operating spillway stoplog gate elements / river sluice / canal sluice emergency gate including cost of all materials, machinery, labour, aligning, anchoring, welding & finishing complete as per specifications (without painting).	312.00	RM			
39	Fixing and Casting of Foundation bolts of Gantry Girders on the pier top.	1.00	NO.			
40	Design, drawing, manufacture, supply, erection, testing and commissioning of 10 ton capacity electrically operated fixed type pulling winch machine for cross travel movement of your existing 10 ton capacity hoisting equipment used for lifting of log gates with all accessories including cost of materials, machinery and labor etc. [for RBHR]	1.00	NO.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
41	Dismantling of Existing manually operated Trolley.	1.00	LS			
42	Design, drawing, manufacture, supply, erection, testing and commissioning of geared brake motor with CT shaft and required couplings to make the existing manually operated CT movement of 10 ton hoisting equipment, motorized. The geared brake motor rating shall be 0.75 KW flange mounted motor fitted with parallel shaft helical gearbox and DC E/M disc brake. The CT speed shall be 8-10 M/Min (+/- 10%) including cost of materials, machinery and labor etc. [for LBHR]	1.00	NO.			
43	Dismantling of Existing stop-log gate from it's original position.	1.00	JOB			
44	Fabrication, Supply, erraction and commissioning of vertical lift stoplogs gate elements (all interchangeable) consisting of skin plate, vertical and horizontal girders, stiffeners, lifting brackets, ballast blocks etc., with all accessories for barrage/dam vent including cost of all materials, machinery, labour,welding ,aligning finishing seal fixing etc.with al lleads and lifts, complete as per specifications and approved drawings.	41658.75	KG			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
45	Fabrication , Supply, erection and commissioning of embeded parts consisting of seal beam,slide track / roller track, side seal seats , top seal seats and guide path with all accessories for Head regulator vertical service gate / Emergency gate/ other vertical lift element of dams and barrages made of MS material consisting of angle , channel, beam, plate, flat, etc. conforming to IS : 2062 -2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machinaries , Manpower, Cutting, Aligning, Anchoring,Welding, Finishing, Consumables, Carriage and all overheads with all leads and lifts complete as per specification (without painting). Remarks: Cost for civil works to be taken from PWD (R) directorate seperatly.					
45.01	(i). Insert plate welded with J hook.	22646.03	KG			
45.02	(ii). Seal beam.	2756.36	KG			
45.03	(iii). Roller Track/ Slide Track/Side seal seat/ Guide Path/Top seal seat.	3971.32	KG			
46	Dismantling of damaged embeded part like guidechannel/bottom seal beam/top seal beam of gates of canal/river from civil structure as directed by the Engineer-incharge.The cost of man power employed for dismantling and hire charges of Tools and Plant, scaffolding charges etc. Payment will be made on actual length of Guide Channel.	1312.00	RM			
47	Fabrication, Supply, erection and commissioning of new fixed wheel type vertical lift Head regulator service gate/Emergency gate of Dams and Barrages as per IS: 4622 - 2003/Latest Revision consisting of skin plate, vertical and	9197.82	KG			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	horizontal girder, stiffener etc. made of MS material consisting of angle, channel, beam, plate, flat, etc. conforming to IS : 2062 -2011/latest revision manufactured as per approved drawing and direction including cost of Materials, Machineries, Manpower, Cutting, Aligning, drilling, Welding, Finishing, Consumables, Carriages and all overheads with all leads and lifts complete as per specification (without painting).					
48	Tick wood Sofa set best quality 3+2 sheter and table. For control room at office of EE, KMD, Khatra.	1.00	JOB			
49	Design, drawing, fabrication, supply, erection, testing and commissioning of automatic lifting beam with all accessories for handling, lowering and lifting of spillway stop log gate elements including cost of all materials, machinery, labour, cutting, aligning, welding, finishing, etc., complete as per specifications and drawings with all leads and lifts. (without painting).	3.80	TONNE			
ELECTRICAL PART						
50	Supplying of 415 V, TPN double door motor control center with canopy head in 14 SWG sheet steel enclosure (size 600mm x 500mm x 250mm deep) complete with control switch with HRC fuse L&T / Siemence make control block reversible starter unit with mechanical interlock, LED type Mikado make indicator lamp showing "Power On", "Hoist", "Lower", and "Trip" with 3 nos. push buttons with elements tripping mechanism with Sneider / Siemence Make overload relay, 2A capacity HRC type control fuse with 16-20A bakelite base, 0 to 30A range ammeter on the door cover with all electrical interconnection complete and fitting fixing the	12.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figur es	In Words	
	same on iron legs of pedestal stool at suitable position including S&F of terminal blocks for outgoing connection to motor and limit switches.					
51	Supply and fixing of finishing of the PVC insulated wire ends by socketing with pin/ring type copper sockets and insulated tapes etc. including supplying sockets, tapes.	72.00	JOB			
52	Supplying and fixing 240/415V MCB of Breaking capacity 10kA & C characteristics on din rail of existing DBs and necessary connection 6-32A, TP, L & T make.	42.00	JOB			
53	Supplying of insulated 4 sq.mm 'FR' stranded Copper Wire.	1200.00	MTR			
54	Supplying of insulated 2.5 sq.mm 'FR' stranded copper wire.	300.00	MTR			
55	Supplying and fitting fixing of Limit Switch with digital display unit of approved make including testing, commissioning the upper limit and lower limit functioning appropriately to complete the job at site up to satisfaction of E.I.C.	36.00	JOB			
56	Supply and fitting fixing of TATA G.C. Sheet including with all necessary 'J' hook, nuts, washer etc. to complete the job at site up to satisfaction of E.I.C.	12.00	JOB			
DG & ACCESSORIES						
57	Supplying & fixing sheet metal (16 SWG) Iron Clad Busbar chambers on angle iron frame on wall, incl. earthing attachment and painting as required – (As per Drawing no. 470 of PWD Specification Book – May 1991) 4 bar 415 v 200A, Dimension of Al bars [85mm long] 4 x 50x5mm, Dimension of sheet metal box-500x150mm	1.00	rate per mtr of complete chamber			
58	Supplying and fixing 415V, TPN SFU with sheet steel enclosure on flat iron/angle iron frame on wall with nuts bolts	1.00	NO.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	etc incl. S & F 3 nos. DIN type HRC fuse as per rating. 160A (make L & T)					
59	Supplying and fixing 415V, TPN on load front operated Changeover switch with Sheet Steel enclosure on angle iron frame on wall with nuts bolts etc , 200A , L&T make.	1.00	NO.			
60	SUPPLYING OF FOLLOWING XLPE INSULATED ALUMINUM CONDUCTOR ARMORED CABLES OF 1.1KV GRADE AS PER IS 7098 (PART 1) 1988 WITH UP TO DATE AMENDMENTS. 4 CORE 95 Sqmm.	100.00	MTR			
61	Laying of cable above 3½ core 90 sqmm and upto 3½ core 150 sqmm on wall/surface including S & F MS clams with earthing attachment in 2 x 10 SWG GI (Hot Dip) Wire, making hole etc. as necy., mending good damages and painting	100.00	RM			
62	Supplying & fixing medium gauge GI Pipe (ISI-Medium) Protection with necessary fittings and jointing materials as required f) 100 mm dia ISI Medium (Jindal Make)	40.00	MTR			
63	Supplying and fixing compression type gland complete with brassgland, brass ring & rubber ring for dust & moisture-proof entry ofXLPE/PVC armoured cables as below, For 4 core upto 95 sqmm.	7.00	EACH			
64	Finishing the end of following XLPE/PVC armoured cables bycrimping method incl. supplying and fixing solderless socket(Dowels make), tapes, anticorrosive paste & jointing materials, 3½ core 95 sqmm cable,	7.00	SET			
65	Excavation of soil for installation of Earth Electrode and filling & ramming. For morrum soil	13.68	M³			
66	Earthing with 50 mm dia GI pipe 3.64 mm thick x 3.04 Mts.	6.00	SET			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	long and 1 x 4 SWG GI (Hot Dip) wire (4 Mts. long), 13 mm dia x 80 mm long GI bolts, double nuts, double washers incl. S & F 15 mm dia GI pipe protection (1 Mts. long) to be filled with bitumen partly under the ground level and partly above ground level driven to an average depth of 3.65 Mts. below the ground level as below: (a) By TATA-Medium GI pipe					
67	Supplying & fixing earth busbar of galvanized (Hot Dip) MS flat 25 mm x 6 mm on wall having clearance of 6 mm from wall including providing drilled holes on the busbar complete with GI bolts, nuts, washers, spacing insulators etc. as required,	101.00	MTR			
68	Supply of OPR 60 (Make:- ABB).	2.00	EACH			
69	Supply of mounting Mast, 2m, 30mm dia, make ABB.	2.00	EACH			
70	Supply of mounting Mast, 3m with guywire and base plate , [Make:- ABB).	2.00	EACH			
71	Supply of lighting stroke counter, make ABB.	2.00	EACH			
72	Supply of Single core cable (either 70 sq. mm copper or 100 sq. mm aluminium) (inclusive of external UPVC pipe , clamp, elbows and accessories) / GI strip 25 x 6 size (inclusive of material, installtion, Epoxy paint, shorting link and fixing accessories like porcelaine insulator, Fastner, nut bolts, stay wire with nylon jacket).	300.00	RM			
73	Cost of ' Electronic type' Earth pit (inclusive of construction charge for each earth pit + Earth electrods' - pipe in pipe type -- + 1 bag (25 kgs bag) GRIC (ground resistance improvement	12.00	EACH			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	compound)-- + earth pit cover for each earth pit ,					
74	Cost of civil work for commissioning (charges including material),designing, supervision labour charges for installation of lighting arrestor labour charges for installation of cable of required length for installation , GI bar/ copper bar adequate size to make inspection joint) , materials charges for 2 nos. copper cable of 70 sqmm of required length for installtion , GI bar / copper bar of adequate size to make inspection joint , transportation for above entire work.	2.00	JOB			
75	SITC of KIRLOSKAR 100 KVA, 3 phase, CPCB - IV+ DG set with liquid cooled engine Model No: 4K1080ETA 4G1 & coupled with KG make Alternator with standard panel, Acoustic Enclosure & base frame.	1.00	JOB			
76	Installation, Testing & Commissioning of Computer along with Monitor, Router, Switch, firewall system and A3 color printer Monitor 27"model no- M27F , IPS, FHD , CPU - i-5, 8GB, 512SSD, Win-11, Pro. Pre-loaded make- HP commercial model no - 782NIPA . copir model no- IRC 3226 with DADF for control room At office of EE, KMD, Khatra.	1.00	JOB			
77	CAMERA & DISPLAY:					
77.01	PTZ Camera 2MP 100 to 120 MtriR (Make: Hikvision, Model no. DS-2DE4225IW-DE) (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	6.00	NOS.			
77.02	Fixed Bullet Camera 4 mp 50-60 MtriR (Make: Hikvision, Model No. DS-2CDIT43GO-I) (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	45.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
77.03	Sony LED-Ultrafine Smart monitor UHD 4K IPS Panel monitor(Make- Sony, model no. K-43S22M2). (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	2.00	NOS.			
78	STORAGE:					
78.01	Survialliance HDD 8 TB, Seagate.(Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	2.00	NOS.			
78.02	64 Channel NVR - 4 SATA (Make: Hikvision, Model- DS-7764NI-M4) (Rate approved by SE/SWM&EC)	1.00	NOS.			
79	NETWORKING ITEMS:					
79.01	ALCON WIS-EAP 520 ENTERPRISE ACCESS POINT (Model No.- WIS-EAP520 11AX1800MBPS Dual Band, Wifi 6). (Rate approved by SE/SWM&EC)	4.00	NOS.			
79.02	Alcon POE Injector for P2P (Rate approved by SE/SWM&EC)	4.00	NOS.			
79.03	TP-Link 24 Port POE Switch and 4 SFP (Make- TP-Link Model No.- TL-SL2428P 24 Port POE Switch) (Rate approved by SE/SWM&EC)	1.00	NOS.			
79.04	TP-Link 16 Port POE Switch and 2 SFP(Make- TP-Link, Model No.- TL-SG1218MPE). (Rate approved by SE/SWM&EC)	1.00	NOS.			
79.05	TP-Link 8 Port POE Switch and 2 SFP(Make- TP-Link, Model No.- TL-SG3210). (Rate approved by SE/SWM&EC)	9.00	NOS.			
79.06	Cisco 1G SFP Module (Make:- Cisco Model no.- GLC-LH-SM-20, Brand name- QSFPTK). (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	20.00	NOS.			
79.07	D'link RJ45 CONNECTOR. (Rate taken from Approved	2.00	BOX			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	shedule No-40 of 2024-25 of S.E, South West M & E Circle)					
80	CABLES:					
80.01	Digisol OFC Single Mode 6 Core. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	3000.00	MTR			
80.02	Polycab 3 Core 1.5 SQ. MM Cu Armored Power Cable. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	3000.00	NOS.			
80.03	D'link Cat6 UTP Cable 305 Mtr. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	8.00	BOX			
81	ONLINE UPS:					
81.01	3KVA Online UPS for Control Room with 1 Hour Backup (Make: BPE, Model No.- MF1103B8) (Rate approved by SE/SWM&EC)	1.00	NO			
81.02	1KVA Online UPS for control room with 1 Hours backup APC Make Model RC1000 VA with inbuild battery. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	5.00	NOS.			
82	ACCESSORIES:					
82.01	SS Rack 24U Floor Standing Rack 600 x 600 Full Loaded at CR. (Rate approved by SE/SWM&EC)	1.00	NO.			
82.02	Outdoor 4U Rack Pole Mount Full Loaded - (Make: Netrack/VAL/Schneider).(Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	8.00	NOS.			
82.03	Rack Indoor Wallmount Rack 6U Rack Full Loaded (Rate approved by SE/SWM&EC)	2.00	NOS.			
82.04	D'link Rackmount LIU 24 Port Full Loaded at LBMC Lodge(Make: D'Link, Model No.- NLU-FSDLLCR-24) (Rate approved by SE/SWM&EC)	1.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
82.05	D'link LIU full Loaded for Outdoor Pole 6 port (Make- D'Link, Model No.- SC SM). (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	8.00	NOS.			
82.06	ISI PVC Pipe 25mm with others accessories. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	2000.00	MTR			
82.07	HDPE Pipe 32mm with others accessories. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	2000.00	MTR			
82.08	Junction Box with 16A DP MCB (Make- Havells). (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	3.00	NOS.			
82.09	16A Power Solect for Outdoor Junction Box IP 55 outdoor enclosour make- C&S (Model No.- CG26400W). (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	8.00	NOS.			
82.10	Fixing of Camera with Pole Mount Bracket (Make- Bectro). (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	51.00	NOS.			
82.11	Galvanized Round Steel Triangle Guyed Steel Tower with Civil Foundation 24 mtr (Rate approved by SE/SWM&EC)	1.00	NO.			
82.12	Hexagonal Pole 6Mtr. And Civil Foundation at Control Room Site (Rate approved by SE/SWM&EC)	1.00	NO.			
83	WORKSTATIONS:					
83.01	Desktop spec: ci7@14gen, 16gb ram DDR5, 1 tb NVMessd, 22" LED, Keyboard, Mouse, Windows 11 prof, SMPS [gigabite SMPS make- GYGABYTE GP-P450B80, CABINET MAKE- ZEBRONIX ZIUM, MONITOR MAKE- SAMSUNG	6.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	22" IPS, (MODEL NO.- LS22C310EAWXXL), RAM MAKE-CRUCIAL (MODEL- CT16G 48C 40U5), PROCESSOR MAKE- INTEL CORE I7- 14700KLGA, NVME MAKE CROCIAL (MODEL- CT1000P3SSD8)] (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)					
84	CABLE LAYING AND SOCKETING:					
84.01	Undergrouond Digging through Soft Soil Cable Laying Charges. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	1000.00	MTR			
84.02	Undergrouond Digging through Hard Soil Cable Laying Charges. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	400.00	MTR			
84.03	Splicing Charges. (Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	400.00	NOS.			
84.04	Cat6 UTP, OFC & Power Cable Laying Charges.(Rate taken from Approved shedule No-40 of 2024-25 of S.E, South West M & E Circle)	7000.00	MTR			
85	OPERATION & MAINTENANCE:					
85.01	One Time SITC and 1st Year operation of CCTV Surveillance system installed at Mukutmonipur Dam Area including providing the broadband internet facilities for remote access. operation through skilled engineering manpower 01 nos./day x 365 days = 365 nos. + 30 nos./year on emergency basis. (Rate approved by SE/SWM&EC)	1.00	PER YEAR			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
85.02	Annual operation & maintenance for 2nd, 3rd, 4th & 5th year by providing a trained engineer, and Comprehensive warranty for CCTV Surveillance system along with accessories, installed at kangsabati dam Area. This includes replacement of materials & consumables as & when required, including the broadband internet facilities for remote access. Operation & maintenance through skilled engineering manpower 01 nos./day x 365 days = 365 nos. + 30 nos./year on emergency basis. (Rate approved by SE/SWM&EC)	4.00	PER YEAR			
CHARGE-MAN OFFICE WIRING						
86	Wiring in 1.1 KV grade single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) of following sizes in 25mm PVC casing-capping (Precision make) incl. necy. PVC clips, fittings etc.					
86.01	2 x 36/0.3 (2.5 sqmm) + 1 x 22/0.3 (1.5 sqmm)	100.00	RM			
86.02	2 x 56/0.3 (4 sqmm) + 1 x 22/0.3 (1.5 sqmm)	40.00	RM			
87	Distribution wiring in 1.1 KV grade 2x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in suitable size PVC casing-capping (Precision make) with 1x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire for ECC, incl. necy. PVC clips, fittings etc. to light/fan/call bell point with piano key type switch (Anchor make) fixed on sheet steel fabricated switch board with Perspex/bakelite top cover on wall incl. necy. connections and making earthing attachment and mending good damages to building works. [PVC casing-capping and Switch board both on surface]					

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
87.01	Average run 6 mtr	50.00	POINT			
88	Supply & Fixing 240 V, 3 nos. 6A, & 1 no. 20A plug socket with separate 3 nos. 6 A & 1 no. 20A Piano key type switch, indicator & 20A switch type SP MCB (Brand approved by EIC) on sheet metal switch board embedded in wall incl. S & F 240x200x 65mm MS (16SWG) switch board and bakelite/perspex top cover of 3mm thick by Brass screws after making housing for switch by cutting bakelite/ perspex cover and making necessary connections as required.	2.00	Each			
89	Supply & Fixing 240 V, 20A, plug socket with separate 20 A Piano key type switch (Brand approved by EIC) on sheet metal switch board embedded in wall incl. S & F 150x100x 65mm MS (16SWG) switch board and bakelite/perspex top cover of 3mm thick by Brass screws after making housing for switch by cutting bakelite/ perspex cover and making necessary connections as required	6.00	Each			
90	Supplying of approved make high speed ceiling fan (ISI marked) of following sizes having double ball bearing complete with standard down rod, canopy, hanging shackle, Aluminium blades, without regulator, A.C. 230-250 volts, 900mm/ 1050mm/ 1200mm, USHA(Striker) MAKE.	3.00	Each			
91	Fixing only ceiling/wall fan complete with blades, canopy, fork, rubber bush etc. incl. S&F connecting wire for down rod upto 30 cm incl. painting the rod with approved paint and making necessary connection as required by 2x1.5 sqmm flexible copper wire.	3.00	Each			
92	Supply & Fixing Socket type fan regulator (Step type) (Brand approved by EIC) on existing sheet metal switch board with	3.00	Each			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	bakelite/perspex top cover by screw after making housing for regulator knob by cutting bakelite/ perspex top cover incl. making necy. connections etc,					
93	Supply TMC501 Conventional industrial batten Philips LEDtube, model no : TMC 501 P 2xT-LED 22W P3242 with 2nos Mas LEDtube 1200mm 18W865 T8 I - 2100lm including necessary connection,	8.00	EACH			
94	Supplying of different types of LED lamps Havells make, NU Bulb Plus 9W 865 B22 3 Star	4.00	EACH			
95	Fixing only lamp	8.00	EACH			
96	Supplying of approved make exhaust fan heavy duty with mounting frame, blades AC 230-250. 150mm sweep RPM 90011400(6"), EPC/Crompton,	2.00	EACH			
97	Fixing only exhaust fan after making hole in wall and making good damages and smooth cement finish etc. as practicable as possible and providing necy. length of PVC insulated wire and making connection for exhaust of following diameter: 23 cm (9")	2.00	EACH			
98	Connecting the equipments to earth busbar including S & F GI (Hot Dip) wire of size as below on wall/floor with staples buried inside wall/floor as required and making connection to equipments with bolts, nuts, washers, cable lugs etc. as required and mending good damages,Solid GI wire	60.00	MTR			
99	SUPPLYING OF FOLLOWING XLPE INSULATED ALUMINUM CONDUCTOR ARMORED CABLES OF 1.1KV GRADE AS PER IS 7098 (PART 1) 1988 WITH UP TO DATE AMENDMENTS. 2 CORE 6 SQMM.	30.00	MTR			
100	Laying of cable upto 2 core 25 sqmm on wall/surface incl. S & F MS saddles with earthing attachment in 10 SWG GI (Hot	30.00	RM			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	Dip) Wire, making holes etc. as necy. mending good damages and painting					
101	Supplying and fixing compression type gland complete with brass gland, brass ring & rubber ring for dust & moisture-proof entry of XLPE/PVC armoured cables. For 2 core upto 6 sqmm	2.00	EACH			
102	Finishing the end of following XLPE/PVC armoured cables by crimping method incl. supplying and fixing solderless socket (Dowels make), tapes, anticorrosive paste & jointing materials, 2 core 06 sqmm cable	6.00	SET			
103	Supplying and fixing Sheet steel Main Switches on flat iron frame on wall, 240V DP with fuse on L&N 30/32 A,	1.00	EACH			
104	Supplying and fixing double-door SPN MCB Distribution Board with IP-42/43 protection, concealed in wall after cutting the wall & mending good the damages to original finish incl. Inter connection with suitable size of copper wire and neutral link & provision for earthing attachment.					
104.01	2+10 way, Seimens make.	1.00	EACH			
104.02	2+6 way, Seimens make.	1.00	EACH			
105	Distribution Wiring in 1.1 KV grade 2x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire (Brand approved by EIC) in suitable size PVC casing-capping (Precision make) with 1x22/0.3 (1.5 sqmm) single core stranded 'FR' PVC insulated & unsheathed copper wire for ECC, incl. necy. PVC clips, fittings etc. to 5A 3 pin flush type plug socket with piano key type switch (Anchor make) fixed on sheet steel fabricated CRC MS switch	18.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	board with bakelite/perspex (wall matching color) top cover of 3 mm thick flushed in wall by housing the board after cutting brick wall incl. necy. connection making earthing attachment, painting and mending good damages to building works [PVC casing-capping on surface and Switch board concealed] On Board.					
106	Supplying and fixing 240/415 V MCB Isolator on din rail of existing DBs and necessary connection, DP, 40 A, Seimens make.	2.00	EACH			
107	Supplying & Fixing GI Modular Switch Board of the 4 Module complete with three no. suitable size Copper bar with holes (for Ph, N & E) fixed on bakelite/Hard Rubber insulator over the MS welded chairs incl. top cover flushed in wall for housing the board after cutting the brick wall incl. making earthing attachment, painting and mending good damages to building works,	2.00	SET			
108	Supply of KSB single phase 1.5 HP Submersible pump set CORA 2C/18 CORA 100+LX PLUS.	1.00	NOS.			
109	Supply only 3 core 2.5 sqmm Flat pvc insulated copper cable (make poly cab or approved per satisfaction of EIC)	10.00	RM			
110	Supply and delivery of direct on line (DOL) strater panel board conforming to ISI 3947 and IEC 947 of suitable HP rating for operation in 230V (+10%) AC, single phase, 50HZ(+5yo) comprising of ammeter, voltmeter, thermal overload relay, 2 pole magnetic contactor, under voltage protection, indicating lamp, capacitors, on/off push buttons including 5 way connector, wiring with 1/1.5 sq.mm PVC insulated copper wire, powder coated vermin proof box of following capacities: 1.5 H.P. (Relay Range 9-14 Amp.)	1.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
111	Supply and Installation of Split type room air conditioning machine of following tonnage capacity 3 star rating filled with rotary crompressor and cooling capacity min. 6000 k cal/Hr., minimum discharge air flow 800cum mtr, 800EER (W/W) 2.7-2.89. (Rates are inclusive of extra refrigerant pipe drain pipe connecting cable) up to the satisfaction of the EIC. 1.5 Ton (Make : Hitachi) 3 star non-inverter type.	2.00	NOS.			
112	Supply & Fixing 240 V, 25 A, Modular type starter (Brand approved by EIC) with 25A Modular switch type DP MCB (CCurve) and 4 Module GI Modular type switch board with 4 Module top cover plate flushed in wall incl. S&F switch board and cover plate and making necy. connections with PVC Cu wire and earth continuity wire etc.	2.00	NOS.			
113	Supply & fitting fixing of V- Guard VND 400 Voltage Stabilizer for 1.5/2 Ton AC (150V-290V) with suitable arrangements as require .	2.00	NOS.			
114	Supplying and fixing Sheet steel Main Switches on flat iron frame on wall. 32A, 415V TPN with fuse on L&N (Standard)	11.00	NOS.			
115	Supplying and fixing Sheet steel Main Switches on flat iron frame on wall. 32A, 240V DP with fuse on L&N (Standard)	1.00	NOS.			
116	Supplying and fixing MCB SS enclosure with IP-20/30 protection, powder coated provision for two/four pole MCB, concealed in wall after cutting the wall & mending good the damages to original finish incl. painting, connection & provision for earthing attachment 2Way	11.00	NOS.			
117	Supplying of different types of LED lamps (12W) Make: Crompton, LED 12W - B22 - CDL.	35.00	NOS.			
118	Supply and fixing of EnduraLED Bulkhead Pressure Die cast housing LED bulkhead with IP66 Protection and IK09 impact	25.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	resistance suitable for surface and wall mounting applications on ceiling fitting on wall /ceiling by screws etc. Make ; Bajaj, 10W LED					
119	Supply of 3 pole power contactor type ML3, 40A current rating.	22.00	NOS.			
LBHR PANEL						
120	Supply, fixing, testing & commissioning wall/floor mounted LT panel primer coated with powder coated paint & provided with required gasket for dust/vermin proof with degree of protection IP42 suitable for 415Volt 3phase, 50 Hz, 4 wire system fabricated out of CRCA sheet up to 2 mm thick (1.6mm for doors) duly compartmentalized for incomer, bus section, outgoings, cable alleys & CT, PT Ampere , Volt , selector switches, frequency , phase indicating lamp, Energy complete including cost of busbar supports, detachable cable gland plates, 2 earthing terminals, internal wiring & fixing of separately supplied MCBs, MCCBs, ACB, panel mounted changeover switch/SFUs, etc. as required but excluding cost of busbar strips, Ampere , Volt , selector switch as per approved design & specification.	212.32	KG			
121	Supply of copper busbar for electrical power distribution.	51	KG			
122	Supply of moving iron type analog AC ammeter (accuracy class 1.5), model-SMI-96 of following range 0 to 200A	1.00	NOS.			
123	Supply of 0 to 600V range moving iron type analog AC voltmeter (accuracy class 1.5), model-SMI-96	1.00	NOS.			
124	Supply of ammeter selector switch Current in Each phase with OFF, 4 Pos. 90° angle of throw (OFF-R-Y-B).	1.00	NOS.			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
125	Supply of voltmeter selector switch Voltage between phases with OFF, 4 Pos. 90° angle of throw (OFF-RY-YB-BR).	1.00	NOS.			
126	Supply of voltmeter selector switch Voltage between phases with OFF, 4 Pos. 90° angle of throw (OFF-RY-YB-BR)	3.00	NOS.			
127	Supplying and fixing 240/415 V MCB of Breaking capacity 10kA & C characteristics on din rail of existing DBs and necessary connection. (Make Legrand)					
127.01	32A, TP	6.00	NOS.			
127.02	32A, DP	1.00	NOS.			
128	Supplying and fixing 415V, TPN SFU open execution in existing SS enclosure/cubical with nuts bolts etc incl. S & F 3 nos. DIN type HRC fuse as per rating. 160A, Siemens	1.00	NOS.			
129	SUPPLYING OF FOLLOWING XLPE INSULATED ALUMINUM CONDUCTOR UNARMORED CABLES OF 1.1KV GRADE AS PER IS 7098 (PART 1) 1988 WITH UP TO DATE AMENDMENTS. 1 CORE 35 SQ.MM	24.00	MTR			
DG FOUNDATION						
130	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. Depth of excavation not exceeding 1,500 mm.	88.24	M ³			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
131	Filling in foundation or plinth by fine sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity, Do - by fine sand.	29.66	M ³			
132	Supplying and laying Polythene Sheet (150gm / sq.m.) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches.	71.29	M ²			
133	Brick work with 1st class bricks in cement mortar (1:6). In foundation and plinth.	12.05	M ³			
134	Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work) With earth obtained by fresh excavation upto 1800 mm. depth (including the cost of excavation from land arranged by the Deptt. within a lead of 100 m.),	3.38	M ³			
135	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. For works in foundation and upto roof of ground floor/upto 4 m , (i) Tor steel/Mild Steel , I. SAIL/ TATA/RINL	0.15	MT			
136	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as	23.40	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface] With 1:4 cement mortar (a) 15 mm thick plaster					
137	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor), 25 mm to 30 mm thick wooden shuttering as per decision & direction of Engineer-In-Charge.	300.71	M ²			
Chargeman Office						
138	Dismantling all types of masonry excepting cement concrete plain or reinforced, stacking serviceable materials at site and removing rubbish as directed within a lead of 75 m.a) In ground floor including roof.	23.84	M ³			
139	Dismantling all types of plain cement concrete works, stacking serviceable materials at site and removing rubbish as directed within a lead of 75m.In ground floor including roof.(a) upto 150 mm. thick.	4.77	M ³			
140	Dismantling R.C. floor, roof, beams etc. including cutting rods and removing rubbish as directed within a lead of 75 m. including stacking of steel bars.(a) In ground floor including roof.	5.39	M ³			
141	Surface Dressing of the ground in any kind of soil including removing vegetation inequalities not exceeding 15 cm depth and disposal of the rubbish within a lead upto 75 m as	270.00	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	directed.					
142	Pre-Constructional Anti-termite measures: (a) Anti termite treatment to bottom surface (in case of masonry foundation and basements) and the sides (upto a height of 300 mm. from bottom) of the excavation trenches with chemical emulsion by admixing chloropyrofos emulsifiable concentrates (1% concentration) with water by weight at the rate of 5 Litres per sq. m. area. The work shall be carried out as per specification described in 6.2.1. of code IS-6313 (part -II) 1981. (Mode of measurment will be the plan area of foundation treated.)	55.08	M ²			
143	Pre-Constructional Anti-termite measures: (b) Anti termite treatment to back filling of the masonry foundation with chemical emulsion by admixing chloropyrofos emulsifiable concentrates (1% concentration) with water by weight at the rate of 7.5 Litres per sq. m. of the vertical surface of the substructure for each side of the foundation.. The work shall be carried out as per specification described in 6.2.2. of code IS-6313 (part -II) 1981. (Mode of measurment will be vertical area treated.)	82.08	M ²			
144	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	49.10	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
145	Providing and laying Design Mix concrete for plain /reinforced concrete work in any part of bridge (excluding bottom plugging) with coarse aggregates of appropriate nominal size and grading, fine aggregate (sand) conforming to proper grading zone, both of approved quality and cement, as necessary, including labour, cost and carriage of all materials and including preparation of design mix, approval of the same by the Engineer-in-Charge and cost for quality control,sampling, testing etc. all complete but excluding cost of labour and materials for formwork & reinforcement works. a) M-15 Grade Using concrete mixer. Aggregate source- Bankura railway stackyard (58 Km).	23.82	M ³			
146	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) c) (i) With carried earth arranged by the contractor within a radius of 1 km. including cost of carried earth	1.018	M ³			
147	Pre-Constructional Anti-termite measures: (c) Anti termite treatment to the top surface of the consolidated earth within plinth walls with chemical emulsion by admixing chloropyrofos emulsifiable concentrates (1% concentration) with water by weight at the rate of 5 Litres per sq. m. of the surface before sand bed or sub-grade is laid. Holes upto 50 mm. to 75 mm. deep at 150 mm. centre to centre both ways shall be made with 12 mm, diameter mild steel rod on the surface to facilitate saturation of the soil with the chemical emulsion. The work shall be carried out as per specification	41.39	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	described in para 6.4 of code IS- 6313 (part -II) 1981. (Mode of measurment will be per Sq.m of plan area of plinth treated.)					
148	Controlled Cement concrete with well graded stone chips (20 mm graded nominal size) excluding shuttering and reinforcement with complete design of concrete as per IS : 456 and relevant special publications, submission of job mix formula after preliminary mix design after testing of concrete cubes as per direction of Engineer-in charge. Consumption of cement will not be less than 300 Kg of cement with Super plasticiser per cubic meter of controlled concrete but actual consumption will be determined on the basis of preliminary test and job mix foomula. In ground floor and foundation.[using concrete mixture]M 20 Grade (i) Pakur Varity Aggregate source- Bankura railway stackyard (58 Km)	34.81	M ³			
149	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. (a) For works in foundation and upto roof of ground floor/upto 4 m, ILJSW/JSPL/SHYAM/SRMB/BMASL/ELECROSTEEL/SSL	4.92	MT			
150	(b) Applying 2 coats of Non-Toxic Acrylic Polymer modified Paint having adhesive & waterproofing properties by mixing in proportion (1 liquid: 4 cementitious material) or as per manufacturer's specification for water proofing layer in	52.06	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	water tank etc. (No Departmental Cement is required),					
151	Brick work with 1st class bricks in cement mortar (1:6) (b) In superstructure, ground floor,	27.50	M ³			
152	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor). [Excluding cost of chipping over concrete surface] ii) With 1:4 cement mortar,					
152.01	a) 20 mm thick plaster	136.12	M ²			
152.02	b) 15 mm thick plaster	162.50	M ²			
152.03	c) 10 mm thick plaster	44.67	M ²			
153	Rendering the Surface of walls and ceiling with White Cement base WATER PROOF wall putty of approved make & brand. (1.5 mm thick),	169.23	M ²			
154	Applying Interior grade Acrylic Primer of approved quality and brand on plastered or concrete surface old or new surface to receive Distemper/ Acrylic emulsion paint including scraping and preparing the surface thoroughly, complete as per manufacturer's specification and as per direction of the EIC. (In Ground Floor) (b) Two Coats, i) Water based interior grade Acrylic Primer,	1.635	%M ²			
155	Applying Acrylic Emulsion Paint of approved make and brand on walls and ceiling including sand papering in intermediate coats including putty (to be done under specific instruction of Superintending Engineer) : (Two coats) ii) Luxury Quality.	169.23	M ²			
156	Artificial stone in floor, dado, staircase etc with cement					

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	concrete (1:2:4) with stone chips, laid in panels as directed with topping made with ordinary or white cement (as necessary) and marble dust in proportion (1:2) including smooth finishing and rounding off corners including raking out joints or roughening of concrete surface and application of cement slurry before flooring works using cement @ 1.75 kg/sq.m all complete including all materials and labour. In ground floor.3 mm. thick topping (High polishing grinding on this item is not permitted with ordinary cement). Using grey cement (iii) 35 mm. thick.	32.40	M ²			
157	Supplying and laying true to line and level vitrified tiles of approved brand (size not less than 600 mm X 600 mm X 10mm thick) in floor, skirting etc. set in 20 mm sand cement mortar (1:4) and 2 mm thick cement slurry back side of tiles using cement @ 2.91Kg./sqM or using polymerised adhesive (6 mm thick layer applied directly over finished artificial stone floor/Mosaic etc without any backing course) laid after application slurry using 1.75 Kg of cement per sqM below mortar only, joints grouted with admixture of white cement and colouring pigment to match with colour of tiles / epoxy grout materials of approved make as directed and removal of wax coating of top surface of tiles with warm water and polishing the tiles using soft and dry cloth upto mirror finish complete including the cost of materials, labour and all other incidental charges complete true to the manufacturer's specification and direction of Engineer-in-Charge. (White cement, synthetic adhesive and grout material to be supplied by the contrr[e] I(I) With application slurry @1.75 kg/ Sq.m, 20 mm sand cement mortar (1:4) & 2 mm thick cement slurry	14.51	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	at back side of tiles, 0.2 kg/ Sq.m white cement for joint filling with pigment. B) Light Colour,					
158	Wood work in door and window frame fitted and fixed in position complete including a protective coat of painting at the contact surface of the frame excluding cost of concrete, Iron Butt Hinges and M.S clamps. (The quantum should be corrected upto three decimals).d) Sal : Local.	0.45	M ³			
159	Panel shutters of door and window, as per design (each panel consisting of single plank without joint), including fitting and fixing the same in position but excluding the cost of hinge and other fittings. In ground floor. (iv) 25mm thick shutters with 12mm thick panel of size 30 to 45 cm. (c)other Local wood.	18.69	M ²			
160	M.S.or W.I. Ornamental grill of approved design joints continuously welded with M.S, W.I. Flats and bars of windows, railing etc. fitted and fixed with necessary screws and lugs in ground floor.(i) Grill weighing above 10 Kg./sq.mtr and up to 16 Kg./sq. mtr.	1.68	Qty			
161	Applying Exterior grade Acrylic primer of approved quality and brand on plastered or concrete surface old or new surface to receive decorative textured (matt finish) or smooth finish acrylic exterior emulsion paint including scraping and preparing the surface thoroughly, complete as per manufacturer's specification and as per direction of the EIC. (b) Two Coats,	1.36	%M ²			
162	Protective and Decorative Acrylic exterior emulsion paint of approved quality, as per manufacturer's specification and as per direction of Engineer-in-Charge to be applied over acrylic primer as required. The rate includes cost of material, labour,	136.12	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	scaffolding and all incidental charges but excluding the cost of primer. a) Normal Acrylic Emulsion					
163	b) Priming one coat on timber or plastered surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	59.90	M ³			
164	(a) Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	17.28	M ²			
165	(A) Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary : (a) On timber or plastered surface : With other than hi-gloss of approved quality- (iv) Two coats (with any shade except white),	59.90	M ²			
166	(A) Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary : b) On steel or other metal surface : With other than hi-gloss of approved quality- (iv) Two coats (with any shade except white),	17.28	M ²			
167	Supplying, fitting and fixing M.S. clamps for door and window frame made of flat bent bar, end bifurcated with necessary screws etc. by cement concrete(1:2:4) as per direction. (Cost of concrete will be paid separately) (b) 40mm X 6mm, 200mm Length,	24.00	EACH			
168	Iron butt hinges of approved quality fitted and fixed with steel screws, with ISI mark.(vi) 100mm. X 50mm. X 1.25mm.	24.00	EACH			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
169	Anodisedaluminium Aldrop / Sliding bolts of approved quality manufactured from extruded section conforming to I.S. specification (I.S. 2681/66) fitted and fixed complete.(i) 250mm x 16mm dia bolt.	4.00	EACH			
170	Anodisedaluminium barrel / tower / socket bolt (full covered) of approved manufactured from extruded section conforming to I.S. 204/74 fitted and fixed with cadmium plated screws:(iv) 150mm long x 10mm dia. bolt.	24.00	EACH			
171	Supplying, fitting and fixing steel rolling shutter profile type with 18 B.G . of approved type steel latch section 75mm wide, fitted with coil wire spring to necessitate the fitting of required Nos. of C.I. Pulleys on heavy type solid drawn seamless steel tube complete with locking arrangements both inside and outside specially builtup side guide channels including providing a hood for the steel rolling shutter in the room, painting two coats of approved aluminium paint over a coat of red lead primer complete.	4.32	M ²			
172	Supplying, fitting and fixing G.I. pipes of TATA make with all necessary accessories, specials viz. socket, bend, tee, union, cross, elbo, nipple, longscrow, reducing socket, reducing tee, short piece etc. fitted with holder bats clamps, including cutting pipes, making threads, fitting, fixing etc. complete in all respect including cost of all necessary fittings as required, jointing materials and two coats of painting with approved paint in any position above ground. (Payment will be made on the centre line measurements of total pipe line including all specials. No separate payment will be made for accesories, specials. Payment for painting will be made seperately) (A) For Exposed					

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	Work,					
172.01	15 mm dia. medium quality	15.00	MTR			
172.02	20 mm dia. medium quality	15.00	MTR			
173	25 mm. thick damp proof with cement concrete (1:1.5:3) (with graded stone aggregate 10 mm. normal size) and painting the top surface with a coat of bitumen [VG.40] using 1.7 kg. persq.m. including heating the bitumen and cost and carriage of all materials complete. [Bitument to be supplied by the Agency]	10.89	M ²			
STOP LOG BAY						
174	Excavation for Structures. Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, removing, spreading or stacking of spoils within a lead of 150 m. as directed and including trimming the sides of the trenches, leveling, dressing and ramming the bottom, and backfilling with approved material complete as per direction of the Engineer-in-Charge. I. In all sorts of soil excluding marshy soil & rocks (soft or hard) by manual means..					
174.01	a) upto 3 m depth..... iv) Without pumping out water and shoring (Backfilling to be duly consolidated / tamped)	233.00	M ³			
174.02	b) 3 m to 6 m depth..... iv) Without pumping out water and shoring (Backfilling to be duly consolidated / tamped)	143.00	M ³			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
175	Supplying, fitting and placing HYSD bar reinforcement in Sub-structure including initial straightening, straightening of coils bars, removal of loose rust (if any), cutting to requisite length bending, binding with annealed wire not less than 1 mm in size and conforming to IS 280 at every intersection hooked and bent to correct shape and placed on forms etc. including cost of black annealed wire and cost of loading, unloading, carriage of all steel materials complete as per drawing and technical specifications and direction of Engineer-in-charge . (Steel Source- Durgapur , Distance-104 Km),	12.00	MT			
176	Turfing with chorkata or durba grass sods 5 cm. to 8 cm. thick in slope, crest berm etc. of embankments, canals and drainage channels etc. within a lead of 150 metre and all lifts including fine dressing, watering, ramming, guarding etc. complete. (sods will have to be arranged by the contractor at his own cost. Payment to be made on the grown grass only). USoR 2018, IWD page no- C-6 Item no- 1.28	45000.00	M ²			
177	Overhead Signs (only sheet to be placed over existing frame) Providing and erecting overhead signs with a corrosion resistant 2mm thick aluminium alloy sheet reflectorized with high intensity retro-reflective sheeting of encapsulated lens type with vertical and lateral clearance given in clause 802.2 and 802.3 and installed as per clause 802.6 over a designed support system of aluminium alloy or galvanised steel trestles and trusses of sections and type as per structural design requirements and approved plans (Reference to MORT&H's specification 802). P.W.D. Schedule Road & Bridge Works 2018 page no- 274 Item no-8.22	42.00	M ²			

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	b) Aluminium Alloy Plate for Over Head Sign					
178	Supplying, fitting and fixing Stainless Steel railing consist of 38mm dia and 900mm height vertical balustrade at every two alternative steps, 50mm dia top rail, 3 (three) nos 19mm dia horizontal Strainless steel pipe and base/cover plate with StrainlessSteelGRADE 304 containing 7.5% nickle (Interior Grade) Brushed/Matfinish, complete as per direction of the Engineer-in-charge. Weight of Strainless Steel railing per metre 6.5 Kg (approx).	200.00	Mtr.			
179	M.S. structural works with hollow sections (square or rectangular shape) conforming to IS: 806-1968 & IS:1161-1998) connected to one another with bracket, gusset, cleat as per design, drawing & direction of Engineer-in-Charge complete including cutting to requisite shape & size, fabrication including metal arc welding conforming to IS: 816-1969 & IS: 9595 using electrodes of approved make and brand conforming to IS:814- 2004, haulage, hoisting and erection all complete. The rate includes the cost of all M.S. Hollow section, all consumables such as electrodes, gas and hire charges of all tools and plants and labourrequired for execution and all incidental chages (such as electricity, labour insurance) etc. complete. Payment to be made on the basis of calculated weight of structural memebtrs of MS Holow Section as specified in relevent IS code in finished work. Payment for gusset, bracket, cleat may be made by adding the actual weight of such items with weight of finished structural members. The rates are considered for a hight of erection 8 m. / 2nd floor level from the ground. Add 1.5 % extra over					

SL. No.	Item Description	Quantity	Unit	Rate		Amount
				In Figures	In Words	
	the rate for each additional floor or 4m. beyond the initial 8 m. or part thereof.					
179.01	i) For roof truss works c) Span beyond 20 Mtr and up to 30 Mtr	11.25	M.T.			
180	Supplying, fitting & fixing Industrial Troughed Aluminium sheet (excluding the supporting frame work) of approved make & brand in alloy 3105 conforming to IS: 1254-1991 fitted and fixed with 75 mm & 25 mm Self tapping screw , EPDM Washer 16 mm dia& 3 mm th washer etc complete with 150 mm. end lap and one corrugation minimum side lap. (Payment to be made on area of finished work) (Aluminium sheet to be supplied by contractor). b) With 0.71 mm thick sheet.	250.00	M ²			

Note:

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 (refer: ITB Clause 14.2 and GCC Clause 45.4).
2. Unit rates and prices shall be quoted by the bidder in Indian Rupees (refer: ITB Clause 14.1 and ITB Clause 15.1).
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 (refer: ITB Clause 36). [Note: delete this point if the e-procurement system automatically calculates the total from the unit rate and quantity]
4. Where there is a discrepancy between the rate in figures and words, the rates in words will govern (refer: ITB Clause 36). [Note: delete this point if the e-procurement system automatically populates the amount in words from the amount in figures]

Section V - Eligible Countries

Eligibility for the Provision of Goods, Works and Non-consulting Services in Bank-Financed Procurement

In reference to ITB 4.8, 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 4.8(a) and 5.1 : *None*

Under ITB 4.8(b) and 5.1 : *None*

[Note: as and when some country/ countries become ineligible insert the list of such countries following approval by the Bank to apply the restriction]

Section VI –Fraud and Corruption

(Section VI shall not be modified)

1. Purpose

1.1 The Bank’s Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders(applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

2.2 To this end, 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;
- ii. “fraudulent practice” is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;
- 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;
- 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;
- v. “obstructive practice” is:
 - (a) 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
 - (b) acts intended to materially impede the exercise of the Bank’s inspection and audit rights provided for under paragraph 2.2 e. below.

- b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, 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. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank 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 process, selection and/or execution 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. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;¹ (ii) to be a nominated² sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;
- e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders (applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents personnel, permit the Bank to inspect³ all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

¹ For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

² A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has 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.

³ Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

PART 2 – Works' Requirements

Section VII–Works’ Requirements

SCOPE OF WORK

The Irrigation & waterways Department has participated in World Bank funded project namely DRIP (Dam Rehabilitation & Improvement Project) taking concurrence from the State Finance Department for rehabilitation of 16 structures. Kangsabati Dam is one of the most important structures among them.

The New Project i.e., DRIP, Phase-II and Phase-III is a World Bank assisted Scheme of the Central Government. There is no Central Grant in this Project and the funding arrangement is back-to-back reimbursement. The funding pattern, applicable for West Bengal, considering it as a General Category State, is 70:30 (World Bank: State Share)

The State Finance Department accorded in-principal approval in July-2019 on participating in World Bank funded Project DRIP-II for rehabilitation of Kangsabati Dam including distressed Right Bank Main Canal Head Regulator Structure, Left Bank Main Canal Head Regulator Structure and allied structures and intends to apply part of the proceeds toward eligible payments under the contract for Rehabilitation & Improvement of works as detailed below:

“Rehabilitation of gates & emergency gate and its hoisting system including all electrical works and CCTV surveillance system of Kangsabati-Kumari Dam in Block- Khatra & Indpur of Bankura district in West Bengal under the World Bank assisted scheme Dam Rehabilitation and Improvement Project, Phase-II (DRIP-II).”

2.0 PROJECT BACKGROUND

The Project consists of a reservoir in the upper valley of the river Kangsabati and Kumari around 2.0 km upstream of their confluence by construction of a dam at Mukutmanipur in Bankura district, canals of both banks taking off directly from the dam through supply sluices housed in it and three pickup barrages across the river Silabati, Bhairab-Banki and Tarafeni to incorporate their supplies also in this scheme and to serve as level crossing of the Main Canals. Flood control is also one of the major objectives of this scheme. Although it has not been proposed to impound all the discharges of the maximum flood that is ever likely to occur, it is proposed to tackle all high floods by absorbing a portion of its discharge in the reservoir where a about 2 lakh Acre-ft storage capacity is reserved for this purpose and this is maintained between 6th June to 16th October.

Kangsabati – Kumari Dam is situated in the district of Bankura, in West Bengal having semi-arid climate. Acute crisis of irrigation water even drinking water in dry period of April-May, had led to initiation of this project in the middle of 20th century and finally the project started its operation in the year of 1965. This project was constructed during the period 1957 to 1965 and along with its three pick-up barrages i.e., Tarafeni, Bhairab-Banki and Silabati were taken up for

feeding irrigation water in a large area of 340.93 thousand ha in the district of Bankura, Paschim Medinipur and partially in the district of Hooghly.

Kangsabati Kumari Dam is located over rivers Kangsabati & Kumari around 2.0 km upstream of their original confluence point at Gorabari Ambikanagar, Mukutmanipur, Bankura, West Bengal. Total length of Dam, embankment and spillway is 11.30 km. It is having spillway with 11 nos. of bays of 9.144 m (30 ft) width each and two canal head regulators namely Left Bank Feeder Canal Head Regulator and Right Bank Canal Head Regulator.

The Left Bank Feeder Canal bifurcates after 9.9 Kms into branches namely, i) Khatra Main Canal Upper and ii) Supur Main Canal. This Supur Main Canal outfalls into river Silabati at Silabati (Kadamdeuli) Barrage and continues further to provide irrigation in the command on the left bank. Khatra Main Canal upper, after few kilometers, renamed as Khatra Main Canal Lower and again bifurcated at Metala to rename as Garbeta Branch Canal and Medinipur Branch Canal respectively.

Capacity of spillway is 6371.29 Cumec (225000 Cusec) with respect to a design flood of 10619 Cumec (375000 Cusec) and a flood space of 24669.68 Ha-m (2.0 lakh acre-ft). Individual size of spillway gate is 9.144 m x 10.058 m (h) (30' x 33' (h)). Capacity of Left Bank head regulator is 181.23 Cumec (6400 Cusec) and Right Bank Head Regulator is 2500 cusec.

The Right Bank Main Canal (RBMC) first outfalls into Bhairab-Banki Barrage on Bhairab-Banki River from where the Bhairab-Banki-Tarafeni Main Canal (BTMC) originates. This canal outfall into Tarafeni Barrage over river Tarafeni. Again, from Tarafeni Barrage a canal named Tarafeni South Main Canal (TSMC) originates to continue further for providing water in the command.

As preparatory activity a SPMU (State Project Monitoring Unit) and DSRP (Dam Safety Review Panel) have been formed for examine each dam & furnish a proposal for rehabilitation.

The DSRP members have been carrying out their activity since July, 2019 by undertaking site visits at Dams and barrages in different locations in the state for preparing DSRP report & submitting to the CWC for funding. The identification of rehabilitation works have been find out for the structure of Kangsabati Dam.

3.0 PROJECT LOCATION / ADDRESS / AREA

The overall Project area considering both irrigation and flood management aspects is as follows: Kangsabati Dam is a Gravity Type Dam is located at 22°57'49.92" N, 86°47'21.30" E, Mukutmanipur, Khatra in the district of Bankura.

The Mukutmanipur Spillway is provided with 11 (eleven) numbers of radial gates, each having a horizontal width of 9.144 m, radial height of 11.33 m, and vertical height of 10.058 m.”

Right Bank head regulator structure offtaking Right bank canal from Kangsabati Dam has 6 Nos. vertical gates of size 1.65 m x 3 m located at Block & PS- Ranibandh, District- Bankura.

Left Bank head regulator structure offtaking left bank canal from Kangsabati Dam has 3 Nos. radial gates of size horizontal width of 3.05 m, radial height of 5.2 m, located at Block & PS- Khatra, District- Bankura.

4.0 PROJECT OBJECTIVES

DRIP consists of three components, namely (i) Rehabilitation and Improvement of Dam and Associated Appurtenances; (ii) Dam Safety Institutional Strengthening and (iii) Project management. The project development objective is to improve the safety and operational performance of selected existing dams in the territory of the participating states. It is expected that especially the institutional development activities will lead to an improvement in the system-wide management approach to all dams in the participating states, over and above the focus on the selected dams covered by the project. The DRIP project activities will focus not only on the rehabilitation and improvement of dam structures, but will also address shortcomings in instrumentation, maintenance and provide for improvements in operation of the dams. This will in turn help to keep dams safe, respond to changing water demands, and keep the downstream population safe from floods. DRIP will include investments targeted towards: (i) physical and technical dam rehabilitation and improvement; and (ii) managerial upgrading of dam operation and maintenance, with accompanying institutional reforms and strengthening of regulatory measures pertaining to safe and financially-sustainable dam operations.

DRIP will aim at assuring the full reservoir capacity of project dams, achieving effective utilization of the stored water, and managing and monitoring the long-term performance of the dams

In view of above constituted technical committee members under the DSRP (Dam Safety Review Panel) & WAPCOS (Water and Power Consultancy Services) Ltd. have visited the DAM and its LBHR & RBHR structure, several times & recommended numerous remedial measures. Such workshare to be carried out keeping the water level at upstream near to its pond level to ensure cattle feeding, and Municipal supplies.

This tender is issued as part of the process of rehabilitation of distressed structures and upgrading or installing the dam safety monitoring systems installed on dams which covers most of the recommendations of WAPCOS & DSRP, thereby addressing the project objective of improving the safety and operational performance of Kangsabati dam and its allied Silabati barrages all in a sustainable manner.

5.0 KEY ACTIVITIES UNDER THE CONTRACT

The rehabilitation of Kangsabati-Kumari dam will include comprehensive civil, mechanical, and electrical works to enhance the safety, operational efficiency, and longevity of the structure. The proposed key activities are based on the recommendations of the Dam Safety Review Panel (DSRP) and WAPCOS Ltd. taken in this project is as follows:

A. Civil works

1. Repair of Spillway railing, Construction roof truss at Kangsabati Bunglow:

- i) Turfing with charkhola or durba grass sods at both side of dam toe inspection road for protection of road embankment from erosion.
- ii) Construction of roof truss over Kangsabati Bhawan for protection roof from weather effect.
- iii) Installation of spillway railing at Spillway parapet wall for the purpose of safety of visitors.

2. Dismantling of old Charge-man office and construction of new Charge-man office:

An additional stoplog bay was suggested by CWC during their site visit. For construction of that arrangement old chargeman office of mechanical wing will be dismantled & new chargeman office has to be constructed.

3. Construction of civil part of new stoplog bay of spillway emergency gate.

B. Mechanical Works

- i. Although the spillway gates are around 50 years old and, as per normal practice, gates are to be replaced after 40 years of service, the gates are still in operation. As per the recommendation of the DSRP, a health check-up of all 11 (eleven) spillway gates was carried out by the Central Mechanical Engineering Research Institute (CMERI). Based on the report submitted by CMERI, major repair works for all 11 (eleven) spillway radial gates have been considered in this estimate for strengthening of the gate shutters and other associated components, including anti-rust painting of all hydro-mechanical structures.

- ii. Replacement of 03 (three) nos. Left Bank Head Regulator radial gates, including emergency gates, has been considered, as these gates have been severely damaged due to prolonged service life.
- iii. Provision has been made for the construction of a cross-bundh made of MS structure of size 12 ft (H) × 17 ft (W) for renovation of the emergency gate of the Left Bank Head Regulator.
- iv. Renovation/reconstruction of embedded parts of the spillway and Left Bank Head Regulator, including emergency gates, has been considered.
- v. Replacement of side and bottom rubber seals of the spillway and Left Bank Canal Head Regulator radial gates has been considered.
- vi. Maintenance/replacement of the hoisting arrangement of the spillway and Left Bank Canal Head Regulator radial gates including plummer blocks, rope drums, trunnions, bearings, shafts, pins, wire ropes, and chains, has been considered.
- vii. Provision has been made for replacement of the emergency gate for the spillway, as the existing emergency gate has a height of only 5.0 m, which covers only half of the main spillway gate height and is insufficient to block the full dam opening during gate maintenance. To address this, 05 (five) nos. stoplog gates of size 2.10 m (H) × 9.60 m (W) have been proposed.
- viii. Construction of first-stage and second-stage embedded parts in the guide path of stoplog gates has been considered. Design supply and erection/installation of embedded parts is required in all eleven bays by specialized contractor who has experience of installation of hilti anchors and to be vetted by the Department before execution.
- ix. General arrangement drawing of stoplog units is enclosed for ready reference. Final execution drawing will be submitted by the working Agency and to be vetted by the Department before execution.

C. Electro-Mechanical Works

- i. Provision for an electrically operated 25-ton capacity crane, including rails, girders, and lifting beam, has been incorporated by replacing the existing manual trolley, as manual operation requires excessive time for placement of stoplog gates of spillway into their grooves. The design of the Gantry crane, lifting beam, girders, rails is in the scope of the Contractor.

- ii. Installation of a 100 kVA DG set to provide backup power for gate operation, approach lighting, and staff facilities has been considered.
- iii. Provision has been made for modification of electrically operated trolleys instead of manually operated trolleys to speed up the movement of emergency gates for the Right and Left Bank Regulator gates.
- iv. Replacement of corroded electrical components, motor starters, and panels has been considered.
- v. Providing new electrical wiring at newly constructed chageman office and control room has been considered.
- vi. Installation of lightning arresters to protect all electrical equipment has been considered, as the area falls under a high lightning zone.

D. CCTV Surveillance

- i. Installation of 06 (six) PTZ cameras and 45 (forty-five) fixed bullet cameras for real-time surveillance.
- ii. Setup of a networked monitoring system with remote access
- iii. Provision for broadband internet for continuous operation.
- iv. “Provision for 5 (five) years of annual operation and maintenance, including deployment of a trained engineer, along with a comprehensive warranty for the CCTV surveillance system and its accessories installed at the Kangsabati Dam area, has been considered.”

E. Expected Outcomes

- i. Enhanced safety and operational efficiency of the kangsabati kumari dam
- ii. Reliable water distribution for agricultural use.
- iii. Improved flood management capacity.
- iv. Strengthened infrastructure for long-term performance.

6.0 ACCESSIBILITY:

Site is accessible by Pucca and Kachha Road from Bankura Railway Station

Specifications

A set of precise and clear Specifications is a prerequisite for Bidders to respond realistically and competitively to the requirements of the Employer without qualifying or conditioning their bids. The Specifications must be drafted to permit the widest possible competition and, at the same time, present a clear statement of the required standards of workmanship, materials, and performance of the goods and services to be procured. Only if this is done shall the objectives of economy, efficiency, and fairness in procurement be realized, responsiveness of Bids be ensured, and the subsequent task of Bid evaluation facilitated. The Specifications should require that all goods and materials to be incorporated in the Works be new, unused, of the most recent or current models, and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

Samples of Specifications from previous similar projects in India are useful in to prepare Specifications. The use of metric units is encouraged by the World Bank. Most Specifications are normally written specially by the Employer or Project Manager to suit the Contract Works in hand. There is no standard set of Specifications for universal application in all sectors, but there are established principles and practices, which are reflected in these documents.

There are considerable advantages in standardizing General Specifications for repetitive Works in recognized public sectors, such as highways, ports, railways, urban housing, irrigation, and water supply, in the same country or region where similar conditions prevail. The General Specifications should cover all classes of workmanship, materials, and equipment commonly involved in construction, although not necessarily to be used in a particular Works Contract. Deletions or addendums should then adapt the General Specifications to apply them to the particular Works.

Care must be taken in drafting Specifications to ensure that they are not restrictive. In the Specifications of standards for goods, materials, and workmanship, recognized Indian standards should be used as much as possible. Where other particular standards are used, the Specifications should state that goods, materials, and workmanship that meet other authoritative standards, and which ensure substantially equal or higher quality than the standards mentioned, shall also be acceptable. To that effect, the following sample clause maybe inserted in the Particular Conditions or Specifications.

“Equivalency of Standards and Codes

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes do not relate to Indian Standards, other authoritative standards that ensure a substantially equal or higher quality than the standards and codes specified shall be accepted subject to the Project Manager's prior review and written consent. Differences between the standards specified and

the proposed alternative standards shall be fully described in writing by the Contractor and submitted to the Project Manager at least 28 days prior to the date when the Contractor desires the Project Manager's consent. In the event the Project Manager determines that such proposed deviations do not ensure substantially equal or higher quality, the Contractor shall comply with the standards specified in the documents."

*The method of measurement of completed work for payment shall be in accordance with **insert the name of a standard reference guide, or full details of the methods to be used so that the bidder can take note of that while quoting prices**.¹*

[These Notes for Preparing Specifications are intended only as information for the Employer or the person drafting the bidding document. They should not be included in the final documents]

¹ The method of measurement should be spelled out precisely in the Preamble to the Bill of Quantities, describing for example the allowances (if any) for timbering in excavation, etc. Many national standard reference guides have been prepared on the subject, and one such guide is the *Standard Method of Measurement* of the U.K. Institution of Civil Engineers.

Specifications

The Works shall be executed in accordance with these Specifications which comprises the following Sections:

- I. **Section A -** General Specifications
- II. **Section B -** Technical Specifications
- III. **Section C-** ESHS i.e.Environmental, Social (including Sexual Exploitation and abuse (SEA) and Gender Based Violence (GBV)), Health and Safety

I. SECTION A–GENERAL SPECIFICATIONS

A-1.1: Mobilisation of Contractor

After signing of agreement, the contractor shall complete the following actions in priority basis as directed by Engineer in Charge.

1. Establish his office in complete manner including installing Telephone and Fax.
2. The contractor shall furnish, in advance, a detailed Work programme containing all activities upto the completion of Works. Supporting resources schedule shall also be submitted.
3. Complete construction, installation and commissioning of “Field Laboratory” including all the tests and test apparatus provided in para 5.
4. Mobilize all required Key Staff, Technicians, Labourers.
5. Mobilize all required equipment/ machinery including commissioning and trial run of all the Plant/ Machinery. Some of the major plants/ equipment to be mobilized are listed in Page 53 & 54 in Section-3.
6. Complete the identification of Quarries and quality of available material.
7. Complete the crushing of Aggregates required for the Section of work taken initially.

A-1.2: Quality Control

The Contractor shall ensure that all the actions are taken to build in Quality Assurance (QA) in the planning, management and execution of works. The QA shall cover all stages of work such as setting out of works, selection of material, selection of method of works, selection of plant and equipment, deployment of staffs, quality control testing. The QA program shall cover as per standard documents such as relevant Indian Standard Codes including its Special Publications, IRC Codes including Special Publications and MORTH (Specifications for Road and Bridge Works) .These shall broadly cover the QA aspects of all services rendered all items to be supplied and all activities to be performed including the temporary structures and equipment which will influence the quality of the completed works or the progress of the work.

As a minimum it will cover the following:

- (i) Document and data control
- (ii) Process control
- (iii) Work, inspection, testing and documentation procedure
- (iv) Control and documentation of purchasing and handling of materials
- (v) Maintenances of records for non-conformity and timely corrective actions.
- (vi) Internal Quality Audit
- (vii) Training of staffs
- (viii) Contractor's ESHS-MSIP

QA Plan should be submitted to the Engineer for approval, not later than 14days from the date of delivery of Letter of Acceptance. The work of building of quality control shall be deemed to be covered under the scope of work. This QA Plan may be updated / modified if required and that updated / modified Plan should be a part of Contract Agreement.

A-1.3: Drawings:

The drawings provided in the Tender Documents shall be used for reference only. The Contractor shall study the nature of the work and ensure that the rates and prices quoted in the Bill of Quantities have due consideration of sites including its accessibility and storage space of storing materials and complexities of the actual execution/construction.

The contractor based on his surveys and investigation shall submit the working drawings (in soft and hard copies) for each activity at least 28 days in advance of the scheduled start date of the activity as per the approved work programme. The working drawing should clearly show the modifications, if any, with reference to the corresponding tender drawing. The Engineer shall review the working drawings including the proposed modification, if any, revise the drawing, if required, approve and issue the drawings to the Contractor in two copies of Good for Construction (GFC) drawings at least 14 days in advance of the scheduled start date of the activity.

The permanent works are normally designed and working drawings furnished by the Department. The Contractor is required to design "Temporary Works". Examination and/or approval of any drawings or documents of Temporary works submitted by the Contractor or by the Engineer in charge shall not relieve the contractor of his responsibilities or liabilities under the Contract.

The tender rates/prices for the work shall be deemed to include the cost of preparation, supply and delivery of all the necessary working drawings, prints, soft copies which the Contractor is required to provide as per the requirement of the Contract.

A-1.4: Site Information

The information about the site of work and site condition provided in the tender document is given in good faith for guidance only but it shall be responsibility of the Contactor to satisfy himself regarding all aspects of the entire site conditions.

The locations of the works and the general site particulars are as shown in the index plan enclosed with the Tender Documents.

Whereas the right of way of the work sites shall be provided to the Contractor by the Employer the Contractor has to make his own arrangement for the land required by him for and areas for temporary stockpiling of materials, setting up his office, field laboratory, site for plants and equipment, maintenance and repair workshops, construction worker's camp, stores etc. The location of quarries and other sources from which naturally occurring materials are available, for guidance of the Contractor. It is assumed that the Contractor has inspected the quarries; borrow areas etc., in the vicinity of the working area before quoting his rates for the work to assess the availability of construction materials in required quantity and quality.

A-1.5: Setting out:

The Contractor shall establish working bench marks tied with the reference bench marks within a fortnight after taking possession of the site. The reference bench marks for the area shall be as indicated in the Contract Document or directed by the Engineer in charge and the values of the same shall be obtained by the Contractor from the Engineer in charge. Checks must be made on the bench marks on every month and adjustments if any approved from the Engineer and recorded. An up to date list of all bench marks including adjustments shall be maintained by the Contractor and a copy of the same mentioning location description, latitude – longitude, levels with actual photographs of the established benchmarks shall be submitted to the Engineer in charge for their record.

The lines and levels of formation (foundation level of the hydraulic structure, Top level and toe levels of the protection works side slopes shall be carefully set out and frequently checked, care being taken to ensure correct cross section and gradient obtained everywhere.

In order to facilitate the setting out of the works the centerline of the canal & canal embankment/ hydraulic structure/protection works must be established accurately and approved by the Engineer-in-Charge. It must then be accurately referenced in a manner satisfactory to the Engineer-in-Charge at an interval of 60 m outside the limit of work area as directed by the Engineer-in-Charge with marker pegs and chainage boards. These marker pegs shall be maintained by the Contractor unless the work finished upto the satisfaction of the Engineer-in-Charge.

The Contractor will be sole responsible for safe-guarding all survey monuments, bench marks, marking pegs etc. The Engineer-in-Charge will provide the Contractor all necessary data for setting out centerline, toe line. All dimensions and levels shown on the drawings or mentioned in the document forming part of or issued under the contract shall be verified by the Contractor on the site and he shall immediately inform the Engineer in case of apparent error or discrepancies in levels or dimensions. The Contractor shall in connection with staking out, survey of canal & canal embankment and submit the longitudinal profile of

canal & canal Embankment along the centerline and cross sections at the said intervals to the Engineer for approval.

Staking out shall be done by the experienced personal and field record will be maintained as directed by the Engineer. After obtaining approval from Engineer the work on earthwork may commence. The longitudinal sections and cross sections before the work and after the work will form the basis of measurement. There will be no separate payment for any survey work performed by the Contractor. The cost of these services shall be considered as being included in the rates of items of works in the Bill of quantities.

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

SECTION B-TECHNICAL SPECIFICATIONS

General

All works shall be carried out according to technical specifications, the Indian Standard Code(s) of practice, Specifications of USoR i.e. **Unified Schedule of Rates (I&WD) 2018, I&WD USoR (M&E) 2022, SOR (Roads & Bridge works) –Volume III, 2018, PWD (WB), Sanitary & Plumbing Works (Volume –II), 2018, PWD (WB) & SOR (Building works) Volume I, 2018 PWD (WB), I&WD-Mechanical Circle, SoR 2011, Government of India, Central Public Works Department, Delhi, SoR (E&M), 2018 with all latest amendments.** The Indian Standard specification and any work not covered there shall be carried out as per best practice adopted in this country according to the direction and satisfaction of the Engineer-in charge.

1. Earth Work

1.1. Setting Out

Before start of work centre line of the canal / embankment shall be marked by suitable and firm pegs each at about 30m interval in straight reaches. In the curved reaches of the canal the curve shall be laid out and top and bottom edges of excavation and toe of embankment shall be suitably peg marked. The centre line in such reaches shall be marked by pegs at an interval of 5 m to ensure smooth curve profile during excavation/filling. Distance pegs shall be constructed at 200 m interval at canal boundary for proper alignment.

All levels of canal profiles shall be referred to a specified and established firm bench mark not subject to subsidence/interference or disturbance. Temporary bench mark pillars shall be constructed at suitable locations for reference of levels during construction. Proper layout of the embankment / flood walls shall be marked with pucca reference pillars.

1.2. Clearing of Land

Before beginning the construction / repair of embankment, the land over which excavations/filling is to be done shall be cleared of all trees, bushes, vegetation, rubbish, roots, ant hills and any other objectionable material before excavation/filling. The cleared material shall be the property of the Government and its disposal shall be done in a manner as approved by the Engineer-in-Charge. The land so cleared shall be maintained free from any growth and vegetation during the period of construction.

In filling reaches, all holes and hollows whether originally existing or produced by digging up roots shall be filled with suitable earth well rammed and leveled off. The depth to which top soil is removed shall be adequate to remove all perishable material and any soil which may become unstable on saturation or may interfere with the development of proper bond between the existing surface and new embankment. As per IS 4701, the depth of stripping as a guide for containing light grass cover shall be 5 to 7.5cm. It shall be 20cm for soil containing thick vegetation/agricultural land.

1.3. Excavation

Before commencement of the excavation in any reach the contractor shall inform and obtain the necessary instructions in writing from the Engineer-in-Charge.

The contractor shall excavate whatever material may be encountered up to the depth of excavation shown on the Cross-section of the channels. All material, thus excavated, shall be the property of the Government.

Excavation to be carried out shall strictly conform to the plans and levels shown on the profile of excavation in the Cross-sections. The bed of the canal will have a longitudinal gradient as given in L-section and will be kept level transversely. The side slopes shall also conform to those given in the drawings and shall be neatly finished. Any excavation below the prescribed bed level shall not be paid.

Excavation of internal section in branch canal/distributary shall be carried out by suitable earthmoving equipments/tractors. Excavation of internal section in minors may be done manually.

1.4. Dewatering and Bailing out water by Pump

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 bailing out water is to be carried out as per direction of the Engineer-in-charge. Approval of the Engineer shall, however, not

relieve the Contractor of the responsibility for the adequacy of dewatering and protection arrangements and 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 or for any 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. The pump installation capacity number (HP, Discharge and Head) must be approved by Engineer-in-charge in writing in a separate register to be issued by the department for the item.

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.

The Payment will be made on the quantity of water calculated on the basis of initial and final water level measured before starting and completion of each day's work which necessitates a bailing/ pumping of water from the trench. The final level of water to be measured, will depend on the level at which the day's work will be taken up. The rate includes any seepage water that may percolate in the trench during pumping.

1.5. Earthwork in Excavation of foundation: (Ref. PWD, Building works, Para: point B under General Specification)

All works shall be carried out in proper manner. Items of works not covered by the following shall be carried out as per best practice according to directions of the Engineer-in-Charge and to his satisfaction. Unless otherwise specified in this section or in the description of item, the cost of all stages of works mentioned hereunder shall be deemed to have been included in the rates of items provided in the Schedule. Foundation when excavated to the level shown in the drawing will be shown to the

Engineer-in-Charge and if on account of bad ground or for any reason whatsoever he decides to go deeper with the foundation, the contractor shall excavate further to the depths required by the Engineer-in-Charge. In no case shall the foundation soling or concrete be laid prior to receiving orders to that effect from the Engineer-in-Charge or his representative.

Excavating shall include throwing the excavated earth at least one meter or half the depth of excavation, whichever is more, clear of the edge. The excavated areas around the foundation of structures are to be filled up properly to the required levels with earth obtained from excavation or other materials as directed, well rammed with water and consolidated in layers not exceeding 150 mm. at a time. The quantity for this item of work will be measured on the basis of quantity of excavation paid for less the volume occupied by the structure in foundation.

2. Cement Concrete Works (Plain or Reinforced):

2.1. Shuttering and Staging:

Wherever necessary, shuttering and staging must be provided. Unless otherwise stated no payment will be made for such shuttering or staging and the cost thereof will be deemed to have been covered by the rate for relevant finished item of work. Where payment for shuttering has been specified, the rate shall be deemed to cover the cost of the necessary staging as well. Payment, if any, for shuttering will be on the basis of surface area of shuttering in actual contact with concrete. Shuttering may be of approved dressed timber true to line, not less than 25 mm. thick. Surface to be in contact with concrete are to be planed smooth except where otherwise stated. As an alternative, sufficiently rigid steel shuttering may be used. In every case, joints of the shuttering are to be such as to prevent the loss of liquid from concrete. In timber shuttering the joints must be perfectly closed and the entire shuttering surface shall be covered with polythene sheets of approved quality. In case of steel shuttering also the joints are to be similarly lined. All shuttering and framing must adequately be stayed and braced to the satisfaction of the Engineer for properly supporting the concrete during the period of hardening. It shall be so constructed that it may be removed without shock or vibration to the concrete. Before the concrete is placed, the shuttering shall, if considered necessary be coated with an approved preparation for preventing the adhesion of the concrete to the moulds, and it is to be of such a nature and so applied that the surface of the finished concrete is not stained. Care shall also be taken that such approved preparation shall be kept out of contact with the reinforcement. In no circumstances shall forms be struck until the concrete reaches strength of at least twice the stress of which the concrete may be subjected at the time of striking.

Interior of all moulds and boxes must be thoroughly washed out with a hosepipe or otherwise so as to be perfectly clean and free from all extraneous matter prior to the deposition of concrete. All form works shall be removed without shock or vibration. Before the form work is stripped, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has hardened sufficiently. In normal weather and with ordinary cement, vertical or side shuttering may be removed after three days and the

bottom shuttering of horizontal members after fourteen days in case of slabs and twenty one days in case of beams and cantilevers etc. from the date of placing the last portion of the concrete in the structure. The above are the minimum and may be extended if found necessary. Before stripping the shuttering of structural members the contractor shall take prior permission of the Engineer

No plugs, bolts, ties, hold fasts or any other appliances whatsoever for the purpose of supporting the shuttering are to be fixed in the structure or placed in such a way that damage might result to the work in removing the same when the shuttering is struck.

2.2. Scaffolding:

The scaffolding must be strong and rigid stiffened with necessary cross bracers and always decked and boarded on the sills with close boarded veiling and swings to prevent any injury to persons or materials. The contractor shall have to allow other traders to make reasonable use of his scaffolding as and when directed by the Engineer-in-Charge. If for the interest of the work contractors have to erect scaffolding in other 's properties including local bodies or corporation, the arrangement for the same including the cost of licensing fees etc. shall have to be borne by the contractor and the department should be kept free from any liability on this account.

2.3. Mixing, Placing and Compacting:

The proportion specified is by volume in dry rodded condition of the different constituents. Boxes of suitable sizes shall be used for measuring sand and aggregate. The unit of measurement for cement shall be bag of cement weighing 50 Kg. and this shall be taken as 0.035 cubic metre while measuring the aggregate, shaking, ramming or hammering shall not be done. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand allowances for bulking be made. The aggregate in each batch of concrete are to be proportioned as to contain full bags of cement. Normally all structural concrete shall be mixed in mixture machine in appropriate proportion, shall have to be vibrated with suitable vibrator. Mixing shall be continued until there is uniform distribution of the materials and the mass is uniform in colour and consistency, but in no case mixing shall be done for less than two minutes. The rates appearing in the Schedule of Rates against such items are inclusive of hire and operational charges of such appliances. For a particular job the Engineer-in- Charge may allow hand mixing and or hand tapping of concrete In case of hand mixing concrete, extra cement up to 10% over the standard requirement of cement for machine mix of particular mix shall have to be provided by the contractor at his own cost.

As the bulking of sand may vary from day to day and at different parts of the day on account of varying moisture content, frequent tests for bulking shall be carried out with the sand to be used and amount of bulking allowed for in the field mix so as to keep the actual proportion constant through- out.

Only such quantities as are required for immediate use are to be mixed at any one time. Sufficient water is to be added to obtain proper workability so that the mixture may flow

readily round the reinforcement and into every part of the moulds. The workability shall be measured by the amount of slump.

The quantity of water to be used for each mix of 50 kg cement to give the required consistency shall not be more than 34 litres for 1:3:6 mix, 32 litres for 1:2:4 mix, 30 litres for 1:1½:3 mix and 27 litres for 1:1:2 mix. In the case of vibrated concrete, the limit specified may be suitably reduced to avoid segregation.

Nominal mix concrete may be used for concrete of M20 or lower as per Para 9.3, Table 9 of IS 456:2000. The proportions of materials for nominal mix concrete shall be in accordance with the following table 1.

Table 1; Proportions for Nominal Mix Concrete

Grade of Concrete	Total Quantity of Dry Aggregates by Mass per 50 Kg of Cement, to be Taken as the Sum of the Individual Masses of fine and Coarse Aggregates. (Kg. Max)	Proportion of Fine Aggregate to Coarse Aggregate (by Mass)	Quantity of Water per 50 Kg of Cement, (KG., Max)
M 5	800	Generally 1:2 but subject to an upper limit of 1:1½ and lower limit of 1:2½.	60
M 7.5	625		45
M 10	480		34
M 15	330		32
M 20	250		30

Note: The proportion of the aggregates should be adjusted from upper limit to lower limit progressively as the grading of the aggregates becomes finer and the maximum size of coarse aggregate become larger. Graded coarse aggregate shall be used.

Example: For an average of fine aggregate (that is, Zone II). The proportions shall be 1:½, 1:2 and 1:2½ for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively. The total water content in each batch of concrete shall always be kept constant as the amount previously determined by experiments. The quantity of water to be actually added may, therefore, vary depending on moisture content in the aggregates. In actual job, if the quantities of the ingredients remain constant, the amount of slump may be taken as a good guide indicating the total water content in the mixture. The consistency and consequently the water content of the concrete shall therefore be kept constant and checked from time to time as work proceeds, by means of standard slump test. The slump tests shall be carried out with concrete B-11 immediately after it has been mixed and before any initial set has commenced, the sample being taken preferably at the point where the concrete is being delivered for placing in the moulds.

The mould shall then be removed by rising vertically immediately after filling. The moulded concrete shall then be allowed to subside and the height of the specimen measured after coming to rest. The consistency shall be recorded in terms of millimeters of the subsidence of the specimen during the test, which is known as slump.

The following slumps shall be adopted for different works shows in Table 2.

Sl. No	Type of Work	SLUMPS	
		When vibrator	When vibrators

		are used	are not used
1	Mass concrete in foundation footings, retaining walls, pavements Piers, Abutments, lining, etc.	10 to 25 mm.	50 to 75 mm.
2	Mass concrete in RCC foundation, footing and retaining walls, Piers, Abutments, etc.	10 to 25 mm.	80 mm.
3	Beams, slabs and columnssimply reinforced	25 to 40 mm.	100 to 125 mm.
4	Thin RCC section or section with congested steel	40 to 50 mm.	125 to 150 mm

IS: 456-2000 allows use of nominal mix of concrete up to grade M20 and may be allowed in works at the discretion of Engineer-in-Charge and will be guided by the provision of IS 4562000. For grade of concrete above M20, design mix has to be adopted. For determination of mix proportion for design mix concrete, the target strength should be higher than the specified characteristic strength to ensure that characteristic strength is attained at 28 days at site. According to Explanatory Hand Book on IS 456-1978 (S.P. 24—1983): Target Strength = Characteristic strength + 1.65 x standard deviation.

Standard deviation for different grades of concrete in absence of any test may be taken as per IS: 456 — 2000 as follows: in table 3

Table: 3

Grade of Concrete	Assumed Standard Deviation N/mm ²
M 10	3.5
M 15	3.5
M 20	4
M 25	4
M 30	5

Once the target strength of cube moulds with specific mix design is obtained in the laboratory, it may be inferred that the corresponding characteristic strength of concrete, prepared with the materials used in the test mould(s) cured under identical condition as that of the test specimen, shall be obtained at site at 28 days.

The Explanatory Hand Book on IS: 456—1978 (S.P.-24-1983) provides an approximate formula for expressing the strength of concrete at age 't' (in days),

$f_t = t_{a+bt}^{1/b} f_{28}$ where f_{28} is the strength at 28 days. f_t = strength of concrete at any age- 't' (in days), $a = 4.7$ and $b = 0.833$

2.2.1. ACCEPTANCE CRITERIA:

The concrete shall be deemed to comply with the strength requirements when both the following conditions are met:

- The mean strength determined from any group of four non overlapping consecutive test results complies with the appropriate limits, in Col. 2 of following table.

- b) Any individual test result complies with the appropriate limits in Col. 3 of following table 4.

Table – 4: Characteristic Compressive Strength Compliance Requirement

Specified Grade	Mean of the Group of 4 Non-Overlapping Consecutive Test Results in N/mm ²	Individual Test Result in N/mm ²
M 15	$= f_{ck} + 0.825 \times \text{established standard deviation}$ (rounded off to nearest 0.5N/mm ²) $\text{Or } f_{ck} + 3 \text{ N/mm}^2$ Whichever is greater	$= f_{ck} - 3 \text{ N/mm}^2$
M 20 or above	$= f_{ck} + 0.825 \times \text{established standard deviation}$ (rounded off to nearest 0.5N/mm ²) $\text{Or } f_{ck} + 3 \text{ N/mm}^2$ Whichever is greater	$= f_{ck} - 3 \text{ N/mm}^2$

Note: In the absence of established value of standard deviation, the values given in relevant Table may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish value of standard deviation.

Concrete of each grade shall be assessed separately. Concrete shall be assessed daily for compliance.

Providing a proper construction joint; (iii) the reinforcement has been displaced beyond the tolerances specified; or (iv) construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-in-Charge.

2.3.2 Frequency of sampling:

Sampling Procedure—a random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested; that is, the sampling should be spread over the entire period of concreting and cover all mixing units.

Frequency- The minimum frequency of sampling of concrete of each grade shall be in accordance with the following Table 5:

Table: 5

Quantity of concrete in the Work, Cum.	Number 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 50m ³ or part thereof

TEST SPECIFICATION—The 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 at the time of striking the form work, or to determine the duration of curing, or to check the testing error. Additional cubes may also

be required for testing cubes cured by accelerated methods as described in IS: 9013—1978. The specimen shall be tested as described in IS: 516-1959.

TEST STRENGTH OF SAMPLE—The test strength of the samples shall be the average of the strength of three specimens. The individual variation should not be more than ± 15 percent of the average. Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent the segregation or loss of the ingredients. It shall be deposited as nearly as practicable in the final position to avoid re-handling or flowing. Unless specially permitted by the Engineer-in-Charge, concrete shall not be dropped freely from a height of more than 2 metres. Before placing the concrete, the moulds should be cleaned of shavings, pieces of wood or other rubbish.

When placing the concrete the finer materials must be carefully worked against the moulds so that the faces of concrete shall be left perfectly smooth and free from honey-combing upon withdrawal of the moulds. Any defect in this respect must be dealt with by the contractor as directed by the Engineer-in-Charge without any extra charges thereof.

Depositing concrete under water shall not be allowed without specific permission from the Engineer-in-Charge. The method of concreting to be adopted in such cases shall have to be previously approved by him.

During placing and also immediately after deposition, the concrete shall be thoroughly compacted by ramming, spearing etc. until it has been made to penetrate and fill all the spaces between and around the steel rods, around embedded fixtures, and into the corners of formwork in such a manner as to ensure a solid mass entirely free from voids. If so directed by the Engineer-in-Charge, in addition to usual ramming, spearing etc. sufficient number and suitable type of vibrators may have to be used on important jobs to enable working with homogeneity. It is imperative that the work should be done quickly as well as efficiently and adequate number of hands must therefore be employed to ensure this.

Concrete shall be placed and compacted in its final position before setting has commenced and shall not subsequently be disturbed.

Concreting shall be carried out continuously up to construction joints, the position and arrangement of which shall be predetermined by the Engineer-in-Charge or his representative. Any rest, pauses, such as for meal, shall also be subject to his approval. All concreting work should be so programmed as not to necessitate work at night. If for any reason this becomes imperative, the contractor shall obtain previous permission of the Engineer-in-Charge or representative and make proper lighting arrangements, at own cost, to his satisfaction.

2.4 Protection and Curing:

The contractor shall adequately protect freshly laid concrete, about 1 to 2 hours after its laying from too rapid drying due to sunshine, drying winds etc. and also from rains or surface water and shocks. The moist curing of concrete shall conform to the requirement of IS 456:2000, Paragraph 13.5.1. Exposed surfaces of concrete shall be kept continuously in a damp or wet condition by ponding or by covering with a layer of sacking, canvas, hessian or similar materials and kept constantly wet for at least seven days from the date of placing concrete in case of placing concrete of Ordinary Portland Cement and at least 14 days where mineral admixture or blended cements are used. The period of curing shall not be less than 10 days for concrete exposed to dry and hot weather conditions. About 24

hours after laying of concrete, the surface shall be cured by flooding with water of minimum 25 mm. depth or by covering with wet absorbent materials. The curing shall be done for a minimum period of 7 days. Over the foundation concrete the masonry work may be started after 48 hours of its laying, but the curing of cement concrete shall be continued along with masonry work for a minimum period of 7 days. In case of cement concrete used as sub-grade for flooring, the flooring may be commenced with 48 hours of the laying of sub-grade. In case it is not possible to do so due to exigencies of work. The subgrade shall be roughened with steel wire brush without disturbing the concrete, wetted with neat cement slurry at the rate of 1.75 kg of cement per square metre applied to the base before laying floor, and full rate of artificial stone flooring/mosaic will be paid with the specific orders of the Engineer-in-Charge. The curing to be continued along with top layer of flooring for a minimum period of 7 days.

2.5 Construction Joints:

All joints in slabs and other horizontal members are to be formed by inserting vertical boards against which the concrete deposited can be properly rammed. The position where such joints may be made will be indicated by the Engineer-in-Charge or his representative. In the case of horizontal joint any excess mortar or laitance shall be moved from the surface after the concrete is deposited and before it has set.

When the work has to be commenced on a surface which has hardened, such surface shall be well roughened and all laitance removed; the surface shall then be swept clean, thoroughly wetted and covered with a thin layer of mortar composed of equal volumes of cement and sand. Such works shall be deemed to be covered by the rates for concrete.

2.6 Minimum Crushing Strength:

For major RCC work, (where concrete is specified by strength) the mix should not be leaner than 1:11/ :3 so as to give ultimate crushing strength not less than 25 N/Sq. mm. at 28 days cured under field condition. The mix for the concrete is to be so adopted and the slump is to be so allowed as to give specified strength and proper workability at the existing site conditions. Contractor shall remain fully responsible for producing concrete of specified strength in the actual job and therefore cast at his own cost test specimens of 15 cm. Cube as already specified during work and cure the same in similar way as for laid concrete being tested for strength. Each set of test specimen shall be taken to cover the quantity of concrete laid on the job during the period from the time of taking the previous set of specimens and the quantity will be estimated by the Engineer-in-Charge from records maintained by him.

The interior surface of the mould and base plate shall be lightly oiled before the concrete is placed in the mould.

2.7 Compacting

The test specimens shall be made as soon as practicable after mixing and in such a way as to produce full compaction of the concrete with neither segregation nor excessive laitance.

The concrete shall be filled into the mould in layers approximately 5 cm deep. In placing each scoopful of concrete, the scoop shall be moved around the top edge of the mould as the concrete slides from it, in order to ensure a symmetrical distribution of the concrete within the mould. Each layer shall be compacted either by hand or by vibration. After the top layer has been compacted, the surface of the concrete shall be finished level with the top of the mould, using a trowel, and covered with a glass or metal plate to prevent evaporation.

2.7.1 Compacting by Hand –

When compacting by hand, the standard tamping bar shall be used and the strokes of the bar shall be distributed in a uniform manner over the cross—section of the mould. The number of strokes per layer required to produce specified conditions will vary according to the type of concrete. For cubical specimens, in no case shall the concrete be subjected to less than 35 strokes per layer for 15 cm cubes or 25 strokes per layer for 10 cm cubes. For cylindrical specimens, the number of strokes shall not be less than 30 per layer. The strokes shall penetrate into the underlying layer and the bottom layer shall be rodded B-162 throughout its depth. Where voids are left by the tamping bar, the sides of the mould shall be tapped close the voids.

2.7.2 Compacting by Vibrator

When the job concrete is placed by vibration and consistency of the concrete is such that the test specimens cannot be properly moulded by hand rodding as described under 2.6.1.1 above, the specimens shall be vibrated to give a compaction corresponding to that of the job concrete. The fresh concrete shall be placed in the mould in two layers, each approximately half the volume of mould. In placing each scoopful of concrete, the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to ensure a symmetrical distribution of concrete within the mould. Either internal or external vibrator may be used. The vibration of each layer shall not be continued longer than what is necessary to secure the required density. Internal vibrators shall be of appropriate size and shall penetrate only the layer to be compacted. In compacting the first layer, the vibrators shall not be allowed to rest on the bottom of the mould. In placing the concrete for the top layer, the mould shall be filled to the extent that there will be no mortar loss during vibration. After vibrating the second layer, enough concrete shall be added to bring the level above the top of the mould. The surface of the concrete shall then be struck off with a trowel and covered with a glass or steel plate as specified under (a) above. The whole process of moulding shall be carried out in such a manner as to preclude the alternation of water cement ratio of the concrete by loss of water either by leakage from the bottom or overflow from the top of the mould.

2.8 Curing

The test specimens shall be stored on the site at a place free from vibration, under damp matting, sacks or other similar material for 24 hours $\pm \frac{1}{2}$ hour from the time of adding the water to the other ingredients. The temperature of the place of storage shall be within the range of 22°C to 32°C. After the period of 24 hours, they shall be marked for later

identification removed from the moulds and unless required for testing within 24 hours, stored in clean water at a temperature of 24°C to 30°C until they are transported to the testing laboratory. They shall be sent to the testing laboratory well packed in damp sand, damp sacks, or other suitable material so as to arrive there in a damp condition not less than 24 hours before the time of test. On arrival at the testing laboratory, the specimens shall be stored in water at a temperature of 27°C $\pm$ 2°C until the time of test, records of the daily maximum and minimum temperature shall be kept during the period of the specimens remain on the site and in the laboratory.

After curing, the specimen suitably marked and properly wrapped shall be made over to the Engineer-in-Charge or his representative who will arrange to have them tested at 28 days from the date of casting. If there be any delay for any reason whatsoever the result of the test shall nevertheless be valid and will be applicable as per rules in each case for all test specimens whatsoever. The contractor shall be responsible for proper packing of the specimens at his own cost, for safe and convenient transport of the same from the site to the testing laboratory. The cost of testing the test moulds and other charges including cost of carriage of the test moulds from the work site to the particular laboratory (both ways) and other incidental charges in this connection will have to be borne by contractor.

In case of concrete showing, on the result of the cube tests, strength less than that specified in (a) and (b) of the Acceptance Criteria but has a strength greater than (c) & (d) of the said Acceptance Criteria concrete may, at the discretion of the Engineer-in-Charge, be accepted as being structurally adequate without further testing.

If the concrete is deemed not to comply pursuant to I&S (d) of the Acceptance Criteria, the Structural adequacy of the parts affected may be investigated as per provision of I.S. 456 latest revision i.e. core test and/ or load test, as the case may be before rejection on the application of the Contractor with the undertaking to bear the cost of such tests. If the strength of concrete is such that it satisfies provisions made in relevant of 16.3.3 and/or sub-clause 16.5.3 of I.S. 456-1978, concrete in the member represented by such tests shall be considered acceptable but the Engineer-in-Charge shall have the full power to fix the rate of deduction @ Rs.200/- per cubic metre.

In case the test results do not satisfy the relevant requirement of the preceding paragraph, the volume of concrete so deficient shall be deemed to be un-acceptable and shall be removed from the structure and replaced by fresh concrete to specified strength and the contractor shall, in that case, have to carry out the instruction of the Engineer-in-Charge irrespective of the amount of loss, inconvenience and difficulties involved.

The contractor shall remain liable to act/to carry out instructions under the provision of this clause, notwithstanding issuing of any certificate or the passing of any bills or accounts by the Engineer-in-Charge.

3.0 MATERIALS

General

All materials used in the works shall be of the best kind and to the approval of the Engineer-in-Charge. All materials shall comply with the relevant Bureau of Indian Standard Specification.

3.1 BRICKS

All bricks shall be of approved quality of standard specifications, made of good brick earth, uniform deep red, cherry or copper colour, thoroughly burnt in kiln (machine made) without being vitrified, regular in shape and size, sound, hard, homogeneous in texture, true to shape and of standard dimension and shall be free from cracks, chips, flaws, stones or humps of any kind and shall not show appreciable signs of efflorescence either dry or subsequent to soaking in water. The size of bricks shall be $9\frac{3}{4} \times 4\frac{3}{4} \times 2\frac{3}{4}$ (conventional). 190 x 90 x 90 mm (modular) and should be of 1st class quality. The Bricks shall emit a clear ringing sound on being struck and have minimum crushing strength of 105 kg/sq.cm. All the bricks which absorb water more than 20% of their own dry weight after 24 hours immersion in cold water shall be rejected. Use of fly ash bricks in brick flat soling will be preferred.

The 1st class bricks shall be thoroughly burnt, but not over burnt, and should have a uniform deep cherry red or copper colour. The bricks should be regular in shape. The edges must be straight and square and the bricks shall emit a clear ringing sound when struck. The bricks should be free from cracks & chips. The bricks should not break when dropped flat on a hard ground from a height of about 1.5 m. Before the bricks are carried to site, they should be got approved at kiln by the Engineer-in-Charge.

3.1.1 Properties (IS: 1077)

Size of brick – The size of bricks shall be 190 × 90 × 90 cm (modular) and 1st class quality.

Tolerance – The dimension of 20 whole bricks when tested as per IS: 1077 shall be within following limits.

S.No.	Dimension	As per IS:1077
1	Length	3800 mm ± 80 mm
2	Width	1800 mm ± 40 mm
3	Height	1800 mm ± 40 mm

3.1.2 Classification & Compressive Strength

The common burnt clay bricks shall be classified on the basis of average compressive strength.

3.1.3 Water Absorption

The bricks shall be tested as specified after immersion in cold water for 24 hours. The average water absorption shall not be more than 20% by weight (IS: 1077).

3.1.4 Efflorescence

With the bricks containing soluble salts, the water used in construction invariably leaves the salts dissolved from the bricks on the surface. When the structures dry up, there is a white powdery layer of salts on the surface. The bricks shall be tested as specified. The rating of efflorescence shall be not more than 'slight' as per IS: 1077.

3.1.5 Tests

Water Absorption (IS: 3495-II)

The brick specimen is dried in a ventilated oven at a temperature of 105 – 115°C till it attains a substantially constant mass. The specimen is cooled to room temperature and its weight is noted (M_1). The specimen warm to touch shall not be used. Completely dried specimen is immersed in clean water at room temperature for 24 hours. The specimen is then taken out of water and any water on surface is wiped out by damp cloths. After 3 – 5 minutes, the specimen is weighed (M_2).

Water absorption (% by mass) is $\frac{M_2 - M_1}{M_1} \times 100$

Dimensional Tolerance (IS: 1077)

Twenty clean bricks shall be arranged on a level surface in contact with each other and in a straight line. The overall length of so arranged bricks shall be measured with a steel tape. If for any reason it is found impractical to measure the bricks in one go, it may be divided in two rows of a 10 bricks which shall be measured separately to the nearest millimeter. All these dimensions shall be added.

Similarly measurements shall be taken for width and height of the bricks by arranging 20 whole and clean bricks width wise and height wise.

Compressive Strength (IS: 3495 – I)

Five whole bricks shall be chosen at random from the lot. The dimension shall be measured to 1mm. Any unevenness in bed faces of bricks shall be removed to provide two smooth and parallel faces by grinding. Bricks are immersed in water for 24 hours. The bricks are then removed from water and surplus moisture is wiped out. The frog and all voids in the bed face are filled with 1 : 3 cement mortar. The bricks are covered with damp jute bag for 24 hours and are then immersed in water for three days. The bricks are then removed & skin dried. The specimen of brick is placed with flat faces horizontal and mortar filled facing upwards between two 3- ply and 3 mm thick plywood sheets and is carefully centered between two plates of the testing machine. Load is axially applied at a uniform rate till failure occurs. The maximum load at failure is noted. The compressive strength is given by dividing the load at failure with average bed face area of brick. The average of the results is reported.

Efflorescence (IS: 3495 – III)

A shallow flat bottom dish made of glass or porcelain and of size 180 × 80 × 40 mm is filled with sufficient distilled water to completely saturate the brick specimen, is taken.

The bricks are placed on its ends (length vertical) in the dish. The depth of immersion shall be 25 mm. The whole arrangements is placed in a warm (20 – 30° C) and well ventilated room until all the water in the dish is absorbed by the specimens and surplus water evaporates. The dish with bricks is covered with suitable glass cylinder to avoid excessive evaporation from the dish. When the water has been absorbed and the bricks appear dry, a similar quantity of water is placed in the dish and is allowed to evaporate as before. The bricks are observed for efflorescence after the second evaporation. Slight efflorescence is reported when not more than 10% of the exposed area of brick is covered with the deposit of white salts.

3.1.6 Storage

The bricks shall not be dumped. They shall be staked in regular layers as they are unloaded to minimize breakage and defacement of bricks.

3.2 CEMENT MORTAR

3.2.1 Proportioning and Mixing of Mortar

Cement and sand shall be mixed in specified proportions as specified and given on the drawings. Cement shall be proportioned by weight, taking the unit weight of cement as 1.44 tonne per cubic metre. Sand shall be proportioned by volume with due allowance for bulking. All mortar shall be mixed with a minimum quantity of water to produce desired workability consistent with required density. The mix shall be clean and free from soil, acid, alkali, organic matter or other deleterious substances.

The mixing shall be done in a mechanical mixer operated manually or by power. As an exception, and mixing can also be resorted to as long as uniform density of the mix and its strength are assured. Hand mixing shall be permitted only for very small and isolated works like canal structures works, subject to the prior approval of the Engineer. Hand mixing shall be carried out on clean watertight platform, where cement and sand shall be first mixed dry in the required proportion by being turned over and over, backwards and forwards, several times till the mixture is of uniform colour. Thereafter, minimum quantity of water shall be added to bring the mortar to the consistency of a stiff paste. The mortar shall be mixed for at least two minutes after addition of water.

Mortar shall be mixed only in such quantity as required for immediate use. The mix which has developed initial set shall not be used. Initial set of mortar with ordinary Portland Cement shall normally be considered to have taken place in 30 minutes after mixing. In case the mortar has stiffened during initial setting time because of evaporation of water, it can be re-tempered by adding water as frequently as needed to restore the requisite consistency, but such re-tempering shall not be permitted 30 minutes after mixing. Mortar remaining unused for more than 30 minutes after mixing, shall be rejected and removed from site of work.

3.2.2 Testing of Mortar

Necessary tests to determine compressive strength of the mortar, its consistency and water resistivity shall be carried out in accordance with IS:2250. For compressive strength tests, the frequency of testing shall be 1 cube for every 2 cum of mortar, subject to a minimum of work.

3.2.3 SOAKING OF BRICKS

All bricks shall be thoroughly soaked in a tank filled with water for a minimum period of one hour prior to being laid. Soaked bricks shall be removed from the tank sufficiently in advance so that they are skin dry at the time of actual laying. Such soaked bricks shall be stacked at a clean place where they are not contaminated with dirt, earth, etc.

3.2.4 JOINTS

The thickness of joints shall not exceed 10 mm. All joints on exposed faces shall be tooled to give concave finish.

3.2.5 LAYING

All brickwork shall be laid in an English bond, even and true to line, plumb and level and all joints accurately kept in accordance with the drawing or as directed by the Engineer. Half and cut bricks shall not be used except when necessary to complete the bond. Closer in such cases shall be cut to the required size and used near the ends of the walls. The bricks used at the face and also at all angles forming the junction of any two walls shall be selected whole bricks of uniform size, with true and rectangular faces.

All bricks shall be laid with frogs up on a full bed of mortar except in the case of tile bricks. Each brick shall be properly bedded and set in position by slightly pressing while laying, so that the mortar gets into all its surface pores to ensure proper adhesion. All head and side joints shall be completely filled by applying sufficient mortar to brick already placed and on brick to be placed. All joints shall be properly flushed and packed with mortar so that no hollow spaces are left. No bats or cut bricks shall be used except to obtain dimensions of the different courses for specified bonds or wherever a desired shape so requires.

The brick work shall be built in uniform layers and for this purpose, wooden straight edge with graduations indicating thickness of each course including joint shall be used. Corners and other advanced work shall be raked back. Brickwork shall be done true to plumb or in specified batter. All courses shall be laid truly horizontal, and vertical joints shall be truly vertical. Vertical joints in alternate courses shall come directly one over the other. During construction, no part of work shall rise more than one metre above the general construction level, to avoid unequal settlement and improper jointing. Where this is not possible, the work shall be raked back according to the bond (and not toothed) at an angle not steeper than 45 degree with prior approval of the Engineer. Toothing may also be permitted where future extension is contemplated.

Before laying bricks in foundation, the foundation slab shall be thoroughly hacked, swept clean and wetted. A layer of mortar not less than 12 mm thick shall be spread on the surface of the foundation slab before the first course of bricks is laid.

3.2.6 JOINTING OLD AND NEW WORK

Where fresh masonry is to join with masonry that is partially/entirely set, the exposed jointing surface of the set masonry shall be cleaned, roughened and wetted, so as to achieve the best possible bond with the new work. All loose bricks and mortar or other material shall be removed.

In the case of vertical or inclined joints, it shall be further ensured that proper bond between the old and new masonry is obtained by interlocking the bricks. Any portion of the brickwork that has been completed shall remain undisturbed until thoroughly set.

In case of sharp corners specially in skew bridges, a flat cutback of 100 mm shall be provided so as to have proper and bonded laying of bricks.

3.2.7 CURING

Green work shall be protected from rain by suitable covering and shall be kept constantly moist on all faces for a minimum period of seven days. Brick work carried out during the day shall be suitably marked indicating the date on which the work was done, so as to keep a watch on the curing period. The top of the masonry work shall be left flooded with water at the close of the day. Watering shall be done carefully so as not to disturb or wash out the green mortar.

During hot weather, all finished or partly completed work shall be covered or wetted in such a manner as to prevent rapid drying of the brickwork.

During the period of curing, the brick work shall be suitably protected from all damages. At the close of day's work or for other period of cessation, watering and curing shall have to be maintained. Should the mortar perish i.e. become dry, white or powdery through neglect of curing, work shall be pulled down to the extent required and rebuilt as directed by the Engineer. If any stains appear during watering, the same shall be removed from the surface.

3.2.8 SCAFFOLDING

The scaffolding shall be sound, strong and safe to withstand all loads likely to come upon it. The holes which provide resting space for horizontal members shall not be left in masonry under one metre in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good. Scaffolding shall be got approved by the Engineer, but its safety shall be the responsibility of the Contractor.

3.2.9 EQUIPMENT

All tools and equipment used for mixing, transporting and laying of mortar and bricks shall be clean and free from set mortar, dirt or other injurious foreign substances.

3.2.10 FINISHING OF SURFACES

3.2.10.1 General

All brickwork shall be finished in a workmanlike manner with the thickness of joints, manner of striking or tooling as described in these specifications.

For a surface which is to be subsequently plastered or pointed, the joints shall be squarely raked out to a depth of 15 mm, while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly cleaned and wetted.

3.2.10.2 Jointing

In jointing, the face of the mortar shall be worked out while still green to give a finished surface flush with the face of the brick work. The faces of brick work shall be cleaned to remove any splashes of mortar during the course of raising the brick work.

3.2.10.3 Pointing

Pointing shall be carried out using mortar not leaner than 1:3 by volume of cement and sand or as shown on the drawing. The mortar shall be filled and pressed into the raked joints before giving the required finish. The pointing shall be ruled type for which it shall, while still green, be ruled along the centre with half round tools of such width as may be specified by the Engineer: The superfluous mortar shall then be taken off from the edges of the lines and the surface of the masonry shall be cleaned of all mortar. The work shall conform to IS: 2212. Raised pointing which projects beyond the face of stone, brick or block shall be avoided.

3.2.10.4 Plastering

Plastering shall be done as per thickness specified and where shown on the drawing with the specified proportion of cement mortar.

Superficial plastering may be done, if necessary, only in structures situated in fast flowing rivers or in severely aggressive environment. Plastering shall be started from top and worked down. All holes shall be properly filled in advance of the plastering, while the scaffolding is being taken down. Wooden screeds 75 mm wide and of the thickness of the plaster shall be fixed vertically 2.5 m to 4 m apart, to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plasterer's float and pressing the mortar so that the raked joints are properly filled. The plaster shall then be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with a small upward and sideways motion 50 mm to 75 mm at a time. Finally, the surface shall be finished off with a plasterer's wooden float. Metal floats shall not be used.

When re-commencing plastering beyond the work suspended earlier, the edges of the old plaster shall be scraped, cleaned and wetted before plaster is applied to the adjacent areas.

No portion of the surface shall be left unfinished for patching up at a later period. The plaster shall be finished true to plumb surface and to the proper degree of smoothness as directed by the Engineer.

The average thickness of plaster shall not be less than that specified. The minimum thickness over any portion of the surface shall not be less than the specified thickness by more than 3mm.

Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut in rectangular shape and re-done as directed by the Engineer.

3.2.10.5 Curing of Finishes

Curing shall be commenced as soon as the mortar used for finishing has hardened sufficiently so as not to be damaged during curing. The curing shall be done for a period of at least 7 days, during which the finishing shall be suitably protected from all damages.

3.2.10.6 Scaffolding for Finishes

Stage scaffolding independent of the structure, shall be provided for the work of finishing.

3.2.10.7 COPING FOR WING/RETURN/PARAPET WALL

This work shall consist of providing an architectural coping for wing/return/parapet walls.

The material used shall be with the specified cement mortar or as shown on the drawings. The cement mortar shall be laid evenly to an average thickness of 15 mm to the full width of the top of the wall and in a band of 150 mm depth along the top outer face of the walls.

3.2.10.8 ACCEPTANCE OF WORK

All work shall be true to lines and levels as indicated on the drawing or as directed by the Engineer, subject to tolerances as indicated in these specifications.

Mortar cubes shall be tested in accordance with IS: 2250 for compressive strength, consistency of mortar and its water receptivity. The frequency of testing shall be one sample for every 2 cubic metres of mortar subject to a minimum 3 samples for a day's work.

In case of plaster finish, the minimum surface thickness shall not be less than the specified thickness by more than 3 mm.

3.3 STRUCTURAL STEEL

M.S. Structural works

M.S. structural works in columns, beams etc. with simple rolled structural members (e.g. joists, angle, channel sections conforming to IS: 226, IS: 808 & SP (6)- 1964 connected to one another with bracket, gussets, cleats as per design, direction of Engineer-in-charge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS: 816- 1969 & IS: 1995 using electrodes of approved make and brand conforming to IS: 814- 2004, haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental charges such as electricity charges, labour insurance charges etc. I) For structural members of specified sections weighing less than 22.5 Kg./m

Reinforcement / Un-tensioned Steel

For plain and reinforced cement concrete (PCC and RCC) works, the reinforcement / un-tensioned steel as the case may be shall consist of the following grades of reinforcing bars:

Grade Designation	Bar Type conforming to governing IS Specification	Characteristic Strength f_y Mpa	Elastic Modulus Gpa
S 240	IS: 432 Part I Mild Steel Bar	240	200
S 415	IS: 1786 High Yield Strength Deformed Bars	415	200

Other grades of bars conforming to IS: 432 and IS: 1786 shall not be permitted. **All steel shall be procured from original producers; no re-rolled steel shall be incorporated in the work.**

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

The actual “Nominal Cover of reinforcement /Concrete Cover” of the erected reinforcement shall not deviate from the required / specified Nominal Cover by + 10 mm and minus 0 mm. This tolerance level envisages that the Nominal Cover can be more than the Specified Cover by 10 mm but in no case it has to be less than the specified Cover. This confirms to the requirement of IS 456: 2000.

Structural Steel

Unless otherwise permitted herein, all structural steel shall before fabrication comply with the requirement of the following Indian Standards:

IS: 226	Structural Steel (Standard Quality)
IS: 961	Structural Steel (High Tensile)
IS: 2062	Weldable Structural Steel
IS: 8500	Weldable Structural Steel (medium & high strength qualities)
IS: 1148	Hot rolled rivet bars (upto 40mm dia) for structural purposes
IS: 1149	High tensile rivet bars for structural purposes
IS: 1161	Steel tubes for structural purposes
IS: 4923	Hollow Steel sections for structural use
IS: 11587	Structural weather resistant steel
IS: 808	Specifications for Rolled Steel Beam, Channel and Angle Sections
IS: 1239	Mild Steel Tubes
IS: 1730	Dimension for Steel Plate, sheet and strip for structural and general engineering purposes
IS: 1731	Dimension for Steel flats for structural and general engineering purposes
IS: 1732	Dimension for round and square steel bars for structural and general engineering purposes
IS: 1852	Rolling and cutting tolerances for hot rolled steel products

3.4. STONES AND BLOCKS (cl. 1004 of MORT&H)

3.4.1 Stones

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

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

The length of stone shall not exceed three times its height and the width on the base shall not be greater than three-fourth of the thickness of the wall nor less than 150 mm. Stones shall be procured from authorised source only.

3.4.2 CAST IRON (cl. 1005 of MORT&H)

Cast iron shall conform to IS:210. The grade number of the material shall not be less than 14.

3.4.3. CEMENT (cl. 1006 of MORT&H)

Cement to be used shall be any of the following types with the prior approval of the Engineer.

- a) Ordinary Portland cement, 33 Grade, conforming to IS: 269.
- b) Ordinary Portland cement, 43 Grade, conforming to IS: 8112.
- c) Ordinary Portland cement, 53 Grade, conforming to IS: 12269.
- d) Sulphate resisting Portland cement, conforming to IS: 12330.
- e) Portland Pozzolana cement (fly ash based) conforming to IS:1489 (Part I)
- f) Portland slag cement conforming to IS:455
- g) Rapid Hardening Portland cement, conforming to IS: 8041.
- h) Low heat Portland cement conforming to IS: 12600

Cement of 33 grade conforming to IS:269 shall be used only after ensuring that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 450 Kg/cum of concrete (excluding any mineral admixture).

Cements of 43 and 53 grades conforming to IS:8112 and IS: 12269 respectively may be used provided the minimum cement content mentioned elsewhere from durability considerations, is not reduced.

Sulphate resisting cement conforming to IS: 12330 shall be used when sodium sulphate and magnesium sulphate are present in large enough concentration to be aggressive to concrete. The recommended threshold values as per IS: 456 are: sulphate concentration in excess of 0.2 percent in surrounding soil or 300 ppm (0.03 percent) in ground water. Cement conforming to IS: 12330 shall be carefully selected from strength considerations to ensure that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 450 kg/cum (excluding any mineral admixture).

Alternatively, Portland slag cement conforming to IS:455 with slag content more than 50 percent can be used instead of sulphate resisting cement when the sulphate content in the surrounding soil is less than 1 percent or the sulphate content in the ground water is less than 2500 ppm.

Cement conforming to IS: 8041 shall be used only for precast concrete products after specific approval of the Engineer.

Total chloride content shall be 0.1 percent by mass of cement for the cement to be used in structures other than prestressed concrete structures and 0.05% by mass of cement in prestressed concrete structures. Also, total sulphur content calculated as sulphuric anhydride (SO₃) shall in no case exceed 3.5 percent.-

Where chloride is encountered along with sulphates in soil or ground water, ordinary Portland cement with C₃A content from 5 to 8 percent shall be preferably used in concrete, instead of sulphate resisting cement.

Manufacturer's test certificate shall be submitted to the Engineer by the contractor for every consignment of cement. The certificate shall cover all the tests for chemical requirements, physical requirements and chloride content as per relevant codes as applicable.

Independent tests of samples drawn from the consignment shall be carried out at the site laboratory or in an independent laboratory approved by the Engineer, immediately after delivery. The following properties shall be tested:

- I. Compressive strength.
- II. Setting time.

The cost of the tests shall be borne by the Contractor. Cement in bags in local storage for more than 3 months after completion of tests, may be re-tested for compressive strength and setting times (initial and final) before use and may be rejected if it fails to conform to any of the requirements.

Lot size for independent testing of cement at site shall be the quantity received at site on any day, subject to a maximum of 500 tonnes.

A-1 Coarse Aggregates for Cement Concrete Works:

Stone chips or stone ballast for cement concrete (plain or reinforced) shall be hard, of uniform and fine texture. Free from faults or planes of weakness and free from weathered faces. The ballast or chips must be free from loam, clay or any surface coating, free from organic matter or other impurities and screened, free of dust. Stone of black and hard variety as is generally available from authorized quarries in Pakur or Chandil areas will be normally used. Stone aggregates from other sources may also be used provided the same is found suitable in the opinion of the Engineer-in-Charge. The opinion of Engineer-in- Charge must be recorded in writing. The ballast or chips shall be obtained by breaking from large blocks and must be more or less cubicle in shape. Coarse aggregate shall be procured from authorized sources only.

Size of Coarse Aggregates:For any of the following nominal sizes of graded coarse aggregates, grading shall be in conformity with the requirements laid down in the Indian Standards Specification IS : 383-1963 as shown below in Table 6.

Table 6 : Grading Requirements of Coarse Aggregate

IS. Sieve Designation	Percentage passing for graded aggregate of nominal size			
	40mm	20mm	16mm	12.5mm
1	2	3	4	5
80 mm	100			
63 mm				
40 mm	95-100	100		
20 mm	30-70	95-100	100	100
16 mm			90-100	
12.5 mm.				90-100
10 mm.	10-35	25-55	30-70	40-85
4.75 mm.	0-5	0-10	0-10	0-10
2.36 mm.				0-5

TABLE –7

IS. Sieve Designation	Percentage passing for single sized aggregate of nominal size					
	63mm	40mm	20mm	16mm	12.5mm	10 mm
1	2	3	4	5	6	7
80 mm	100					
63 mm	85-100	100				
40 mm	0-30	85- 100	100			
20 mm	0-5	0-20	85-100	100		
16 mm				85-100	100	
12.5 mm.					85-100	100
10 mm.	0-5	0-5	0-20	0-30	0-45	85-100
4.75 mm.			0-5	0-5	0-10	0-20
2.36 mm.						0-5

When coarse aggregates brought to the site is ungraded, single size coarse aggregates of different nominal sizes, conforming to the requirements vide Table 7 given below, shall be mixed at site with the other ingredients of concrete either directly in the mixture or on the platform in the proportion indicated in Table 8 below :

TABLE –8

Sl. No.	Cement concrete mix	Nominal size of aggregate	Parts of aggregate of size 50 mm.	Parts of aggregate of size 40 mm.	Parts of aggregate of size 20 mm	Parts of aggregate of size 12.5 mm	Parts of aggregate of size 10 mm.
1	2	3	4	5	6	7	8

1.	C.C.1:6:12	63mm	9		3		
2.	C.C.1:6:12	40mm		9	3		
3.	C.C.1:5:10	63mm	7½		2½		
4.	C.C. 1:5:10	40mm		7½	2½		
5.	C.C.1:4:8	63mm		6	2		
6.	C.C.1:4:8	40mm		6	2		
7.	CC. 1:3:6	63mm	4½		1½		
8.	CC. 1: 3 : 6	40mm		4½	1½		
9.	CC. 1:3:6	20mm			4½		1½
10.	C.C.1:2:4	40mm		2½	1		1½
11.	C.C.1:2:4	20 mm			3		1
12.	C.C.1:2:4	12.5mm				3	1
13.	C.C. 1:½:3	20 mm			2		1

TABLE – 9

I.S. Sieve Designation	Percentage passing for all-in-aggregate	
	40mmNominal size	20mmNominal size
1	2	3
80 mm	100	
40 mm	95-100	100
20 mm	45-75	95-100
4.75 mm	25-45	30-50
600 micron	8-30	10-35
150 micron	0-6	0-6

- C. Gravel, for use as coarse aggregates in cement concrete work must be hard, absolutely free from surface coating and on being broken, the fractured surface must indicate a uniform and fine texture free from laminations or planes or weakness. It shall be thoroughly washed and free from any foreign elements.
- D. Jhama chips for cement concrete work shall be obtained by breaking good quality Jhamabats, must not be spongy or with any coating of foreign materials and should be homogeneous in texture. The chips shall be more or less cubicle in shape.

All coarse aggregates for concrete works must be well graded. These shall be screened for removal of dust and if so necessary in the opinion of the Engineer-in-Charge, shall be washed at the cost and expenses of the contractor.

A-2 Fine Aggregate (Sand)

All sand shall be clean sharp and free from clay, loam, organic or any other foreign matter, shall be obtained from approved source. The contractor shall get the sample of sand to be used in different kinds of works approved by the Engineer-in-Charge before using the same in work. Sand which in the opinion of the Engineer- in-Charge or his

representative is dirty, must be washed to his satisfaction at the cost and expenses of the contractor.

- (i) Sand for all cement concrete work must be coarse. The sand shall pass through a mesh, 4.75 mm. square measured in the clear. Sand shall not be used for concrete works if it contains more than 10% of fine grains passing through a 76 mesh sieve as used for cement test, nor should the fineness modulus be less than 2.00 unless specific permission is obtained from the Engineer-in-Charge.
- (ii) Medium sand may be used for cement mortar, for masonry, plaster etc. fineness modulus shall be between 2 and 1.8.
- (iii) Sand filling in plinth or foundation where specified to be done with fine sand. The fineness modulus shall not be less than 1.6.
- (iv) All sand shall be procured from the authorized quarry sites.

Grading

The grading of fine aggregate has been divided in following four zones.

IS Sieve size	Zone I	Zone II	Zone III	Zone IV
	%age passing by weight			
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.38 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600 micron	15-34	34-59	60-79	80-100
300 micron	5-20	8-30	12-40	15-50
150 micron	0-10	0-10	0-10	0-15

Sand conforming to zone I & II shall be used for concrete works. Sand conforming to zone III & IV can also be used for concrete work but concrete mix shall be properly designed. The sand conforming to zone IV shall not be used in reinforced concrete works.

If grading falls outside the limits of particular zone of sieves, except 600 micron sieve, by a total amount not more than 5%, it shall be taken as conforming to that zone.

Percentage (by weight) passing through 600 micron sieve as specified in the table gives the grading zone of the sand.

The amount of deleterious substances shall not exceed the percentage given below:

Deleterious substances	Percentage more than
Shale	1.00
Coal and ignite	1.00
Cinders and clinkers	1.00

Material passing 75-micron sieve 0.50

Alkali, mica and coated grain 3.00

The sum of the percentages of all deleterious substances shall not exceed 5% by weight. The sand shall also be sound and free from any amounts of organic impurities.

Tests

1. One test per each consignment of sand shall be conducted.
2. The supplier, on demand, shall supply a certificate to indicate that material as per the requirement of IS 383.
3. The weight of the samples for gradation shall not be less than that shown below.

Maximum size (mm) present in Substantial proportion	Minimum weight of sample for sieving (kg.)
4.75	0.2
2.36	0.1

The sample for sieving shall be prepared from larger sample either by quartering or by means of a sample divider. The sample shall be brought to an air dry condition by drying it at room temperature before sieving. Air dry sample is weighed and sieved successively on the appropriate sized sieves, starting with the largest sieve. Each sieve shall be shaken separately over a clean tray until not more than a trace passes but for a period of not less than two minutes. If sieving is done with a nest of sieves on a machine, not less than 10 minutes sieving shall be continued.

To prevent blinding of sieve apertures by overloading, quantum of sand placed on each sieve shall be such that the weight of sand retained on the sieve at the completion of the operation is not greater than as under:

<u>IS: Sieve</u>	<u>Maximum weight (for 20 cm dia sieve) gm</u>
2.36 mm	200
1.18 mm	100
600 micron	75
300 micron	50
150 micron	40
75 micron	25

After completion of sieving, material retained on each sieve together with any material cleaned from mesh shall be weighed. The result shall be reported as:

- i. The cumulative percentage, by weight, of the total sample passing each sieve to the nearest whole number.
- ii. Percentage, by weight, of the total sample passing one sieve and retained on the next smaller sieve to the nearest 0.1%.
- iii. Specific gravity of sand shall be minimum 2.6

Bulking of Sand

Sand may contain an amount of moisture which will cause it, when loosely filled in a container, to occupy a larger volume than it would occupy if dry. If the sand is measured by loose volume, it becomes necessary to increase the measured volume of sand put into concrete or mortar to compensate for this bulking. In ordinary sand, the bulking varies from 10 – 30%. The bulking is more in fine sand. If sand is measured by weight, no allowance/ increase for bulking are needed.

For estimation of bulking, a graduated cylinder is filled with sand to approximately 2/3 height. The cylinder is shaken and sand is leveled. The height of sand (H_1) is noted. The cylinder is then filled with water and is shaken well. The cylinder is kept undisturbed so that the sand settles down. The height of settled sand (H_2) is noted.

$$\text{The percentage bulking of sand} = \left(\frac{H_1 - H_2}{H_2} \right) 100$$

Therefore, when sand is measured by volume, extra quantity equal to this percentage is added.

3.4.5 Filter Medium:

The material for the filter shall consist of coarse sand, gravel or stone. One or more layers of graded materials, to act as a filter medium, shall be provided underneath the pitching, to prevent loss of the embankment material and build up of uplift head on the pitching.

The gradation of the filter material shall satisfy the following requirements:

$$\begin{aligned} & \frac{D_{15}(\text{Filter})}{D_{85}(\text{Base})} < 5 \\ & 4 < \frac{D_{15}(\text{Filter})}{D_{15}(\text{Base})} < 20 \\ & \frac{D_{50}(\text{Filter})}{D_{50}(\text{Base})} < 25 \end{aligned}$$

Notes:

- 1) Filter design may not be required if embankment consists of CH or CL soils with liquid limit greater than 30, resistant to surface erosion. In this case, if a layer of material is used as bedding for pitching, it shall be well graded and its D 85 size shall be at least twice the maximum void size in pitching

- 2) In the foregoing, D 15 means the size of that sieve which allows 15 percent by weight of the filter material to pass through it and similar is the meaning of D 50 and D 85 (15 being replaced with 50 and 85 respectively).
- 3) If more than one filter layer is required, the same requirement as above shall be followed for each layer. The finer filter shall be considered as base material for selection of coarser filter.
- 4) The filter shall be compacted to a firm condition. The thickness of filter is generally of the order of 200 to 300 mm. Where filter is provided in two layers, thickness of each layer shall be 150 mm.

3.4.6 CONCRETE ADMIXTURES (cl. 1012 of MORT&H)

3.4.6.1 Mineral Admixtures

Any of the following mineral admixtures may be used as part replacement of Portland Cement with the approval of the Engineer.

Fly ash : conforming to of IS: 3812-3

Granulated slag: Ground granulated slag obtained by grinding granulated slag conforming to IS: 12089.

Silica fume: Silica fume is very fine, non- crystalline SiO₂, obtained as a by-product of Silicon and Ferro – Silicon alloy industries and shall conform to IS: 15388

3.4.6.2 Chemical Admixtures

Information Required from the Manufacturer

Chemical admixtures are proprietary items of manufacture and shall be obtained only from established manufacturers with proven track record, quality assurance and full-fledged laboratory facilities for the manufacture and testing of concrete.

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

- a) Normal dosage and detrimental effects, if any, of under dosage and over dosage.
- b) The chemical names of the main ingredients.
- c) The chloride content, if any, expressed as a percentage by weight of the admixture.
- d) Values of dry material content, ash content and relative density which can be used for Uniformity Tests.
- e) Whether it leads to the entrapment of air when used as per the manufacturer's recommended dosage, and if so to what extent,
- f) Confirmation regarding its compatibility with type of cement.
- g) Whether it increases the risk of corrosion of reinforcement or other embedment.
- h) Whether it affects the durability of concrete adversely.

Physical and Chemical Requirements

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

- a) “Plasticisers” and “Super-Plasticisers” shall meet the requirements indicated for “Water reducing Admixture”.
- b) Except where resistance to freezing and thawing and to disruptive action of deicing salts is required, the air content of freshly mixed concrete in accordance with the pressure method given in IS:1199, shall not be more than 2 percent higher than that of the corresponding control mix and in any case not more than 3 percent of the test mix.
- c) The chloride content of the admixtures shall not exceed 0.2 percent when tested in accordance with IS: 6925. In addition, the maximum permissible limit of chloride content of all the constituents as indicated in Section 1700 of these Specifications shall also not be exceeded.
- d) Uniformity tests on the admixtures are essential to compare qualitatively the composition of different samples taken from batch to batch or from the same batch at different times.
- e) The tests that shall be performed along with permissible variations are as follows:
 - Dry Material Content: within 3 percent and 5 percent of liquid and solid
 - Ash content : within 1 percent of the value stated by the manufacturer.
 - Relative Density (for liquid admixtures) : within 2 percent of the value stated by the manufacturer.
- f) All tests relating to concrete admixtures shall be conducted periodically at an independent laboratory and the results compared with the data given by the manufacturer.

3.4.7 Supplying, fitting and fixing of R.C. Guard Post

The guard post are to be constructed 1.37m long with C.C. 1:2:4 with graded stone chips of 13.2mm down casting, curing complete including providing 4nos.of 12mm dia. Rod of length 1.54m as main reinforcement and 6 nos. of round shaped 8mm dia rods used as binders;

The placing of the first binder should be at 75mm below the top finished surface and the other 5 nos of binders should be placed at 245mm c/c ; the guard post should be of octagonal section with inscribed circle of dia 24cm at the base tapering to corresponding dimensions of 16cm at the top including two coats of painting with best quality synthetic enamel paint of approved make and grade to form 6 nos. horizontal alternate bands in white/ tannery yellow and black to 90 cm length standing up above ground after mending good damages if any during striking off shuttering, making hole in ground of 47cm depth and 30cm. minimum dia, fixing the guard posts in the same holes and repacking the earth properly so as to keep the guard posts standing properly erect in correct position true to line and length including carriage of R. C. Guard Post with due care to the site including loading into the truck and unloading at site complete in all respect.

4.0 PROTECTIVE WORKS

4.1. Pitching Works: -

Before the pitching work is undertaken, the embankment shall be cut and dressed to proper slope. Pitching shall not be laid on made up earth except where unavoidable. In such cases, the earth shall be watered well, rammed and consolidated beforehand.

4.1.1 Boulder Pitching

This shall be done with hard stone boulders to cover the area to be pitched with boulders of size weighing above 20 kgs. The boulders shall be arranged in layers and packed close together to the required specified thickness and made up to the proper slope. Smaller broken stones are to be used in filling the space between the bigger ones. Each working Division shall use the stone boulders from the nearest available quarry site.

Before placing boulders into position, the sub grade shall be brought to the uniform level as mentioned in drawing and properly compacted and got approved by the Engineer-in-charge. The stone shall be approved by the Engineer-in-charge as to its size & shape and shall weigh above 20 kg each. It should be laid with flat surface on top and finished with even surface. Each boulder shall be laid adjacent to the other so as to create minimum void. To create minimum void and proper packing chiseling will be used wherever necessary. Interstices in between the boulders shall be filled up the spawls properly. The top layer shall have to be leveled and hand packed so as to present an even surface to the flow. Rock fragment and spawls shall be tightly driven to wedge the boulders in place and to close direct opening to the under lying layer. While laying the boulders attempt shall be made to break the joints as far as possible.

In case of crated boulder pitching crates will be opened, its wire be stretched and fully straight such that it will take a perfect rectangular shape and size then boulder will be place as mentioned above as per direction of Engineer-in-charge. After proper placing and packing of boulder in crates, they will be closed tightly and perfectly as per direction of Engineer-in-charge.

4.2 Bullah Piling Work

Bullah piles shall be strong, straight and free from knots, holes and cracks. No joints in bullah piling is admissible except written permission from the Engineer-in-charge. Extra length required for lapping and cost of supplying of nuts, bolts and rings will not be paid for. The diameter of piles will be measured at a distance of 1.50metrefrom the thicker end. The driving of bullah piles will be done either in the river / channel bank or in the bed of the river / channel under tidal condition and stagnant or flowing condition of river etc. in all kinds of soil. The rate of supply is inclusive of sharpening the thinner end of the bullah and length shall be measured after sharpening shaping, and numbering. The piles will have to be driven vertically true to plumb along the alignment and upto required depth. The top of piles will have to be maintained more or less in the same level or as directed. The rate of driving is inclusive of hire charges of hoisting and driving arrangement, staging, scaffolding, floating arrangement like boats etc. Driven length shall be measured by deducting the exposed length from the supply length. The rate is

inclusive of shaping of toe, protection of head and hire charges of necessary driving appliances and tools, boat or pontoon and scaffolding. No payment will be made for exposed portion of bullah. No pile shoe will be used if the driving is possible upto the required depth without the shoe and the decision of the Engineer-inCharge shall be final in this respect.

During taking out bullah piling, payment shall be made over previously considered driven length only. The rate of taking out includes hire charges of scaffolding, chain pulley block, rope drum, floating arrangement and all other accessories.

MODES OF MEASUREMENTS

- a) Supply and/or Carriage of stone or Laterite boulder 20 kg and above size: To be deducted as $1/7^{\text{th}}$ (one seventh) voids from gross measurement of stack
- b) Supply and/or carriage of shingles & Brick or Jhama ballast, stone ballast & chips: To be deducted as $1/13^{\text{th}}$ (one thirteenth) voids from gross measurement of stack
- c) Supply and/or Carriage of Earth, Rubbish, Cinder, Lime, Surki, Moorum: To be deducted as $1/10^{\text{th}}$ (one tenth) voids from gross measurement of stack
- d) Supply and/or Carriage of Jhama bats or brick bats : To be deducted as $1/7^{\text{th}}$ (one seventh) voids from gross measurement of stack.
- e) Sand (after necessary deduction of Bulking), steam coal or slacked coal: To be deducted as $1/18^{\text{th}}$ (one eighteenth) voids from gross measurement of stack

Consumption of coarse sand and cement for caulking joints of

C. Stone Boulder pitching	Cement	0.00546 cum
	sand	0.023 cum
C. Brick pitching	Cement	0.000918 cum
	sand	0.00363 cum

Other consideration: May be considered during preparation of estimate.

- Gunny/Poly bags (50Kg cement capacity size)
- One bag filled up with: i) Local earth / ii) fine sand (volume) = 0.028 cum = 0.988 cft.

5.0 ROAD WORKS

5.1 WATER BOUND MACADAM SUB-BASE/BASE (CL. 404 OF MORT&H)

5.1.1 Scope

This work shall consist of clean crushed aggregates mechanically interlocked by rolling and bonding together with screening, binding material where necessary and water laid on a properly prepared subgrade/sub-base/base or existing pavement, as the case may be and

finished in accordance with the requirements of these Specifications and in close conformity with the lines, grades, cross-sections and thickness as per approved plans or as directed by the Engineer.

5.1.2 Materials

5.1.2.1 Coarse Aggregates

Coarse aggregates shall be either crushed or broken stone, crushed slag, over burnt (Jhama) brick aggregates or any other naturally occurring aggregates such as kankar and laterite of suitable quality. Materials other than crushed or broken stone and crushed slag shall be used in sub-base courses only. 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 400-8**. The type and size range of the aggregate shall be specified in the Contract or shall be as specified by the Engineer. 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).

Table 14 : Physical Requirements of Coarse Aggregates for Water Bound Macadam for Subbase/Base Courses (*Table 400-8 of MORT&H*)

S.No.	Test	Test Method	Requirements
1)	Los Angeles Abrasion value or Aggregate Impact value	IS:2386(Part4) IS: 2386 (Part-4) or IS:5640*	40 percent (Max) 30 percent (Max)
2)	Combined Flakiness and Elongation Indices (Total) **	IS: 2386(Part-1)	35 percent (Max)

Aggregates which get softened in presence of water shall be tested for Impact value under wet conditions in accordance with IS: 5640.

The requirement of flakiness index and elongation index shall be enforced only in the case of crushed broken stone and crushed slag.

In case water bound macadam is used for sub-base, the requirements in respect of Los Angeles Value and Aggregate Impact Value shall be relaxed to 50 percent and 40 percent maximum respectively.

5.1.2.2 Crushed Slag

Crushed slag shall be made from air-cooled blast furnace slag. It shall be of angular shape, reasonably uniform in quality and density and generally free from thin, elongated and soft pieces, dirt or other deleterious materials. The weight of crushed slag shall not be less than 11.2 kN per m³ and the percentage of glossy material shall not be more than 20. It should also comply with the following requirements:

i) Chemical stability :	To comply with requirements of appendix of BS: 1047
ii) Sulphur content	Maximum 2 percent
iii) Water absorption	Maximum 10 percent

5.1.2.3 Over burnt (Jhama) Brick Aggregates

Jhama brick aggregates shall be made from over burnt bricks or brick bats and be free from dust and other objectionable and deleterious materials. This shall be used only for road stretch when traffic is low. The coarse aggregates shall conform to one of the Gradings given in Table 400-9 as specified.

5.1.2.4 Screenings

Screenings to fill voids in the coarse aggregate shall generally consist of the same material as the coarse aggregate. However, where permitted, predominantly non-plastic material such as moorum or gravel (other than rounded river borne material) may be used for this purpose provided liquid limit and plasticity index of such material are below 20 and 6 respectively and fraction passing 75 micron sieve does not exceed 10 percent.

Table 15: Grading Requirements of Coarse Aggregates (*Table 400-9 of MORT&H*)

No.	Size Range	IS Sieve Designation	Passing
1)	63 mm to 45 mm	75 mm	100
		63 mm	90-100
		53 mm	25-75
		45 mm	0-15
		22.4 mm	0-5
2)	53 mm to 22.4 mm	63 mm	100
		53 mm	95-100
		45 mm	65-90
		22.4 mm	0-10
		11.2 mm	0-5

Grading Percent by weight

Note: The compacted thickness for a layer shall be 75 mm.

Screenings shall conform to the grading set forth in Table 400-10. The quantity of screenings required for various grades of stone aggregates are given in Table 400-11. The Table also gives the quantities of materials (loose) required for 10 m² for sub-base/base compacted thickness of 75 mm. The use of screenings shall be omitted in the case of soft aggregates such as brick metal, kankar, laterites, etc. as they are likely to get crushed to a certain extent under rollers.

5.1.2.5 Binding Material

Binding material to be used for water bound macadam as a filler material meant for preventing raveling shall comprise of a suitable material approved by the Engineer having a Plasticity Index (PI) value of less than 6 as determined in accordance with IS:2720 (Part-5).

The quantity of binding material where it is to be used, will depend on the type of screenings. Generally, the quantity required for 75 mm compacted thickness of water bound macadam will be 0.06-0.09 m³ per 10 m².

Table 16: Grading For Screenings (*Table 400-10 of MORT&H*)

Grading Classification	Size of Screenings	IS Sieve Designation	Percent by Weight Passing the Sieve
A	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.6 mm	15-35
		180 micron	0-10
B	11.2 mm	11.2 mm	100
		9.5 mm	80-100
		5.6 mm	50-70
		180 micron	5-25

Table 17: Approximate Quantities of Coarse Aggregates and Screenings Required for 75 mm Compacted Thickness of Water Bound Macadam (WBM) Sub-Base/Base Course for 10 m² Area (*Table 400-11 of MORT&H*)

Classification	Size Range	Compacted Thickness	Loose Qty.	Screenings			
				Stone Screening		Crushable Type Such as Moorum or Gravel	
				Grading Classification & Size	For WBM Sub-base /Base Course (Loose Quantity)	Grading Classification & Size	Loose Qty.
Grading 1	63 mm to 45 mm	75 mm	0.91 to 1.07 m ³	Type A 13.2 mm	0.12 to 0.15 m ³	Not uniform	0.22 to 0.24 m ³
-do-	-do-	-do-	-do-	Type B 11.2 mm	0.20 to 0.22 m ³	-do-	-do-
Grading 2	53 mm to 22.4 mm	75 mm	-do-	-do-	0.18 to 0.21 m ³	-do-	-do-

The above-mentioned quantities should be taken as a guide only, for estimation of quantities for construction etc. Application of binding materials may not be necessary when the screenings used are of crushable type such as moorum or gravel.

5.1.3 Construction Operations

5.1.3.1 Preparation of Base

The surface of the sub-grade/sub-base/base to receive the water bound macadam course shall be prepared to the specified grade and camber and cleaned of dust, dirt and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained.

Where the WBM is to be laid on an existing metalled road, damaged area including depressions and potholes shall be repaired and made good with the suitable material. The

existing surface shall be scarified and re-shaped to the required grade and camber before spreading the coarse aggregate for WBM.

As far as possible, laying water bound macadam course over existing bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two courses. It is desirable to completely pick out the existing thin bituminous wearing course where water bound macadam is proposed to be laid over it.

5.1.3.2 Inverted Choke / Sub-surface Drainage Layer

If water bound macadam is to be laid directly over the sub-grade, without any other intervening pavement course, a 25 mm course of fine sand shall be spread on the prepared sub-grade before application of the aggregates is taken up. In case of existing silty or clayey sub-grade, it is advisable to lay 100 mm insulating layer of fine sand on top of the sub grade, the gradation of which will depend upon whether it is intended to act as a drainage layer as well. As a preferred alternative to inverted choke, appropriate geosynthetics performing functions of separation and drainage may be used over the prepared sub-grade as directed by the Engineer. Section 700 shall be applicable for use of geosynthetics.

5.1.3.3 Lateral Confinement of Aggregates

For construction of WBM, arrangement shall be made for the lateral confinement of aggregates. This shall be done by building adjoining shoulders along with WBM layers. The practice of constructing WBM in a trench section excavated in the finished formation must be completely avoided.

Where the WBM course is to be constructed in narrow widths for widening of an existing pavement, the existing shoulders should be excavated to their full depth and width up to the sub-grade level except where widening specifications envisages laying of a stabilised sub-base using in-situ operations in which case the same should be removed only up to the sub-base level.

5.1.3.4 Spreading Coarse Aggregates

The coarse aggregates shall be spread uniformly and evenly upon the prepared sub-grade/sub-base in the required quantities from the stockpiles to proper profile by using templates placed across the road about 6 m apart, in such quantities that the thickness of each compacted layer is not more than 75 mm. 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 base be permitted. Wherever possible, approved mechanical devices such as aggregate spreader shall be used to spread the aggregates uniformly so as to minimize the need for manual rectification afterwards.

No segregation of coarse aggregates shall be allowed and the coarse aggregates, as spread shall be of uniform gradation with no pockets of fine material.

The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregates as may be required. The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved drawings.

The coarse aggregates shall not normally be spread more than 3 days in advance of the subsequent construction operations.

5.1.3.5 Rolling

Immediately following the spreading of the coarse aggregates, rolling shall be started with three wheeled power rollers of 80 to 100 KN capacity or tandem or vibratory rollers of 80 to 100 KN static weight. The type of roller to be used shall be approved by the Engineer based on trial run. Except on super elevated portions and carriageway with unidirectional cross-fall, where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the center. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inward parallel to the center line of the road, in successive passes uniformly overlapping preceding tracks by at least one-half width. Rolling shall be carried out on courses where coarse aggregates of crushed/ broken stone are used, till the road metal is partially compacted. This will be followed by application of screenings and binding material where required in Clauses 404.3.6 and 404.3.7.

However, where screenings are not to be applied as in the case of aggregates like brick metal, laterite and Kankar for sub-base construction, the compaction shall be continued until the aggregates are thoroughly keyed. Rolling shall be continued and light sprinkling of water shall be done till the surface is well compacted. Rolling shall not be done when the sub-grade is soft or yielding or when it causes a wave-like motion in the sub-grade or sub-base course.

The rolled surface shall be checked transversely with templates and longitudinally with 3 m straight edge. Any irregularities, exceeding 12 mm, shall be corrected by loosening the surface, adding or removing necessary amount of aggregates and re-rolling until the entire surface conforms to the desired camber and grade. In no case shall the use of screenings be permitted to make up depressions.

Material, which gets crushed excessively during compaction or becomes segregated, shall be removed and replaced with suitable aggregates.

5.1.3.6 Application of Screenings

After the coarse aggregates have been rolled to Clause 404.3.5, screenings to completely fill the interstices shall be applied gradually over the surface. These shall not be damp or wet at the time of application. Dry roiling shall be done while the screenings are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregates. The screenings shall not be dumped in piles but be spread uniformly in successive thin layers either by the spreading motions of hand shovels or by mechanical spreaders, or directly from tipper with suitable grit spreading arrangement. Tipper operating for spreading the screenings shall be equipped with pneumatic tyres and operated so as not to disturb the coarse aggregates.

The screenings shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand brooms or both. In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregates. These operations

shall continue until no more screenings can be forced into voids of the coarse aggregates. The spreading, rolling, and brooming of screenings shall be carried out in only such lengths of the road which could be completed within one day's operation.

5.1.3.7 Sprinkling of Water and Grouting

After application of screenings, the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screenings into voids and to distribute them evenly. The sprinkling, sweeping and rolling operation shall be continued, with additional screenings applied as necessary until the coarse aggregates have been thoroughly keyed, well-bonded and firmly set in its full depth and a grout has been formed of screenings. Care shall be taken to see that the sub-base or sub-grade does not get damaged due to the addition of excessive quantities of water during construction.

In case of lime treated soil sub-base, construction of water bound macadam on top of it shall be taken up after curing as per Clause 402.3.9 and as directed by the Engineer.

Application of binding material: After the application of screenings in accordance with Clauses 404.3.6 and 404.3.7, the binding material where it is required to be used (Clause 404.2.7) shall be applied successively in two or more thin layers at a slow and uniform rate. After each application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms, or mechanical brooms to fill the voids properly, and rolled during which water shall be applied to the wheels of the rollers if necessary to wash down the binding material sticking to them. These operations shall continue until the resulting slurry after filling of voids, forms a wave ahead of the wheels of the moving roller.

5.1.3.8 Setting and Drying

After the final compaction of water bound macadam course, the pavement shall be allowed to dry overnight. Next morning hungry spots shall be filled with screenings or binding material as directed, lightly sprinkled with water if necessary and roiled. No traffic shall be allowed on the road until the macadam has set. The Engineer shall have the discretion to stop hauling traffic from using the completed water bound macadam course, if in his opinion it would cause excessive damage to the surface.

The compacted water bound macadam course shall be allowed to completely dry and set before the next pavement course is laid over it.

5.1.3.9 Reconstruction of Defective Macadam

The finished surface of water bound macadam shall conform to the tolerances of surface regularity as prescribed in Clause

However, where the surface irregularity of the course exceeds the tolerances or where the course is otherwise defective due to sub-grade soil mixing with the aggregates, the course to its full thickness shall be scarified over the affected area, reshaped with added material or removed and replaced with fresh material as applicable and re-compacted. The area treated shall not be less than 10 q.m. In no case shall depressions be filled up with screenings or binding material.

5.2 PRIME COAT OVER GRANULAR BASE

5.2.1. 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.

5.2.2. Materials

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.

5.2.3. Construction**5.2.3.1. 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.

5.2.3.2. 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.

5.2.3.3. 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 though the jets of the spray and to cover the surface uniformly.

5.2.3.4. 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.

5.3 TACK COAT**5.3.1. 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.

5.3.2. 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.

5.3.3. Construction

5.3.3.1. 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.

5.3.3.2. 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 Clauses 501.8. 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.

5.3.3.3. 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 80°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 31 : Rate of Application of Tack Coat (Table 500-5 of MORT&H)

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

5.3.3.4. 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.

5.4 BITUMINOUS MACADAM

Scope

This work shall consist of construction in a single course having 50 mm to 100 mm thickness or in multiple courses of compacted crushed aggregates premixed with a bituminous binder on a previously prepared base to the requirements of these Specifications. Since the bituminous macadam is an open-graded mix, there is a potential that it may trap water or moisture vapour within the pavement system. Therefore, adjacent layer (shoulders) should have proper drainage quality to prevent moisture-induced damage to the BM.

Materials

Bitumen

The bitumen shall be viscosity graded paving bitumen complying with Indian Standard Specification for paving bitumen, IS:73 or as specified in the Contract. The type and grade of bitumen to be used would depend upon the climatic conditions and the traffic. Guidelines for selection of bitumen are given in Table 500-1.

Coarse Aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. It shall be clean, hard, durable and cubical shape, free from dust and soft organic and other deleterious substances. The aggregate shall satisfy the physical requirements specified in Table 500-6. Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on 4.75 mm sieve shall have at least two fractured faces resulting from crushing operation. Before approval of the source, the aggregates shall be tested for stripping. Where the Contractor's selected source of aggregates have poor affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with approved anti-stripping agents, as per the manufacturer's recommendations, without additional payment.

Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of two, passing 2.36 mm sieve and retained on 75 micron sieve. It shall be clean, hard, durable, free from dust and soft organic and other deleterious substances. Natural sand shall not be used in the binder course.

Table 32 : Physical Properties of Coarse Aggregate (Table 500-6 of MORT&H)

Property	Test	Requirement	Test method
Cleanliness	Grain size analysis	Max. 5% passing 0.075 micron	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max. 35%	IS:2386Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 40% Max. 30%	IS:2386Part IV IS:2386Part IV
Durability	Soundness (Sodium or Magnesium) Sodium Sulphate Magnesium Sulphate	5 cycles Max. 12% Max. 18%	IS:2386 Part V IS:2386PartV
Water absorption	Water absorption	Max. 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate	Min. Retained Coating 95%	IS:6241
Water sensitivity	Retained Tensile strength*	Min. 80%	AASHTO 283

§ If the minimum retained tensile strength falls below 80 percent, use of anti-stripping agent is recommended to meet the minimum requirements.

Aggregate Grading and Binder Content

The combined grading of the coarse aggregates and fine aggregates, when tested in accordance with IS:2386 Part 1, wet sieving method, shall conform to limits given in Table 500-8. The type and quantity of bitumen and appropriate thickness is also given in Table 500-7.

Proportioning of Material

The combined aggregate grading shall not vary from the lower limit on one sieve to the higher limit on the adjacent sieve to avoid gap grading. The aggregate may be proportioned and blended to produce a uniform mix complying with the requirements in Table 500-7. The binder content shall be within a tolerance of ± 0.3 percent by weight of total mix when individual specimens are taken for quality control tests in accordance with the provisions of Section 900.

Construction Operation

Grading	1	2
Nominal maximum aggregate size*	40 mm	19 mm
Layer thickness	80 -100 mm	50 -75 mm
IS Sieve size (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	90-100	
26.5	75-100	100
19	-	90-100
13.2	35-61	56-88
4.75	13-22	16-36
2.36	4- 19	4-19
0.3	2- 10	2-10
0.075	0 - 8	0-8
Bitumen content ** percent by mass of total mix	3.3**	3.4**

* Nominal maximum aggregate size is the largest specified sieve size upon which any of the aggregate material is retained.

** Corresponds to specific gravity of the Aggregate being 2.7. In case aggregates have specific gravity more than 2.7, bitumen content can be reduced proportionately. Further, for regions where highest daily mean air temperature is 30°C or lower and lowest daily mean air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

Preparation of the Base

The base on which bituminous macadam is to be laid shall be prepared, shaped and compacted to the required profile in accordance with Clauses 501.8 and 902.3 as appropriate, and a prime coat, shall be applied in accordance with Clause 502 where specified, or as directed by the

Engineer. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer.

Rolling

Compaction shall be carried out in accordance with the provisions of Clauses 501.6 and 501.7. Rolling shall be continued until the specified density is achieved, or where no density is specified, until there is no further movement under the roller. The required frequency of testing is defined in Clause 903.

5.5 DENSE BITUMINOUS MACADAM

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.

Materials

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.

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, and 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 result 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.

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).

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.

Aggregate Grading and Binder Content : 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 34: Physical Requirements for Coarse Aggregate for Dense Bituminous Macadam (Table 500-8 of MORT&H)

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386PartI
Particle shape	Combined Flakiness and Elongation Indices *	Max 35%	IS:2386 Parti
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:2386PartV
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

□ To determine this combined proportion; the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

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

Table 35 : Grading Requirements for Mineral Filler (Table 500-9 of MORT&H)

IS sieve (mm)	Cumulative Percent Passing by Weight of Total Aggregate
0.6	100
0.3	95-100
0.075	85-100

Table 36 : Composition of Dense Graded Bituminous Macadam (Table 500-10 of MORT&H)

Grading	1	2
Nominal aggregate size*	37.5 mm	26.5 mm
Layer thickness	75- 100 mm	50 - 75 mm
IS Sieve (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	28-42
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 30°C or lower and lowest daily air temperature is – 10°C or lower, the bitumen content may be increased by 0.5 percent,

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 (F/B) ratio by weight of total mix shall range from 0.6 to 1.2.

Requirements for the Mix

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11.

Table 37 : Requirements for Dense Graded Bituminous Macadam (Table 500-11 of MORT&H)

Properties	Viscosity Grade Paving Bitumen	Modified bitumen		Test Method
		Hot climate	Cold climate	
Compaction level	75 blows on each face of the specimen			
Minimum stability (kN at 600C)	9.0	12.0	10.0	AASHTO T 245
Marshall flow (mm)	2 - 4	2.5 - 4	3.5 - 5	AASHTO T 245
Marshall Quotient Stability Flow	2 - 5	2.5 - 5		MS-2 and ASTM D 2041
% air voids	3 - 5			
% Voids Filled with Bitumen (VFB)	65-75			
Coating of aggregate particle	95% minimum			IS:6241
Tensile Strength ratio	80% Minimum			AASHTO T 283
% Voids in Mineral Aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-13			

Binder Content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 500-11. 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 Table 500-12 shall be multiplied by 2.25, and the minimum flow shall be 3 mm.

Table 38 : Minimum Percent Voids In Mineral Aggregate (VMA) (Table 500-12 of MORT&H)

Nominal Maximum Particle Size ¹ (mm)	Minimum VMA Percent Related to Design Percentage Air voids		
	3.0	4.0	5.0
26.5	11.0	12.0	13.0
37.5	10.0	11.0	12.0

Note : Interpolate minimum voids in the mineral aggregate (VMA) for designed percentage air voids values between those listed.

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 (G_{mm}), 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.

Plant Trials – Permissible Variation in Job Mix Formula

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials to establish that the plant can produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500-13 and shall remain within the gradation band. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900.

Table 39 : Permissible Variations in the Actual Mix from the Job Mix Formula (Table 500-13 of MORT&H)

Description	Base/binder Course
Aggregate passing 19 mm sieve or larger	±8%
Aggregate passing 13.2 mm, 9.5 mm	±7%
Aggregate passing 4.75 mm	±6%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	±5%
Aggregate passing 0.3 mm, 0.15 mm	±4%
Aggregate passing 0.075 mm	±2%
Binder content	± 0.3%
Mixing temperature	±10°C

Laying Trials

Once the plant trials have been successfully completed and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid and compacted all in accordance with Clause 501. The laying trial shall be carried out on a suitable area which

is not to form part of the works. The area of the laying trials shall be a minimum of 100 sq.m of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid. The Contractor shall previously inform the Engineer of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores, no sooner than 24 hours after laying, or by other approved method. The compacted layers of Dense Graded Bituminous Macadam (DBM) shall have a minimum field density equal to or more than 92% of the density based on theoretical maximum specific gravity (Gmm) obtained on the day of compaction in accordance with ASTM D 2041. Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer, who may at his discretion require further laying trials.

Construction Operations

Preparation of Base : The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer.

Prime Coat : Where the material on which the dense bituminous macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 502, or as directed by the Engineer.

Tack Coat : Where the material on which the dense bituminous macadam is to be laid is either bitumen bound layer or primed granular layer, tack coat shall be applied, as specified, in accordance with the provisions of Clause 503, or as directed by the Engineer.

Mixing and Transportation of the Mix : The provisions as specified in Clauses 501.3 and 501.4 shall apply. Table 500-2 gives the mixing, laying and rolling temperature for dense mixes using viscosity grade bitumen. In case of modified bitumen, the temperature of mixing and compaction shall be higher than the mix with viscosity grade bitumen. The exact temperature depends upon the type and amount of modifier used and shall be adopted as per the recommendations of the manufacturer. In order to have uniform quality, the plant shall be calibrated from time to time.

Spreading : The provisions of Clauses 501.5.3 and 501.5.4 shall apply.

Rolling : The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing

Opening to Traffic : It shall be ensured that the traffic is not allowed without the approval of the Engineer in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

5.6 OPEN-GRADED PREMIX SURFACING

Open-Graded Premix Surfacing using Viscosity Grade Paving Bitumen

Scope

This work shall consist of preparation, laying and compaction of an open-graded premix surfacing material of 20 mm thickness composed of small-sized aggregate premixed with bituminous binder on a previously prepared base, in accordance with the requirements of these Specifications to serve as a wearing course.

Materials

Binder : The binder shall be viscosity grade bitumen of a suitable grade as specified in the Contract, or as directed by the Engineer, and satisfying the requirements of IS:73. For selection of grade of bitumen guidance may be taken from Table 500-1.

Aggregates : The aggregates shall conform to Clause 504.2.2 except that the water absorption shall be limited to a maximum of 1 percent. The Polished Stone Value, shall not be less than 55, when tested as per BS:812-114.

Proportioning of Material

The materials shall be proportioned in accordance with Table 500-23.

Table 51 : Quantities of Materials Required for 10 m² of Road Surface for 20 mm Thick Open-graded Premix Surfacing (Table 500-23 of MORT&H)

Materials		Quantity
Aggregates		
a)	Nominal Stone size 13.2 mm (passing 22.4 mm sieve and retained on 11.2 mm sieve)	0.18 m ³
b)	Nominal Stone size 11.2 mm (passing 13.2 mm sieve and retained on 5.6 mm sieve)	0.09 m ³
	Total	0.27 m³
Binder		
a)	For 0.18 m ³ of 13.2 mm nominal size stone of 52 kg bitumen per m ³	9.5 kg
b)	For 0.09 m ³ of 11.2 mm nominal size stone of 56 kg bitumen per m ³	5.1 kg
	Total	14.6 kg

Construction Operations

Preparation of Surface: The underlying surface on which the bituminous surfacing is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross-section in accordance with Clause 501. A prime coat where needed shall be applied in accordance with Clause 502 as directed by the Engineer.

Tack Coat: A tack coat complying with Clause 503, shall be applied over the base preparatory to laying of the surfacing.

Preparation of Premix: Hot mix plant of appropriate capacity and type shall be used for the preparation of the mix material. The hot mix plant shall have separate dryer arrangement for heating aggregate.

The temperature of the binder and aggregate at the time of mixing, laying and compaction shall be in conformity with the temperature given in Table 500-3. The difference in temperature between the binder and aggregate shall at no time exceed 14°C. Mixing shall be thorough to ensure that a homogeneous mix is obtained in which all particles of the aggregates are coated uniformly.

The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or hand barrows. The vehicles employed for transport shall be clean and the mix being transported covered in transit if so directed by the Engineer.

Spreading and Roiling: The pre mixed material shall be spread on a previously prepared base to Clause 501 by a paver unless specified otherwise in the Contract to the desired thickness, grades and cross fall (camber). The cross-fall should be checked by means of camber boards and irregularities levelled out. Excessive use of blades or rakes should be avoided. As soon as sufficient length of bituminous material has been laid, rolling shall commence with 8-10 tonne rollers, smooth wheel tandem type or other approved equipment. Rolling shall begin at the edge and progress towards the centre longitudinally, except that on super elevated and uni-directional cambered portions, it shall progress from the lower to upper edge parallel to the centre line of the pavement.

When the roller has passed over the whole area once, any high spots or depressions, which become apparent, shall be corrected by removing or adding premixed materials. Rolling shall then be continued until the entire surface has been rolled and all the roller marks eliminated. In each pass of the roller the preceding track shall be overlapped uniformly by at least one-third width. The roller wheels shall be kept damp to prevent the premix from adhering to the wheels. In no case shall fuel/lubricating oil be used for this purpose. Excess use of water for this purpose shall also be avoided.

Rollers shall not stand on newly laid material. Rolling operations shall be completed in every respect before the temperature of the mix falls below the rolling temperature indicated in Table 500-3.

Seal Coat: A seal coat conforming to Clause 511 of the type specified in the Contract shall be applied to the surface immediately after laying the surfacing.

Opening to Traffic: No traffic shall be allowed on the road until the seal coat has been laid. After the seal coat is laid, the road may be opened to traffic according to Clause 511.4.

5.7 SEAL COAT

Scope

This work shall consist of the application of a seal coat for sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall (camber).

Seal coat shall be of either of the two types specified below:

- A. Liquid seal coat comprising of an application of a layer of bituminous binder followed by a cover of stone chips.
- B. Premixed seal coat comprising of a thin application of fine aggregate premixed with bituminous binder.

Materials

Binder: The requirements of Clauses 510.1.2.1 and 510.2.2.1 shall apply.

The quantity of bitumen per 10 square metres, shall be 9.8 kg for Type A, and 6, 8 kg for Type B seal coat. Where bituminous emulsion is used as a binder, the quantities for Type A and Type B seal coats shall be 15 kg and 10.5 kg respectively.

Stone Chips for Type A Seal Coat: The stone chips shall consist of angular fragments of clean, hard, tough and durable rock of uniform quality throughout. They shall be free of soft or disintegrated stone, organic or other deleterious matter. Stone chips shall be of 6.7 mm size defined as 100 percent passing through 11.2 mm sieve and retained on 2.36 mm sieve. The quantity used for spreading shall be 0.09 cubic metre per 10 square metre area. The chips shall satisfy the quality requirements given in Table 500-8 except that the upper limit for water absorption value shall be 1 percent.

Aggregate for Type B Seal Coat: The aggregate shall be sand or grit and shall consist of clean, hard, durable, uncoated dry particles, and shall be free from dust, soft or flaky/elongated material, organic matter or other deleterious substances. The aggregate shall pass 2.36 mm sieve and be retained on 180 micron sieve. The quantity used for premixing shall be 0.06 cum per 10 sqm area.

Construction Operations

Preparation of Surface: The seal coat shall be applied immediately after laying the bituminous course which is required to be sealed. Before application of seal coat materials, the surface shall be cleaned free of any dust or other extraneous matter.

Construction of Type A Seal Coat: The construction operations shall be the same as described in Clause 509.3.3 to 509.3.5.

Construction Type B Seal Coat: Using Paving Bitumen

The construction operations shall be the same as in Clause 510.1.3.

Using Emulsion: The construction operations shall be the same as in Clause 510.2.4.

Opening to Traffic: In the case of Type B seal coat, traffic may be allowed soon after final rolling when the premixed material has cooled down to the surrounding temperature. In the case of Type A seal coat, traffic shall not be permitted to run on any newly sealed area until the following day. In special circumstances, however, the Engineer may open the road to traffic immediately after rolling, but in such cases traffic shall be rigorously limited to 20 km per hour until the following day.

5.8 MASTIC ASPHALT

Scope

This work shall consist of constructing a single layer of mastic asphalt wearing course for road pavements and bridge decks.

Mastic asphalt is an intimate homogenous mixture of selected well-graded aggregates, filler and bitumen in such proportions as to yield a plastic and void less mass, which when applied hot can be trowelled and floated to form a very dense impermeable surfacing.

Materials

Binder: Subject to the approval of the Engineer, the binder shall be a paving/ Industrial grade bitumen meeting the requirements given in Table 500-39.

Table 67 : Requirements for Physical Properties of Binder (Table 500-39 of MORT&H)

Property	Test Method	Requirements
Penetration at 25°C	IS:1203	15 ± 5*
Softening point, °C	IS:1205	65 ± 10
Loss on heating for 5h at 163°C, % by mass Max.	IS:1212	2.0
Solubility in trichloroethylene, % by mass Min.	IS:1216	95
Ash (mineral matter), % by mass Max.	IS:1217	1.0

* In cold climatic regions (temperature less than 10°C), VG 40 grade bitumen may be used.

Coarse Aggregates: The coarse aggregates shall consist of crushed stone, crushed gravel/shingle or other stones. They shall be clean, hard, durable, of fairly cubical shape, uncoated and free from soft, organic or other deleterious substances. They shall satisfy the physical requirements given in Table 500-6.

The percentage and grading of the coarse aggregates to be incorporated in the mastic asphalt depending upon the thickness of the finished course should be as specified in Table 500-40.

Table 68 : Grade and Thickness of Mastic Asphalt Paving and Grading of Coarse Aggregates (Table 500-40 of MORT&H)

Application	Thickness Range (mm)	Nominal Size of Coarse Aggregate (mm)	Coarse Aggregate Content, % by Mass of Total Mix
Roads and bridge decks	25-50	13	40±10
Heavily stressed areas i.e. Junctions and toll plazas	40-50	13	45±10
Nominal size of coarse aggregate IS Sieve (mm)		13 mm Cumulative % passing by weight	
19		100	
13.2		88-96	
2.36		0-5	

Fine Aggregates: The fine aggregates shall be the fraction passing the 2.36 mm and retained on the 0.075 mm sieve consisting of crusher run screening, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry, and free from soft or flaky pieces and organic or other deleterious substances.

Filler : The filler shall be limestone powder passing the 0.075 mm sieve and shall have a calcium carbonate content of not less than 80 percent by weight when determined in accordance with IS:1514.

The grading of the fine aggregate inclusive of filler shall be as given in Table 500-41.

Table 69 : Grading of Fine Aggregate (Inclusive of Filler) (Table 500-41 of MORT&H)

IS Sieve	Percentage by weight of aggregate
Passing 2.36 mm but retained on 0.600 mm	0-25
Passing 0.600 mm but retained on 0.212 mm	10-30
Passing 0.212 mm but retained on 0.075 mm	10-30
Passing 0.075 mm	30-55

Mix Design

Hardness Number

The mastic asphalt shall have a hardness number at the time of manufacture of 50 to 70 at 25DC prior to the addition of coarse aggregate and 10 to 20 at 25°C at the time of laying after the addition of coarse aggregate.

The hardness number shall be determined in accordance with the method specified in ISM195-1978.

Binder Content

The binder content shall be so fixed as to achieve the requirements of the mix specified in Clause 516.3.1 and shall be in the range of 14 to 17 percent by weight of total mix as indicated in Table 500-42 of MoRT&H.

Table 70 : Composition of Mastic Asphalt Blocks without Coarse Aggregate (Table 500-42 of MORT&H)

IS Sieve	Percentage by Weight of Mastic Asphalt	
	Minimum	Maximum
Passing 2.36 mm but retained on 0.600 mm	0	22
Passing 0.600 mm but retained on 0.212 mm	4	30
Passing 0.212 mm but retained on 0.075 mm	8	18
Passing 0.075 mm	25	45
Bitumen Content % by mass	14	17

Job Mix Formula

The Contractor shall submit to the Engineer for approval at least one month before the start of the work the job mix formula proposed to be used by him for the work, indicating the source and location of all materials, proportions of all materials such as binder and aggregates, single definite percentage passing each sieve for the mixed aggregate and results of the tests recommended in the various Tables and Clauses of this Specification.

Construction Operations

Preparation of the Base

The base on which mastic asphalt is to be laid shall be prepared, shaped and conditioned to the profile required, in accordance with Clause 501 or 902 as appropriate or as directed by the Engineer. In the case of a cement concrete base, the surface shall be thoroughly power brushed clean and free of dust and other deleterious matter. Under no circumstances shall mastic asphalt

be spread on a base containing a binder which might soften under high application temperatures. If such material exists, the same shall be cut out and repaired before the mastic asphalt is laid.

Tack coat

A tack coat in accordance with Clause 503 shall be applied on the base or as directed by the Engineer.

Preparation of Mastic Asphalt

Preparation of mastic asphalt consists of two stages. The first stage shall be mixing of filler and fine aggregates and then heating the mixture to a temperature of 170°C to 210°C. Required quantity of bitumen shall be heated to 170°C to 180°C and added to the heated aggregated. They shall be mixed and cooked in an approved type of mechanically agitated mastic cooker for some time till the materials are thoroughly mixed. Initially the filler alone is to be heated in the cooker for an hour and then half the quantity of binder is added. After heating and mixing for some time, the fine aggregates and the balance of binder are to be added and further cooked for about one hour. The second stage is incorporation of coarse aggregates and cooking the mixtures for a total period of 3 hours. During cooking and mixing care shall be taken to ensure that the contents in the cooker are at no time heated to a temperature exceeding 210°C.

Where the material is not required for immediate use it shall be cast into blocks consisting of filler, fine aggregates and binder, but without the addition of coarse aggregate, weighing about 25 kg each. Before use, these blocks shall be reheated to a temperature of not less than 175°C and not more than 210°C, thoroughly incorporated with the requisite quantity of coarse aggregates and mixed continuously. Mixing shall be continued until laying operations are completed so as to maintain the coarse aggregates in suspension. At no stage during the process of mixing shall the temperature exceed 210°C,

The mastic asphalt blocks (without coarse aggregate) shall show on analysis a composition within the limits as given in Table 500-42 of MoRT&H.

The mix shall be transported to the laying site in a towed mixer transporter having arrangements for stirring and keeping the mix hot during transportation.

Spreading

The mastic asphalt shall be laid, normally in one coat, at a temperature between 175°C and 210°C and spread uniformly by hand using wooden floats or by machine on the prepared surface. The thickness of the mastic asphalt and the percentage of added coarse aggregate shall be in accordance with Table 500-40 or as specified by the Engineer. Where necessary, battens of the requisite dimensions should be employed. Any blow holes that appear in the surface shall be punctured while the material is hot, and the surface made good by further floating. Laying surface over existing bridge deck : Before laying bitumen over existing bridge deck, the existing cross fall/camber, expansion joint members and water drainage spouts shall be carefully examined for their proper functioning in the bridge deck structure and any deficiency found shall be removed. Loose elements in the expansion joint shall be firmly secured.

The existing wearing coat shall be removed, as per Clause 2809. The cracks in the concrete surface, if any, shall be repaired and filled up properly or replaced by new concrete of specified grade before laying the bitumen mastic over bridge deck. Laying over new bridge deck : New concrete bridge deck which is not in camber/cross fall shall first be provided with required camber and cross fall by suitable concrete or bituminous treatment.

Treatment where mastic asphalt is laid over a concrete surface: In case of laying over concrete surface, following measures shall be taken :

- a) For proper bond with new concrete deck, surface shall be roughened by means of stiff broom or wire brush and it shall be free from ridges and troughs.
- b) A thin bituminous tack coat (with bitumen of grade VG 30) shall be applied on the concrete deck before pouring mastic. The deck shall be dry. The quantity of bitumen for tack coat shall be as per Table 500-6 of MoRT&H.
- c) After applying tack coat, chicken-mesh reinforcement of 1.5 mm dia steel wire with hexagonal or rectangular openings of 20-25 mm shall be placed and held properly in position on the concrete surface before pouring mastic.

Joints

All construction joints shall be properly and truly made. These joints shall be made by warming existing mastic asphalt by the application of an excess quantity of the hot mastic asphalt mix which afterwards shall be trimmed to leave it flush with the surfaces on either side.

Surface Finish

The mastic asphalt surface can have poor skid resistance after floating, in order to provide resistance to skidding, the mastic asphalt after spreading, while still hot and in a plastic condition, shall be covered with a layer of stone aggregate.

This aggregate shall be 13.2 mm size (passing the 19.0 mm sieve and retained on the 6.7 mm sieve) or 9.5 mm size (passing the 13.2 mm sieve and retained on the 6.7 mm sieve) subject to the approval of the Engineer. Hard stone chips, complying with the quality requirements of Table 500-16, shall be percolated with bitumen at the rate of 2 ± 0.4 percent of VG 30 grade. The addition of 2 percent of filler complying with Table 500-9 may be required to enable this quantity of binder to be held without draining. The chips shall then be applied at the rate of 0.005 cu.m per 10 sq.m and rolled or otherwise pressed into the surface of the mastic layer when the temperature of the mastic asphalt is not less than 100°C.

Opening of Traffic

Traffic may be allowed after completion of the work when the mastic asphalt temperature of the completed layer has cooled to the daytime maximum ambient temperature.

5.9 GRANULAR SUB-BASE

Scope

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

Materials

- The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag, or combination thereof depending upon the grading required. Use of materials like brick metal, Kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the gradings given in Table 400-1 and physical requirements given in Table 400-2. Gradings III and IV 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.
- 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).

Construction Operations

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.

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. So 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 up to 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 cross fall or on super elevation. For carriageway having cross fall 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 cross fall (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.

5.10 CEMENT CONCRETE PAVEMENT

Scope

- The work shall consist of construction of un-reinforced, dowel jointed, plain cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer.
- The design parameters, viz., thickness of pavement slab, grade of concrete, joint details etc. shall be as stipulated in the drawings.

Materials

Cement

Any of the following types of cement capable of achieving the design strength may be used with prior approval of the Engineer, but preference shall be to use at least the 43 grade or higher.

S.No.	Type	Conforming to
i)	Ordinary Portland Cement 43 Grade	IS:8112
ii)	Ordinary Portland Cement 53 Grade	IS:12269
iii)	Portland slag cement	IS:455
iv)	Portland Pozzolana Cement	IS:1489-Part I

If the soil around concrete pavement has soluble salts like sulphates in excess of 0.5 percent, the cement used shall be sulphate resistant and shall conform to IS: 12330.

Cement to be used may preferably be obtained in bulk form. If cement in paper bags is proposed to be used, there shall be bag-splitters with the facility to separate pieces of paper bags and dispose them off suitably. No paper pieces shall enter the concrete mix. Bulk cement shall be stored in accordance with Clause 1014. The cement shall be subjected to acceptance test.

Fly-ash up to 20 percent by weight of cementations material may be used in Ordinary Portland Cement 43 and 53 Grade as part replacement of cement provided uniform blending with cement is ensured. The fly ash shall conform to IS:3812 (Part I). Site mixing of fly ash shall be permitted only after ensuring availability of the equipment at site for uniform blending through a specific

mechanized facility with automated process control like batch mix plants conforming to IS:4925 and IS:4926. Site mixing will not be allowed otherwise.

The Portland Pozzolana Cement produced in factory as per IS:1489-Part I shall not have fly-ash content more than 20 percent by weight of cementitious material. Certificate from the manufacturer to this effect shall be produced before use.

Chemical Admixtures

Admixtures conforming to IS:9103 and IS:6925 shall be permitted to improve workability of the concrete and/or extension of setting time, on satisfactory evidence that they will not have any adverse effect on the properties of concrete with respect to strength, volume change, durability and have no deleterious effect on steel bars. The particulars of the admixture and the quantity to be used, must be furnished to the Engineer in advance to obtain his approval before use. Satisfactory performance of the admixtures should be proved both on the laboratory concrete trial mixes and in the trial length paving, (fair entraining admixture is used, the total quantity of air shall be 5 ± 1.5 percent for 31.5 mm maximum nominal size aggregate (in air-entrained concrete as a percentage of the volume of the mix).

Aggregates

Aggregates for pavement concrete shall be natural material complying with IS: 383 but with a Los Angeles Abrasion Test value not exceeding 35 percent. The limits of deleterious materials shall not exceed the requirements set out in Table 600-2 of MoRT&H.

Permissible Limits of Deleterious Substances in Fine and Coarse Aggregates

S. No.	Deleterious Substance	Method of Test	Fine Aggregate Percentage by Weight, (Max)		Coarse Aggregate Percentage by Weight (Max)	
			Uncrushed	Crushed*	Uncrushed	Crushed*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Coal and lignite	IS:2386 (Part II)-1963	1.0	1.0	1.0	1.0
ii)	Clay lumps	do	1.0	1.0	1.0	1.0
iii)	Materials finer than 75 μ IS Sieve	IS:2386 (Part II)-1963	3.0	8.0	3.0	3.0
iv)	Soft fragments	IS:2386 (Part II)-1963	—	—	3.0	—
v)	Shale	IS:2386 (Part II)-1963	1.0	—	—	—
vi)	Total of percentages of all deleterious materials (except mica) including SI No. (i) to (v) for col 4, 6 and 7 and SI No. (i) and (ii) for col 5 only		5.0	2.0	5.0	5.0

* Crushed aggregate at least one face fractured

Note: The presence of mica in the fine aggregate has been found to reduce considerably the durability and compressive strength of concrete and further investigations are underway to determine the extent of the deleterious effect of mica. It is advisable, therefore, to investigate the mica content of fine aggregate and make suitable allowances for the possible reduction in the strength of concrete or mortar; in cases where the stretch of the project road passes through vivacious belt.

The aggregates shall be free from chert, flint, chalcedony or other silica in a form that can react with the alkalis in the cement. In addition, the total chlorides content expressed as chloride ion content shall not exceed 0.06 percent by weight and the total sulphate content expressed as sulphuric anhydride (SO₃) shall not exceed 0.25 percent by weight. In case the Engineer considers that the aggregates are not free from dirt, the same may be washed and drained for at least 72 hours before batching, as directed by the Engineer.

Coarse Aggregates

Coarse aggregates shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of coarse aggregate shall not exceed 31.5 mm for pavement concrete. No aggregate which has water absorption more than 2 percent shall be used in the concrete mix. The aggregates shall be tested for soundness in accordance with IS:2386(Part-5). After 5 cycles of testing, the loss shall not be more than 12 percent if sodium sulphate solution is used or 18 percent if magnesium sulphate solution is used. The Los Angeles Abrasion value shall not exceed 35. The combined flakiness and elongation index of aggregate shall not be more than 35 percent.

Fine Aggregates

The fine aggregates shall consist of clean natural sand or crushed stone sand or a combination of the two and shall conform to IS:383. Fine aggregate shall be free from soft particles, clay, shale, loam, cemented particles, mica and organic and other foreign matter. The fine aggregates shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37).

Steel for Dowels and Tie Bars

Steel shall conform to the requirements of IS:432 and IS:1786 as relevant. The dowel bars shall conform to IS:432 of Grade. Tie bars shall be either High yield Strength Deformed bars conforming to IS: 1786 and grade of Fe 500 or plain bars conforming to IS:432 of Grade I. The steel shall be coated with epoxy paint for protection against corrosion.

Joint Filler Board

Synthetic Joint filler board for expansion joints shall be used only at abutting structures like bridges and shall be of 20-25mm thickness within a tolerance of ± 1.5 mm and of a firm compressible material and complying with the requirements of IS:1838, with a compressibility more than 25 percent. It shall be 25 mm less in depth than the thickness of the slab within a tolerance of ± 3 mm and provided to the full width between the side forms. It shall be in suitable lengths which shall not be less than one lane width. If two pieces are joined to make up full width, the joint shall be taped such that no slurry escapes through the joint. Holes to accommodate dowel bars shall be accurately bored or punched out to give a sliding fit on the dowel bars.

Joint Sealing Compound

The joint sealing compound shall be of hot poured, elastomeric type or cold polysulphide/polyurethane/silicone type having flexibility level 234d234eance to age hardening and durability as per IRC:57. Manufacturer's certificate shall be produced by the Contractor for establishing that the sealant is not more than six months old and stating that the sealant complies with the relevant standard mentioned below. The samples shall meet the requirements as

mentioned in IRC:57.If sealant is of hot poured type, it shall conform to Hot applied sealant: IS:1834 or ASTM : 3406-95, as applicable Cold poured sealants shall be one of the following :

- i) polysulphide IS:11433 (Part I), BS:5212 (Part II)
- ii) polyurethane BS:5212
- iii) silicone ASTM 5893-04

Proportioning of Concrete

After approval by the Engineer of all the materials to be used in the concrete, the Contractor shall submit the mix design based on weighed proportions of all ingredients for the approval of the Engineer vide Clause 602.3.4. The mix design shall be submitted at least 30 days prior to the paving of trial length and the design shall be based on laboratory trial mixes using the approved materials and methods as per IRC:44 or IS: 10262. The target mean strength for the design mix shall be determined as indicated in Clause 602.3.3.1. The mix design shall be based on the flexural strength of concrete..

Sub-base

The cement concrete pavement shall be laid over the sub-base constructed in accordance with the relevant drawings and Specifications. It shall be ensured that the sub-base is not damaged before laying the concrete pavement. If the dry lean concrete sub-base is found damaged at some places or it has cracks wider than 10 mm, it shall be repaired with fine cement concrete (aggregate size 10 mm and down) or bituminous concrete before laying separation membrane layer.

Separation Membrane

A separation membrane shall be used between the concrete slab and the sub-base. Separation membrane shall be impermeable PVC sheet 125 micron thick transparent or white in color laid flat with minimum creases. Before placing the separation membrane, the sub-base shall be swept clean of all the extraneous materials using air compressor. Wherever overlap of plastic sheets is necessary, the same shall be at least 300 mm and any damaged sheathing shall be replaced at the Contractor's cost. The separation membrane may be n'iled to the lower layer with concrete nails. The separation membrane shall be omitted when two layers of wax-based curing compound is used.

Joints

Transverse Joints

Transverse joints shall be contraction, construction and expansion joints constructed at the spacing described in the drawings. Transverse joints shall be straight within the following tolerances along the intended line of joints.

- I. Deviations of the performed filler board (IS: 1838) in the case of expansion joints from the intended line of the joint shall not be greater than ± 10 mm.
- II. The best fit straight line through the joint grooves as constructed shall be not more than 25 mm from the intended line of the joint.
- III. Deviations of the joint groove from the best fit straight line of the joint shall not be greater than 10 mm.

- IV. Transverse joints on each side of the longitudinal joint shall be in line with each other and of the same type and width. Transverse joints shall have a sealing groove which shall be sealed in compliance with Clause 602.10 of MoRT&H.

Contraction Joints

The contraction joints shall be placed transversely at pre-specified locations as per drawings/design using dowel bars. These joints shall be cut as soon as the concrete has undergone initial hardening and is hard enough to take the load of joint sawing machine without causing damage to the slab. Contraction joints shall consist of a mechanical sawn joint groove, 3 to 5 mm wide and one-fourth to one-third depth of the slab $\pm$ 5 mm or as stipulated in the drawings and dowel bars complying with Clause 602.6.5 of MoRT&H.

Contraction joint shall be widened subsequently to accommodate the sealant as per Clause 602.10, to dimensions shown on drawings or as per IRC: 57.

Expansion Joints

The expansion joint shall consist of a joint filler board complying with Clause 602.2.9 and dowel bars complying with Clause 602.6.5 and as detailed in the drawings. The filler board shall be positioned vertically with the prefabricated joint assemblies along the line of the joint within the tolerances given in Clause 602.6.2.1. The adjacent slabs shall be completely separated from each other by the joint filler board.

Transverse Construction Joint

Transverse construction joint shall be placed whenever concreting is completed after a day's work or is suspended for more than 30 minutes. These joints shall be provided at location of contraction joints using dowel bars. If sufficient concrete has not been mixed to form a slab extending up to a contraction joint, and if an interruption occurs, the concrete placed shall be removed upto the last preceding joint and disposed of. At all construction joints, steel bulk heads shall be used to retain the concrete. The surface of the concrete laid subsequently shall conform to the grade and cross sections of the previously laid pavement. When positioning of bulk head/stop-end is not possible, concreting to an additional 1 or 2 m length may be carried out to enable the movement of joint cutting machine so that joint grooves may be cut and the extra 1 or 2 m length is cut out and removed subsequently after concrete has hardened. After minimum 14 days of curing, in case OPC cement is used and 16 days of curing when flash or blended cement is used, the construction joint shall be widened to accommodate the sealant as per Clause 602.10 to dimensions shown on drawing or as per IRC:57.

Longitudinal Joint

Tie Bars

Tie bars shall be provided at the longitudinal joints as per dimensions and spacing shown in the drawing and in accordance with Clause 602.6.6. The direction of the tie bars at curves shall be radial in the direction of the radius.

Dowel Bars

Dowel bars shall be mild steel rounds in accordance with Clause 602.2.8 with details/dimensions as indicated in the drawings and free from oil, dirt, loose rust or scale. They shall be straight, free of irregularities and burring restricting slippage in the concrete. The sliding ends shall be sawn or cropped cleanly with no protrusions outside the normal diameter of the

bar. Any protrusions shall be removed by grinding the ends of the dowel bars. The dowel bar shall be supported on cradles/dowel chairs in pre-fabricated joint assemblies positioned prior to the construction of the slabs or mechanically inserted with vibration into the plastic concrete by a method which ensures correct placement of the bars besides full re-compaction of the concrete around the dowel bars.

2.37.6.4.2 Unless shown otherwise on the drawings, dowel bars shall be positioned at mid depth of the slab within a tolerance of ± 20 mm, and centered equally about intended lines of the joint within a tolerance of ± 25 mm. They shall be aligned parallel to the finished surface of the slab and to the center line of the carriageway and to each other within tolerances given here-in-under, the compliance of which shall be checked as per Clause 602.11.7 of MoRT&H.

- I. For bars supported on cradles prior to the laying of the slab:
 - a. All bars in a joint shall be within ± 2 mm per 300 mm length of bar
 - b. 2/3rd of the number of bars shall be within ± 3 mm per 500 mm length of bar
 - c. No bar shall differ in alignment from an adjoining bar by more than 3 mm per 300 mm length of bar
- II. in either the horizontal or vertical plane
 - a. Cradles supporting dowel bar shall not extend across the line of joint i.e. no steel bar of the cradle
- III. assembly shall be continuous across the joint.
- IV. For all bars inserted after laying of the slab except those inserted by a Dowel Bar Inserter the tolerance
- V. for alignment may be twice as indicated in (i) above.
- VI. The transverse joints at curves shall be radial in the direction of the radius.

Dowel bars, supported on cradles in assemblies, when subject to a load of 110 N applied at either end and in either the vertical or horizontal direction (upwards and downwards and in both directions horizontally) shall conform to be within the limits given in Clause 602.6.5.2 of MoRT&H.

The assembly of dowel bars and supporting cradles, including the joint filler board in the case of expansion joints, shall have the following degree of rigidity when fixed in position:-

- i) For expansion joints, the deflection of the top edge of the filler board shall be not greater than 13mm, when a load of 1.3 kN is applied perpendicular to the vertical face of the joint filler board and distributed over a length of 600 mm by means of a bar or timber packing, at mid depth and midway between individual fixings, or 300 mm from either end of any length of filler board, if a continuous fixing is used. The residual deflection after load shall be not more than 3 mm.
- ii) The fixings for joint assembly shall not fail under 1.3 kN load and shall fail before the load reaches 2.6 kN when applied over a length of 600 mm by means of a bar or timber packing placed as near to the level of the line of fixings as practicable
- iii) Fixings shall be deemed to fail when there is displacement of the assemblies by more than 3 mm with any form of fixing, under the test load. The displacement shall be measured at the nearest part of the assembly to the centre of the bar or timber packing.

Dowel bars in the contraction joints, construction joints and expansion joints shall be covered by a thin plastic sheath. The thickness of the sheath shall not exceed 0.5 mm and shall be tightly fitted on the bar for at least thirds of the length from one end for dowel bars in

contraction/construction joints and half the length plus 50 mm for expansion joints. The sheathed bar shall comply with the following pull-out tests:

Four bars shall be taken at random from stock and without any special preparation shall be covered by sheaths as required in this Clause, The ends of the dowel bars which have been sheathed shall be cast centrally into concrete specimens 150mm x 150 mm x 600 mm, made of the same mix proportions to be used in the pavement, but with a maximum nominal aggregate size of 20 mm and cured in accordance with IS:516. At 7 days a tensile load shall be applied to achieve movement of the bar of at least 0.25 mm. The average bond stress to achieve this movement shall not be greater than 0.14 MPa.

For expansion joints, a closely fitting cap 100 mm long consisting of waterproofed cardboard or an approved synthetic material like PVC or GI pipe shall be placed over the sheathed end of each dowel bar. An expansion space (about 25 mm) at least equal in length to the thickness of the joint filler board shall be formed between the end of the cap and the end of the dowel bar by using compressible sponge. To block the entry of cement slurry into the annular space between the sheathing and dowel bar shall be taped around its mouth,

Construction

General

A systems approach may be adopted for construction of the pavement, and the Method Statement for carrying out the work, detailing all the activities, indication of time-cycle, equipment, personnel etc., shall be got approved from the Engineer before the commencement of the work. This shall include the type, capacity and make of the batching and mixing plant besides the hauling arrangement and paving equipment. The capacity of paving equipment, batching plant as well as all the ancillary equipment shall be adequate for a paving rate of at least 500 m in one day. The paving speed of slip-form paver shall not be less than 1.0 m per minute. The concreting should proceed continuously without stops and starts.

Batching and Mixing

Batching and mixing of the concrete shall be done at a central batching and mixing plant with automatic controls, located at a suitable place which takes into account sufficient space for stockpiling of cement, aggregates and stationary water tanks. This shall be located at an approved distance, duly considering the properties of the mix and the transporting arrangements available with the Contractor.

Paving Equipment

The concrete shall be placed with an approved fixed form or slip form paver with independent units designed to (i) spread, (ii) consolidate, screed and float-finish, (iii) texture and cure the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary and so as to provide a dense and homogeneous pavement in conformity with the plans and Specifications. The paver shall be equipped with electronic sensor controls to control the line and grade from either one side or both sides of the machine.

Vibrators shall operate at a frequency of 8000-10000 impulses per minute under load at a maximum spacing of 600 mm. The variable vibration setting shall be provided in the machine.

Hauling and Placing of Concrete

Placing of Concrete

The total time taken from the addition of the water to the mix, until the completion of the surface finishing and texturing shall not exceed 120 minutes when concrete temperature is less than 25°C and 90 minutes when the concrete temperature is between 25°C and 30°C. When the time between mixing and laying exceed these values, the concrete shall be rejected and removed from the site. Tipping trucks delivering concrete shall normally not run on plastic sheathing nor shall they run on completed slabs until after 28 days of placing the concrete.

The placing of concrete in front of the PQC paver should preferably be from the side placer to avoid damage to DLC by concrete tipping trucks. In case of unavoidable situation, truck supplying concrete to the paver may be allowed to ply on the DLC with the approval of the Engineer. The paver shall be capable of paving the carriageway as shown in the drawings, in single pass and lift.

Curing

Immediately after the surface texturing, the surface and sides of the slab shall be cured by the application of approved resin-based aluminized reflective curing compound which hardens into an impervious film or membrane with the help of mechanical sprayer.

The curing compound shall not react chemically with the concrete and the film or membrane shall not crack, peel or disintegrate within three weeks of application. Immediately prior to use, the curing compound shall be thoroughly agitated in its containers. The rate of spread shall be in accordance with the manufacturer's instructions checked during the construction of the trial length and subsequently whenever required by the Engineer. The mechanical sprayer shall incorporate an efficient mechanical device for continuous agitation and mixing of the compound during spraying. The curing compound shall be sprayed in two applications to ensure uniform spread.

Curing compounds shall contain sufficient flake aluminum in finely divided dispersion to produce a complete coverage of the sprayed surface with a metallic finish. The compound shall become stable and impervious to evaporation of water from the surface of the concrete within 60 minutes of application and shall be of approved type. The curing compounds shall have a water retention efficiency index not less than 90 percent in accordance with BS Specification No. 7542 or as per ASTM C-309-81 Type 2.

In addition to spraying of curing compound, the fresh concrete surface shall be protected for at least 3 hours by covering the finished concrete pavement with tents mounted on mobile trusses as described in Clause 602.7.2, during adverse weather conditions as directed by the Engineer. After three hours, the pavement shall be covered by moist hessian laid in two layers and the same shall then be kept damp for a minimum period of 14 days after which time the hessian may be removed. The hessian shall be kept continuously moist. All damaged/torn hessian shall be removed and replaced by new hessian on a regular basis.†

The Contractor shall be liable at his cost to replace any concrete damaged as a result of incomplete curing or cracked on a line other than that of a joint as per procedure in IRC:SP:83.

6.0 Shotcreting & Epoxy Bond

For shotcreting works, the workmanship to be followed as per MORTH (5th revision) and IS: 13419 :1992. For applying epoxy bond the workmanship to be followed as per MORTH (5th revision).

6.1 EPOXY MORTAR FOR REPLACEMENT OF SPALLED CONCRETE (MORTH, 5th Revision)

6.1.1 Material Formulation

The epoxy resins for use in the mortar shall be obtained from a reputed manufacturer and the mortar shall be prepared in conformity with the manufacturer's recommendations. They shall generally conform to the following:

Pot Life : 90 minutes at 25 degrees Celsius
 60 minutes at 30 degrees Celsius
 45 minutes at 35 degrees Celsius

Bond Strength : 12 MPa

Tensile Strength : 16 MPa

The contractor shall carry out tests on the samples made out or requirements indicated above. The sand content in the mortar shall be in accordance with the desired consistency.

6.1.2 Proportioning and Mixing

The resin and hardener shall be mixed before adding the dry filler. The mixed ready to use mortar should not contain lumps of unwetted filler and should be uniform in colour. For a total weight of 1 kg or less, hand mixing will be sufficient. For quantities in excess of 1 kg, the component shall be mixed for 3 minutes with a slow speed - 400-600 rpm - electric drill with a Jiffy mixer. The stirrer shall be moved up and down and along the sides until an even streak free colour is obtained. Whipping in an excessive amount of air shall be avoided. If no power is available, a flat putty knife may be used to reach into the corners of the can and hand mixing done for at least 5 minutes.

The Surface upon which epoxy is to be placed shall be free of rust, grease, oil, paint, asphalt, loose material, unsound concrete, dust or any other deleterious material. Since cured epoxy does not provide adequate bond with any material, all overlay, whether epoxy or cement based, shall be done within pot life of the base epoxy layer.

Contaminants, such as oil, grease, tar, asphalt, paint, wax, curing compounds or surface impregnants like linseed oil or silicones, including laitance and weak or loose concrete shall be removed. When bonding to asphalt, the surface should be roughened so that clean aggregate is exposed. Epoxy bonding agents shall not be applied when it rains, or in standing water. The surface must be dry.

Two general methods of surface preparation shall be followed :

- a) Mechanical that includes grinding, grit blasting, water blasting and scarification,

- b) Chemical that includes acid etching with 15 per cent by weight of hydrochloric solution, followed by repeated flushing with high pressure stream of water.

6.1.3 Application

Epoxy primer coat shall be applied with the help of stiff nylon bristle brushes or hard rubber rollers or spray gun depending upon the nature of surface and extent of work area. As far as possible, the coating shall be uniformly thick. Before the primer coat is fully cured, epoxy mortar shall be applied by means of trowels and floats. The interval between the application of primer coat and epoxy mortar shall be approximately 15/30 minutes depending upon the ambient temperature. Seal Coat shall be applied after 24 hours curing, after mild roughening of the surface of the mortar.

Coverage: The coverage of resin mix would depend on the system of resin used. However, as a general guideline the coverage area shall be as under :

- a) Primer Coat. One kg of resin-hardener mix covers an area of 3-6 square metres per coat depending on the finish of the concrete,
- b) Epoxy Mortar. One square metre of surface requires approximately 20- 24 kg of epoxy mortar when laid to a thickness of 10mm.
- c) Seal Coat. 4 to 6 square metres per kg of mix depending on the temperature of application.

6.1.4 Cleaning and Maintenance of Equipment

Tools and equipment are best cleaned immediately after use since the removal of cured resin is difficult and time consuming. The bulk of resin shall be removed using a scraper and remainder washed away completely using solvents such as toluene, xylene or acetone. Equipments used for epoxy shall always be cleaned before it hardens. Solvents used for this purpose may be Acetone (flammable), Methyl Ethyl Kethone (flammable), Methyl Chloride (non-flammable). Cured epoxies may be removed using Methylene Chloride.

6.1.5 Handling Precautions

Epoxy resins can cause irritation of skin in sensitive persons if incorrectly handled. The resin and hardener should not be allowed to come into direct contact with skin. The most effective protection is achieved by wearing rubber or polythene gloves.

6.1.6 Personnel and Environment Safety

Any skin contact with epoxy materials, solvents and epoxy strippers should be avoided. Epoxy resins and particularly epoxy hardeners (B component) may cause a rash on the skin. The official toxicity classification on the container labels may be looked for before starting work. Rubber gloves, with a cloth liner, and protective clothing shall be worn. Barrier creams are recommended but are not substitutes for protective clothing. Eyes shall be protected where splashing could occur while spraying or mixing. Good ventilation shall be ensured and inhalation of vapours avoided. If materials are sprayed, a respirator shall be used. If skin contact occurs, it shall be immediately washed with a cleaner, followed by soap and water. Should eye contact occur, it shall be flushed immediately with plenty of water for 15 minutes and a doctor called for. If contact occurs with the clothing, it shall be

immediately changed to prevent further skin contact, and if the contact occurs with components A or B, the clothing shall be thrown away. Hardened epoxy is not harmful but will break the clothing. All emptied, used buckets, rags and containers shall be removed from site. These shall be stored in waste disposal bags and suitably disposed

6.2 EPOXY BONDING OF NEW CONCRETE TO OLD CONCRETE

Epoxy resin used for bonding shall be obtained from a reputed manufacturer. The pot life of such bonding epoxy shall not be less than 60-90 minutes at normal temperature.

The entire surface of the existing concrete member should be thoroughly cleaned by wire brush and then with compressed air to remove dust and loose particles from the surface. Any crack or spalling of concrete shall be scaled by epoxy injection/epoxy mortar/grouting as decided by the Engineer. A coating of suitable epoxy resin at the rate of 0.8 kg/sq.m. (minimum) should then be applied on the surface of the existing concrete members. Fresh concrete shall then be placed within the pot life of the resin system.

6.2.1 Testing

Epoxy used for bonding work shall satisfy the criteria mentioned in Clause 2803.9 of MORTH 5th Revision.

Two concrete cubes 150 mm ^{size} cast as per approved design mix shall be placed at a distance of 150 mm from each other. Epoxy resin system suggested for bonding new to old concrete shall be applied on the opposite faces of the cubes. Fresh cement concrete cube of grade as per approved design mix shall be cast with water cement ratio of 0.4 or less in the manner shown in Fig. 2800/3. The assembly shall be cured in water for 28 days and steel spacer removed thereafter. The cube assembly shall be subjected to compression load after 28 days of curing, thereby subjecting the bond to shearing load. Failure must not occur at this joint.

7. CEMENT GROUTING

7.1 Material

Grouting shall normally be performed with a mixture of neat Portland Cement and water. Other additives and admixtures may be added to improve the impermeability, strength, etc. on the approval of the Engineer. The size of the particles and the consistency of the grout must be suited to the passageways it must follow. Neat grout will not flow freely into holes smaller than about three times the largest cement particle. Except in large cavities where thick mortar can be placed, the sand should all pass the 28-mesh sieve and have a large portion passing the 50- and the 100- mesh sieves. The proportions of Ordinary Portland Cement to sand will depend upon the size of the spaces to be filled and will vary from a neat grout to about 1:1 mix. The amount of water to be added depends upon the consistency required. Grouts with as little as 16 litres of water per bag of cement could be handled and it should seldom be necessary to use more than 35 to 40 litres of water per bag of cement.

Where necessary and approved by the Engineer, admixtures to Portland Cement grout mixtures may be added for delaying the setting time, increasing flow ability, minimising segregation and shrinkage.

7.2 Preparation

The surface shall be cleaned with wire brush and compressed air, 15 mm dia and 150 to 200 mm deep holes along the length of the cracks at a spacing of 500 mm may be drilled by wet drilling using rotary percussion drills and nipples, inserted in these holes.

7.3 Proportioning, Mixing, and Equipment for Grouting

The cement grout shall be mechanically mixed using a system of power-driven paddles of high speed centrifugal pump. The grout pump to be used shall permit close control of pressures to allow a flexible rate of injection with minimum clogging of valves and ports. The most satisfactory equipment for injecting grout is a pump of the double-acting flexible reciprocating type giving a steady flow. The grout pump shall be so placed as to reduce the waste in cleaning lines. It is preferable to add 50 per cent or more of the mixing water into the mixer before adding the dry ingredients and then the remaining water. A continuous supply of grout is preferable to an intermittent one. Consistency of the grout may be determined by trials starting with thin grout i.e. about 40 litres of water per bag of cement and progressively decreasing the water content to about 15 litres per bag of cement.

Where the mixer and pump are combined in one unit, the dry material shall be screened before mixing. If the mixer and pump are in separate units, the grout shall pass through a screen before it enters the pump.

7.4 Application

Highest practical pressure within the limits 100-400 kPa should be used in order to force the surplus water from the grout. As the pressure may be distributed hydraulically over considerable areas, vigilance must be exercised to prevent damage or the needless waste of grout. Grouting is to be done by attaching a packer (consisting of expansible tube of rubber) to the end of the grout supply pump through the holes and nipples. Pressure shall be steady to ensure a continuous flow of grout. Grouting shall not be continued till the hole consumes mix at the rate of not less than 30 litres in 20 minutes or until refusal at the grouting pressure of 400 kPa at any hole until refusal. Should the grout escape from an adjacent nipple, it should be plugged or capped. Any seam, crack or joint through which grout escapes shall be caulked with epoxy mortar as soon as thick grout appears.

7.5 Cleaning of Equipment

After completion of each grouting operation or temporary shutdown, it is advisable to force clear water through the pump until the discharge line shows no colour, after which the pump covers shall be removed and the valve chambers thoroughly cleaned.

7.6 Testing

Percolation test done at the end of grouting operation shall give a value of less than 2 lugions. For Specialized treatment like polymer modified cementitious groin injection, manufacturer's literature and specification shall be followed.

8. MICRO CONCRETE

8.1 Preparation before repair

All exposed reinforcement shall be cleaned of cement deposits and any corrosion products by wire brushing blasting or other approved means to achieve a surface finish acceptable by the Engineer. Reinforcement damaged during the removal of concrete or the preparation process shall, if required by the Client/Consultant, be repaired or replaced.

8.2 Final Cleaning

It is essential that the cleaning process is complete. To ensure this, a final wash down of the concrete substrate and reinforcement shall be carried out to ensure the removal of all residual contamination. After cleaning the reinforcement shall be kept free from contamination and concrete replaced within 3 days.

8.3 Cracked Concrete Repair in Large voids

Adequate formwork shall be provided in accordance with the relevant codes of practice. This shall be securely fixed to withstand the hydraulic pressures of the fluid micro-concrete repair material without distortion or movement during placement. Formwork shall be watertight at all joints between panels and between the formwork and the existing concrete surface so as to prevent grout leakage. The formwork is to be constructed from appropriate materials agreed with the Supervising Officer to achieve the required finish. Formwork surfaces that are to be in contact with the repair micro-concrete shall be treated with a suitable mould release agent such as Reebol. This shall be used in accordance with the manufacturer's recommendations. Sufficient hydrostatic head or pumping pressure shall be maintained to ensure that the void is filled completely and no air remains entrapped. Where necessary, provision shall be made for controllable bleed points to prevent air entrapment and enable the extent of flow of the concrete repair material to be assessed.

8.4 Properties of Concrete repair materials

The cementitious free flowing micro concrete shall be RenderocLAX_{tra}, or any such material, and shall be shrinkage-compensated in both liquid and cured states, contain no metallic expansion system. It shall be pre-packed and factory quality controlled to ISO 9001 and ISO 14001 accreditation. It shall have a maximum equivalent sodium oxide content of 3 kg/m; (UK Department of Transport Specification for Highway Works 1986, Clause 1704.6), be a

Property	Test method	Results
Drying shrinkage	ASTM C157-93	< 300 microstrains @ 7 days <500 microstrains @ 28 days
Permeability	DIN 1048 Part 5	< 10 mm
Flextural strength	BS 6319 Pt. 3	>9 N/mm ² @ 28 days
Typical Compressive strength - N/mm ²	BS 1881 Pt.116	39 @ 3 days 45 @ 7 days 60 @ 28 days
Tensile strength	BS 6319 Pt. 7	> 5 N/mm ² @ 28 days
Water absorption	BS 1881 Pt. 121	< 2 %

free flowing cementitious material that has a coefficient of thermal expansion fully compatible with the host concrete and which complies with the following requirements:

8.5 Placing of Concrete

The micro-concrete shall be mixed and placed in accordance with manufacturer's recommendations, particularly with regard to water cement, mixing equipment and placing time. The placing of the micro-concrete shall be, far as possible, continuous. The mixing operation shall be timed so that there is minimal interruption in the material flow. If however placing is interrupted, the operation shall recommence as soon as possible while the repair material retains its flow characteristics.

8.6 Formwork removal

The formwork shall not be removed until the repaired concrete area with micro- concrete has achieved a compressive strength of at least 10 N/mm² or as directed by the supervising officer.

8.7 Curing

Immediately after the removal of the formwork the repair area shall be cured in accordance with good concrete practice by the use of high efficiency spray applied curing membranes such as Concure 90 or Concure WB or other approved methods. Details of the methods of curing shall be submitted for approval where required.

9. POLY IRONITE CERAMIC CEMENTITIOUS (PICC) MORTAR

9.1 APPLICATION

Providing & Applying UV resistant ,high strength, non shrink , High abrasion resistant, impermeable (K<10 -12),Chemical resistance Non Toxic, self curing Poly Ironite Ceramic Cementitious (PICC) , PICC consist of Nicomix 100 admixed with fresh Cement 53 grade repair mortar for concrete dams or hydraulic structures by resurfacing up to 10 mm thickness Including removing loose mortar from surface, cleaning of lift joints, honey

combing area by breaking using manual and / or mechanical means, removing of existing embedded M.S. bar if any , cleaning the construction joints if any , The existing surface and inside of honey combing are to be clean with a special chemical I.eSteripure 100 for removal of algae- fungi finally to be clean the surface with high pressure .

Applying a bond coat of special type of water miscible primer i.eKelox R101 + Kelox H 404 suitable to bond old to new concrete and concrete to rock for required bond strength before application of PICC mortar, providing a poly ceramic top coat i.eNicCoat Pc + kelmer A 80 after finishing, complete as per specification including materials, machinery, labour, scaffolding, hire charges of cranes, insurance charges transportation with all leads and lifts as directed by the Engineer in charge

9.2 Mixing Procedure (PICC)

PICC mortar

Take 60 % of Nicomix 100 and mix it with 35% of 53 grade OPC cement by weight till uniform colour of mix. Add 5% to 8% of potable water till a homogeneous workable mix is obtained. Avoid mixing at temperature above 30°C

Kelox water miscible Primer (bonding old to new)

Take two part of Kelox R 101 and one part of Kelox H 404 by weight. Stir the mix gently to avoid air bubbles. Hand mixing is preferred. Quantity of mix shall be moderate.

Top Coat

Poly Cementitious Coat is a two-pack system containing NicCoat PC, a blend of Cement, Active Ceramic and modified polymers Kelmer A 80, an Acrylic Base Polymer.

10.0 Dismantling of existing structures like culverts, bridges, retaining walls and other Structures

This work shall consist of Dismantling of existing structures like culverts, bridges, retaining walls and other structures comprising of masonry, cement concrete, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead of 1000 m by Manual means. The structures from the right of way which in the opinion of the Engineer interferes with the works 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.

Dismantling and removing operations shall be carried out with such equipment and in such a manner as to leave undisturbed, 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. The structures shall be dismantled carefully and the resulting materials so removed as not to cause any damage to the part of the structure to be retained and any other properties or structures nearby.

Unless otherwise specified, the superstructure portion of the culverts / bridges shall be entirely removed and other parts removed up to at least 600mm below the sub-grade, slope face or original ground level whichever is the lowest or as necessary depending upon the interference they cause to the new construction. Removal of overlying or adjacent material, if required in connection with the dismantling of the structures, shall be incidental to this item.

Where existing structures are to be extended or otherwise incorporated in the new work, only such part or parts of the existing structure shall be removed as are necessary and directed by the Engineer to provide a proper connection with the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging any part of the structure to be retained. Due care should be taken to ensure that reinforcing bars which are to be left in place so as to protect into the new work as dowels or ties are not injured during removal of concrete. Structures involving pipes shall be carefully removed in such a manner as to avoid damage to the pipes.

Steel structures shall, unless otherwise provided, be carefully dismantled in such a manner as to avoid damage to the members thereof. If specified in the drawings or directed by the Engineer that the structure is to be removed in a condition suitable for re-erection, all members shall be match-marked by the Contractor with white lead paint before dismantling; end pins, nuts, loose plates etc shall be similarly marked to indicate their proper location; all pins, pin holes and machined surfaces shall be painted with a mixture of white lead and tallow and all loose parts shall be securely wired to the adjacent members or packed in boxes.

10.1 Backfilling

Holes and depressions caused by dismantling operations shall be backfilled with excavated or other approved materials and compacted to required density as directed by the Engineer.

10.2 Safe Disposal of Materials

All materials obtained by dismantling shall be the property of Government. Unless otherwise specified, materials having any salvage value shall be placed in neat stack of like materials within the right of way, as directed by the Engineer with all lifts and up to a lead of 1000m.

Pipes that are removed shall be cleaned and neatly piled on the right of way at points designated by the Engineer with all lifts and lead up to 1000m.

Structural steel removed from old structures shall, unless otherwise specified or directed, be stored in a neat and presentable manner on blocks in locations suitable for loading. Structures or portions thereof, which are specified in the Contract for re-erection, shall be stored in separate piles.

All materials obtained from dismantling operations, which, in the opinion of the Engineer, cannot be used or auctioned, shall be disposed of as directed by the Engineer with all lifts and up to a lead of 1000m.

10.3 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. These will also include excavation and backfilling where necessary to the required compaction and for

handling, salvaging, piling and disposing of the dismantled materials within all lifts and up to a lead of 1000m.

11. ARTIFICIAL STONE FLOORINGS:

The artificial stone flooring shall be laid **in panels of shape and size as directed**. The casting of the panels will be so programmed as to prevent bonding of the freshly laid panel with adjacent panels. Unless otherwise specified, the underlay shall be with graded stone chips 12 mm. down, the thickness of topping shall be of 3mm. thick and colouring pigment as may be required shall only be added with the topping. The topping and the underlay shall not be laid in one operation. After laying the Underlay 'the surface shall be left out to dry. The topping shall be laid only after the underlay has sufficiently dried and initially set and after thoroughly brushing with hand wire brush and sweeping clean and after application of slurry. The topping shall be finished with an English trowel and a piece of clean dry linen. During all the stages, the required level shall be carefully observed and maintained. Suitable grading, where required, shall be provided in the flooring for water drainage as directed by the Engineer- in-Charge.

The corner between floor and wall shall be rounded off if so directed by the Engineer-in-Charge for which no separate payment shall be made. All cement concrete surface should be chipped off properly before taking up the flooring work.

12. RAIN WATER PIPES:

The rain water pipes shall be of the materials and of the sizes as specified. All rainwater pipes shall have suitable grating as directed at the inlet opening at roof and shall be fitted and fixed in proper position with necessary offsets, clamps, shoe, Y-junctions and other accessories as required and as directed by the Engineer-in- Charge. The pipes are to be fixed to walls in cement mortar (1: 4 with necessary clamps and nails, suitable teak wood blocks being fixed on the walls to receive the nails. Y- Junction shall be used at the top of the pipe and the vertical leg thereof shall be provided with a cowl. All joints are to be properly packed. In case the hole is made much larger than the size of the pipe, cement concrete (1:2:4) shall be used to fill the annular space. The pipes with fittings etc. are to be painted with 2 coats of paints as approved by the Engineer-in-Charge.

13. WHITE WASHING, COLOUR WASHING:

Preparation of surface: All surfaces for white washing, color washing, painting shall be thoroughly brushed free from mortar droppings and foreign matter and prepared to the satisfaction of Engineering-Charge, before application of the treatment Before white washing all the nails etc. have to be removed from the walls and all nail or other holes, small depressions or damages in plaster of wall surface shall be filled or repaired to original condition with lime paste.

Old surfaces spoiled by smoke and greasy shoots shall be sprinkled with surki and water and rubbed with brickbats or steel wire brushes or steel scrapers. The surface shall then be boomed to remove all dust and shall be washed with clean water.

Preparation of white wash: The white washing is to be done with 5 parts of stone lime and one part of shell lime with necessary gum (2 Kg. per Cu.M. of lime) using indigo as necessary and to be mixed as per standard practice.

Preparation of colour wash: Colour washing shall have a primer of white wash and shall be of shades approved by the Engineer-in-Charge, sufficient quantity of colour wash enough for complete job shall be prepared in one operation to avoid any difference in shade.

Procedure and preparation of the surface shall be same as in white washing.

Application of white wash and color wash : The operation for each coat shall consist of four consecutive strokes of the brush, one horizontally from right to left and the next from left to right and the third stroke bottom to upward and the fourth from top to down ward before the previous stroke dries. Each coat shall be allowed to dry before the next coat applied. No portion of the surface shall be left out initially to be patched up later on. The brush shall be dipped in white wash or color wash, pressed lightly against the wall of the container and then applied by lightly pressing against the surface with full swing of hand. The white wash on ceiling should be done prior to that on walls.

Protective Measures : Surfaces of doors, windows, floors, articles of furniture, beams, burghs etc. and such other parts of the building not to be white or colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white or color wash splashes, if any.

14. PAINTING:

All surfaces for painting shall be properly sand papered and cleaned and where necessary good quality putty shall be used to hide all holes, cracks, open joints etc. The rate for painting includes such work. Paint shall be applied with approved brushes and surfaces shall be sand papered after every coat. All work when completed shall present a smooth, clean solid and uniform surface, to the satisfaction of the Engineer-in-Charge.

(a) Primer: All surfaces for painting, if they are new, should have a coat of priming before application of the paint. Old surfaces where existing paints have been completely worn out owing to long use should also receive a coat of priming before application of fresh painting.

(i) Wood primer: Wood primer of approved brand and manufacture is to be applied on the wooden surface, which would be free from moisture and loose particles.

(ii) Steel Primer: For steel surface red oxide primer, zinc chromate primer of approved brand and manufacture and as per direction of the Engineer-in-Charge is to be applied on the surface. The surface should be made free of grease, rust, moisture and loose particles.

(iii) Acrylic Primer Coat (solvent based Primer) : Acrylic primer coat is to be used as base coat on wall finish of cement, lime or lime cement plaster surface before

application of any wall coating e.g. distemper, oil based paints, synthetic enamel, acrylic emulsion etc. on them. Priming coat shall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided particularly on absorbent surface. New plaster patches in old work before applying distemper paints etc. should also be treated with acrylic primer. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of paris mixed with water on the entire surface including filling up the undulation and then Sand papering the same after it is dry. The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first, vertical strokes shall be applied immediately afterwards. The entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

- (b) **Synthetic Enamel Paint:** Synthetic enamel paint of approved brand and manufacture and of the required shade shall be used for the top coat and an undercoat of shade to match the coat as recommended by the manufacturer shall be used. Undercoat of the specified paints of shade suited to the shade of the top coat shall be applied and allowed to dry overnight. It shall be rubbed next day with the fine grade of wet abrasive paper to ensure a smooth and even surface free from brush marks and all loose particles dusted off. Top coats of specified paint of the desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.
- (c) **Aluminum Paint:** Aluminum paint of approved brand and manufacture shall be used. The paint comes in compact dual containers with the paste and the medium separately. The two shall be mixed together to proper consistency before use. Each coat shall be allowed to dry for 24 hours and lightly rubbed down with fine grade sand paper and dusted before the next coat is applied. The finished surface shall present an even and uniform appearance. As aluminum paint is likely to settle in the container, care shall be taken to frequently stir the paint during use. The paint shall be applied and laid off quickly, as surface is otherwise not easily finished.
- (d) **Interior Acrylic Emulsion Paint:** Acrylic emulsion paint are not suitable for application on external surface and surface which are liable to heavy condensation and are be used generally on internal surface. For plastered surfaces a cement priming coat is required before application of acrylic emulsion. Acrylic emulsion paint of approved brand and manufacture and of the required shade shall be used. The paint will be applied in the usual manner with brush or roller. The paint dries by evaporation of the water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time for drying varies from one hour on absorbent surfaces to 2 to 3hours on non-absorbent surfaces. **The thinning of emulsion is to be done with water and not with turpentine.** Thinning with water will be particularly required for the undercoat, which is applied on the absorbent surface. The quantity of thinner to be added shall be as per manufacturer's instructions. The surface on finishing shall present a flat, velvety,

smooth finish. If necessary more coats will be applied till the surface present a uniform appearance.

Precautions:

- (i) Old brushes if they are to be used with emulsion paints should be completely dried of turpentine or oil paints by washing in warm soap water. Brushes should be quickly washed in water, immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.
- (ii) In the preparation of walls for Acrylic emulsion painting, an oil base putty shall be used in filling cracks, holes etc.
- (iii) Splashes in floor etc. shall be cleaned out without delay as they will be difficult remove after hardening.
- (iv) Washing of surfaces treated with emulsion paints shall not be done within 3 to 4 weeks of application.

15. DOOR, WINDOW FRAMES AND SHUTTERS:

(a) Wooden Section:

All doors, window frames must have plaster rabbit 12 mm x 12 mm. and rabbit for receiving shutter at least 15 mm deep. Wood work shall not be painted, oiled or otherwise treated before it has been approved by the Engineer-in-Charge. All portion of timber abutting against or embedded in masonry or concrete shall be painted with boiling coal-tar, before being placed imposition. In place of coal-tar, use of approved wood primer shall be permitted. In case of doorframes without sills, the vertical members shall be buried in floor 40 mm. deep. Where sills are provided, these sills shall be sunk in the floor to 40 mm. depth and shall rest on damp-proof course. Sills shall be provided, where so directed. The door frames without sills while being placed in position shall be provided with temporary wooden bracing or dry bricks well wedged between the styles at the sill level. These shall be retained to keep the frames from warping during construction. The frames shall also be protected from damages during construction. The shutters shall be so fixed that while closing, the left hand leaf of the shutter is closed first and the right hand leaf of shutter overlaps on the left hand leaf. The overlapping shall be minimum 20 mm. Solid wood panels shall be made out of one or more pieces of timber of not less than 125 mm. in width. In order to avoid warping, splitting and cracking, normally piece not exceeding 200 mm. in width should be used. When made from more than one piece, the pieces shall be joined with continuous tongued and grooved joints glued together and reinforced with metal dowels. The grains of the solid panel shall run along the longer dimension of the panel. The corners and edge of panels shall be finished as shown in drawings and these shall be feather tongued into styles and rails. Sash bars shall have mitered joints with styles. In measuring the width and thickness of styles and rails, a tolerance can be allowed up to 1 mm. Styles and rails shall be properly and accurately mortised and tanned. Rails which are more than 180 mm. in width shall have two tenons. Styles and end rails of shutters shall be made out of one piece only. Lock and intermediate rails exceeding 200 mm. in width may be made out of one or more pieces of timber, but the width of each piece shall not be less than 75 mm. Where more than one piece of timber are used, they shall be joined with a continuous tongued and grooved joint glued together and reinforced with metal dowels at regular intervals not exceeding 200 mm. or pinned with not less than three 40 mm. rust proof pins of the lost heads type. Jointed pieces of timber

shall belong to the same pieces. The tendons shall pass clear through styles. When assembling a leaf, styles shall be left projecting as a horn. The styles and rails shall have 12 mm. grooves impaneled portion for the panel to fit in. The joinery work shall be assembled and passed the Engineer-in-Charge and then the joints shall be pressed and secured by bamboo pins of about 6mm. diameter. The horns of styles shall be sawn off.

Glass panes shall be fixed by wooden beading having mitered joints. A thin layer of putty shall be applied between glass panes and sash bars and also between glass panes and the beading. Fixing of glass panes with simple putty and beads shall not be permitted. Putty shall be prepared by mixing one part white lead with three parts of finely powdered chalk and then adding boiled linseed oil to the mixture to form a stiff paste.

B-15 Schedule of Fittings:

- (i) Fittings shall be of iron, aluminum or as specified. These shall be well made, reasonably smooth and free from edges, corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws. All hinge pins shall be of steel and their riveted heads shall be well formed.
Iron fitting shall be finished bright or copper oxidized. Brass fittings shall be finished bright (brass), oxidized or chromium—plated (electro-plated) and aluminum fittings shall be finished bright or anodized or as specified. Fittings shall be got approved by the Engineer- in charge before fixing.
- (ii) Screws used for fittings shall be of the same metal and finish as the fittings; however anodized brass screws or chromium brass screws shall be used for fixing aluminum fittings.
- (iii) Fittings shall be fixed in proper position as shown in the drawings or as directed by the Engineer-in-Charge. These shall be truly vertical or horizontal as the case may be. Screws shall be driven home with screwdriver and not hammered in. Recesses shall be cut to exact size and depth for the counter -sinking of hinge.

16. ANTI-TERMITE WOKS:

PURPOSE:

The purpose of this procedure is to prepare construction method of Anti-termite Treatment as per specification.

SCOPE:

This procedure covers the material and method of accomplishing pre constructional anti-termite treatment of soil for protection of buildings against the attack by subterranean termites with the usage of chemical emulsions in accordance with the procedure / Manufacturer Specification laid down.

A record of chemicals obtained in sealed containers shall be maintained and duly signed by contractor & EIL/OWNER.

MATERIALS:

The materials used for post construction anti- termite treatment shall generally conform to IS: 6313 (part III), unless specified otherwise. The chemical to be used for soil treatment shall be any one of following, Chlorpyrifos emulsifiable concentrate 1% conform to IS 8944.

Chlorpyrifos 20 EC shall be used for treatment with dilution of chemical will be 1:19 with water.

A record of chemicals obtained in sealed containers shall be maintained and duly signed by contractor.

METHODOLOGY:

The treatment shall be carried out by the licensed or an approved agency that are specialized in this field. Chemicals shall have relevant test & batch certificates and within expiry date. The work shall be carried out in compliance with IS: 6313. In case of any contradiction, EIL specification shall govern.

Chemicals are properly stored as per manufacturer's requirement .MRIR to be prepared before issuing the material at site for consumption.

Site Preparation: Prior to start of chemical treatment, area(s) shall be made free from logs, stumps, timber off cuts, leveling pegs, roots of plants/trees etc. Treatment shall start when foundation trenches/pits are ready to take concrete/masonry in foundations and plinth ready for laying the sub-grade. Treatment shall not be carried out when it is raining or the subsoil level is at the same or higher than the level of treatment. In the event of water logging of foundations, the water shall be pumped out and the chemical emulsion applied when the soil is absorbent.

Treatment of the excavated pits/trenches and backfill for Foundations:

- The bottom surface and the lower 300 mm side surfaces of the excavated pits/trenches for foundations of masonry works and RCC plinth beams supporting such masonry works shall be treated with chemical emulsion @ 5 litre/m² of the surface area. However no such treatment shall be required in case of pits/trenches laid for RCC foundations supporting RCC walls or columns.
- On completion of construction of masonry foundations, the backfill in immediate contact with the substructure shall be treated in layers, of 300 mm, with emulsion @ 7.5 litre/m² of the vertical surface of the substructure i.e. $7.5 \times 0.30 = 2.25$ litre/m of perimeter for each side. The treatment shall be given after ramming of each layer of soil, by roding the earth at 150 mm centers and working the rod backward and forward (parallel to the wall surface) and the spraying the specified dosage of emulsion.
- The emulsion shall be directed towards the masonry surfaces so that the soil in contact with these surfaces is well treated with the chemical. After the treatment, the soil shall be tamped back into the place. This shall be done for full depth of fill.
- For RCC walls and columns, the treatment as specified in (b) shall start from a depth 500 mm below the finished ground level, and shall be done up to the FGL.

Treatment of Plinth/Basement and Apron

- The top surfaces of the consolidated earth below the non-suspended floor slabs and the peripheral aprons of widths up to 750 mm, the bottom surface and the side surfaces of the excavated pits for the basements shall be treated with chemical emulsion @ 5 litre/m² of the surface area. Holes 50 to 75mm deep at 150mm centers, both ways, shall be made on surface with 12mm dia mild steel rod and then emulsion shall be sprayed uniformly over the area. At expansion joint locations, anti-termite treatment shall be supplemented by treating through the expansion joint @ 2 litre/m of the joint after the sub-grade has been laid.
- Treatment of junction of plinth filling and wall/column faces shall be done after making a small channel 30mm X 30mm, by making rod holes 150mm apart (up to the natural or original ground level) in the channel and then by moving the rod backward and forward to break up the Earth. The chemical emulsion shall be poured along the channel @ 7.5 litre /m² of the vertical wall/column surface so as to soak the soil right to the bottom. The soil shall be tamped back into place after the treatment.

Treatment of Soil along External Perimeter of Building:

After the building is complete, the earth along the external perimeter of building shall be treated as follows.

The earth shall be rodded @ 150mm intervals to a depth of 300mm by moving backward and forward parallel to the wall surface.

The chemical emulsion shall be poured along the wall @ 7.5 litre/sqmtr of vertical surface. (I.e. $7.50 \times 0.30 = 2.25$ litre/sqmtr of the perimeter). Then the earth shall be tamped back into place. For critical areas such as openings of electrical cables, drains, junction of floor with column and walls shall be treated up to 300mm depth at the rate of 7.5 litre/m² of vertical surfaces.

Treatment of Soil under Floors:

Chemical Treatment shall be provided within the plinth area on ground floor by spraying prepared solution at a rate of 5lit/m² of vertical areas adjoining to walls coming from foundation, upto depth of 300mm by providing holes at an interval of 150mm before laying of floor slab.

No future removal and/or deposition of soil from the treated areas are allowed to cut the termite proof soil layer.

The holes shall be sealed by the same treated soil.

17.0 For S & P Works – General Specification**EXECUTION**

General -- All works shall be carried out in prop– manner. Items of works not covered by the following shall be carried out as per direction of the Engineer-in-Charge and to his satisfaction. Unless otherwise specified in this Section or in the description of item the cost of all stages of works mentioned hereunder shall be deemed to have been included in the rates of items provided in the Schedule.

17.1G.I. Tank:

Before acceptance of any G.I. Tank, proper scrutiny as to the thickness of the sheets should be made. Due check should also be made on each face of the tank by punching holes to be subsequently mended and hermetically sealed by the contractor without any extra charge being paid on this account by Department. Thickness of M.S. Sheet is exclusive of galvanizing.

17.2 Flushing Cistern:

Flushing Cistern of I.P.W.C. & E.P.W.C. will be 10 litre pull and let low down cistern types as specified. Flush pipes for urinals shall be made of G.I. Pipes of Polythene pipes with fittings or lead pipes as may be directed by the Engineer-in-Charge. Flushing cistern of urinals shall be of approve type. All flush pipes and cisterns shall have to be painted with 2 coats of paint of approved shade and brand over a coat of approved primer. The inlets of sanitary fittings and equipments to be connected with the adjacent distribution line (water supply) with requisite lengths and size of P.V.C. connection pipe is to be provided with necessary unions at both ends within the quoted rates of respective items. Cost of these P.V.C. connection pipe will be paid separately.

17.3 Fittings for G.I. Pipes:

All G.I. Fittings will be of approved make. For installation of G.I. pipe line all fittings and specials as may be necessary shall have to be fitted and fixed to the line.

17.4 Joints:

The joints of pipes, fitting & accessories shall be made as specified and unless otherwise specified, no separate payment shall be allowed.

(i) G.I. Pipes fitting, valves and cocks with jute and white lead paint.

(ii) C.I. Soil pipes & fittings: The jointing shall have to be done by either of the two methods as specified :

(a) The half of the depth of the annular space between spigot and socket shall be packed with spun yarn and the remaining half to be filled up with molten lead well caulked with caulking tools.

(b) The half of the depth of the annular space between spigot and socket shall be packed with tarred gasket and the remaining half will be filled up three quarters with void and the top quarter with cement mortar (4:1) and shall be finished beveled at 45°.

(i) Stone Ware Pipes & Fittings : The half of the depth of the annular space between socket and spigot shall be packed with tarred gasket and the remaining half shall be filled up with Cement mortar (3:1) & shall be finished beveled at 45°.

(ii) C.I. Water mainline: The jointing shall have to be done with Tyton joints as per manufacture's specifications.

17.5 Test of pipe lines valves and cocks:

The pipe lines, valves and cocks shall be tested at the contractor's expenses for which no extra payment shall be allowed. The available water supply sources may however be allowed to be utilized for testing but in absence of any such arrangement the contractor shall have to conduct the following tests.

(i) C.I. Water main pipe line : The pipe shall have to be tested at least for designed working pressure.

(ii) C.I. soil pipe line : Smoke test.

(iii) S.W. Pipe line : All sections between two inspection pits shall have to be tested separately. The funnel shall be at least 1.3 meter above the soffit of the S.W. pipe at the upper inspection pit.

Any defect or defects detected during testing shall be rectified at the contractor's expenses.

17.6. Septic Tank:

Construction of septic tank shall be done as per approved design. After completion of the tank, the tank shall have to be filled up with clear water after removing any foreign materials from the inside of the tank, if any. No separate payment shall be allowed on this account.

17.7. Painting:

All pipes (G.I., C.I. water main and soil) and fittings shall have to be painted outside with two coats of paint of approved brand and shade.

17.8 MODE OF MEASUREMENT

17.8.1 G.I., C.I. Water main & Soil, S.W. Pipe line:

All the pipe lines shall be measured in fitted condition along the central line of the exposed surface.

17.8.2. Strainer:

The strainer as used in the Tube-Well shall be measured in fitted condition along the central line of the exposed surface.

17.8.3. Boring of Tube-Well:

Boring for tube-wells always shall have to be done by the contractor's pipe. In no case Departmental pipes or the pipes which will be actually lowered shall be used for the purpose of boring. Labour rate of boring is inclusive of hire charge of boring pipes. Generally measurement of the boring will be taken on the basis of the finished length of the tube well from the ground line. If for some special reasons, boring depth is required to be more than the finished length of the tube-well, previous permission of Engineer-in-Charge is to be taken to get the payment of extra boring in excess of the finished length.

18.0 Technical specifications and requirements of the Gates and its Hoisting System:

The requirement of the operation of the canal gates and replacement of the existing gates wherever required. The technical specification and IS standards for the work are as follows:

18.1 Gate Systems. (Brief Overview)

Hydraulic gates are used to control water flow in dams, barrages, canals, rivers, and drainage channels. They work by moving a closure member (gate leaf) across the waterway to regulate the flow. The main types of gates used are **Vertical Lift Gates**, **Radial Gates**, **Flap Gates**, and **Fall Board Gates**. Most gates are **Low Head Gates** ($\text{head} \leq 15\text{m}$), with some being **Medium Head Gates** ($15\text{m} < \text{head} \leq 30\text{m}$).

Components of a Gate System

A gate system consists of three main parts:

1. **Embedment and Fixed Parts:** Include sill beam, track plate, seal seats, liners, gate body, gland stuffing box, etc.
2. **Gate Leaf:** Movable part of the gate, consisting of skin plate, stiffeners, girders, wheel/slide assembly, and seals.
3. **Control Equipment:** Includes Screw Hoist, Rope Drum Hoist, Hydraulic Hoist, EOT Crane, and Gantry Crane.

A. Vertical Lift Gate

- Operates in a vertical direction using a flat plate (skin plate) supported by horizontal girders and vertical stiffeners.
 - Loads are transferred through wheels or sliding pads to embedded tracks.
 - Used for spans up to 25m; $\text{Span} \times \text{Head} \approx 105$.

Advantages:

- ✓ Short flume walls
- ✓ Uniform load distribution
- ✗ Overhead support structure needed

Disadvantages:

- ✗ Requires gate slots
- ✗ Risk of trash blockage in wheels

Types:

- i. Slide Type
- ii. Fixed Wheel Type
- iii. Stony or Roller Type

Key Components:

- i. **Skin Plate** – Transfers water load
- ii. **Vertical Stiffeners** – Divide skin plate into panels
- iii. **Horizontal Girder** – Transfers pressure from skin plate to end vertical girder
- iv. **End Vertical Girder** – Carries load from horizontal girders
- v. **Wheel Assembly/Slide Pads** – Transfers load to track plate.

B. Radial Gate

- Consists of a curved plate supported by a steel framework.
- Transfers load to concrete through anchorages.
- Ideal for spillways due to smooth flow and simple operation.

Key Components:

- Skin Plate** – Transfers water load
- Horizontal Girder** – Transfers pressure from skin plate to end arms
- End Arms** – Transfer load to trunnion
- Trunnion Hub and Assembly** – Rotational support
- Anchor Flats and Girders** – Transfer load to piers/abutments
- Thrust Pad** – Transfers lateral force to the pier

18.2 New Project Work of Gate System (Brief Overview)

A. Criteria for Selection of Type of Gate

The selection of gate type in a water resource structure depends on site-specific conditions and operational requirements. Key factors to consider include:

1. **Discharge Capacity** – Ability to handle varying water flow rates.
2. **Floating Debris Discharge** – Effective removal of debris.
3. **Silt and Bed Load Passage** – Allowing silt and sediment flow.
4. **Headwater Pressure Operation** – Handling high water pressure.
5. **Load on Concrete Structure** – Structural strength and stability.
6. **Absence of Vibration** – Ensuring smooth operation.
7. **Hydraulic Regulation** – Precise water flow control.
8. **Automatic Closure** – Self-closing during emergencies.

B. Design Criteria of Gate

The general design requirements for hydraulic gates include:

- Designed to withstand hydrostatic and hydrodynamic loads.
- Self-closing under its own weight.
- Can be manually or power-operated.
- Must operate without vibration or cavitation when partially open.
- Water tightness within limits of 5 to 10 liters/minute/meter of seal length.

Types of Forces Considered:

- Hydrostatic and hydrodynamic load
- Silt and wave pressure
- Seating load and earthquake load

- Self-weight (relatively small)

Permissible Stresses:

Material	Condition	Direct Compression	Bending/Tension	Shear Stress	Combined Stress	Bearing Stress
Structural Steel	Wet / Accessible	0.45YP	0.45YP	0.35YP	0.60YP	—
Structural Steel	Dry / Accessible	0.55YP	0.55YP	0.40YP	0.75YP	—
Bronze/Brass	Wet	—	—	—	—	0.035UTS
Bronze/Brass	Dry	—	—	—	—	0.040UTS

(Yield Point = YP, Ultimate Tensile Strength = UTS)

C. Design of Vertical Lift Gate

1. Skin Plate – Transfers water load to other components.
2. Vertical Stiffeners/Horizontal Girders – Provide structural support.
3. End Vertical Girder – Takes load from horizontal girders.
4. Wheel Assembly – Transfers load to track plate.
5. Seal Assembly – Ensures water tightness.

D. Design of Radial Gate

1. Gate Sill Location – Positioned for structural efficiency.
2. Radius of Gate – Ideal range is 1.0 to 1.25 times gate height.
3. Gate Trunnion – Positioned to avoid debris damage.
4. Hoist Location – Positioned upstream or downstream based on load conditions.

Key Components:

- Skin Plate – Transfers water load.
- Horizontal Girder – Provides structural support.
- End Arms – Transfer load to trunnion.
- Trunnion Hub/Assembly – Provides rotational support.
- Anchors – Transfer load to concrete piers.

E. Provision of Stop Logs

- Typically provided for 10% of total spillway bays for maintenance.
- Emergency bulkhead gates may be used for operational flexibility.

F. Embedded Parts

- Include steel track, guides, seal seat, and anchorages embedded in concrete.
- Quality of embedded parts affects gate performance.

G. Hoist Support Structure

- Made of structural steel (IS 2062).
- Designed to withstand dead weight, vibration, and hoisting load.

H. Catwalk Bridge

- Provided at the downstream side for inspection and maintenance.

I. Hoist Arrangement

1. **Screw Hoist** – Used for low head gates, manually or electrically operated.
2. **Rope Drum Hoist** – Used for larger gates, supports remote operation.
3. **Chain Hoist** – Less common due to higher maintenance needs.

J. Material Standards

Component	Material	Code Reference
Skin Plate, Stiffeners, Girders	Structural Steel	IS 2062
Wheel/Guide Rollers	Cast/Forged Steel	IS 1030, IS 2062
Trunnion Hub and Bracket	Cast Steel	IS 1030, IS 2062
Pins, Bushings	Stainless Steel, Bronze	IS 305, IS 318
Seals	Rubber	IS 11855

18.3 Manufacturing

Manufacturing of hydro-mechanical gates requires **high dimensional accuracy** and **tight tolerances** to ensure proper assembly and smooth operation during commissioning. Most fabrication is carried out in a **well-equipped workshop** under controlled conditions to maintain precision, with only site-specific work left for final adjustment and installation. The workshop should have essential machine tools like **lathe machines, shaping machines, drilling machines, gear cutting machines, milling machines, shearing machines, and welding & gas cutting facilities**.

A. Activity at workshop.

Accuracy and maintaining tolerances play most vital role in successful commissioning of any hydro-mechanical work. Hence, most of the work shall be performed at workshop as per approved drawing. The only portions of work are to be left for doing at site, shall be based on erection methodology and ease of installation.

Prior to commencement of work, contractor shall intimate the project manager the name and address of the workshop having all facility to carry out the intended work. Workshop must be equipped with all necessary machine tool such as cutting machine, drilling machine, Lathe, gear cutting machine, welding facility etc. and such machines should be run by highly skilled personnel.

For example, length and size of any load bearing member of a MS structure shall be obtained from full scale drawing in millimeter. Sizing/cutting work shall be mandatorily done by machine cutting to obtain the accuracy. No gas cutting is allowed.

For any structural work, contractor shall perform trial assembly at workshop though bolting, so that any mistake may be rectified at the floor of the workshop. Thereafter marking of each member shall be done as per drawing. Thereafter disassemble the same to dispatch to the site.

Any machining work to be done within the permissible tolerance. Such tolerance shall be guided by fundamental tolerance limit that equal to $0.45D^{1/3} + 0.001D$, where D is the geometric mean of diameter step and preferably H hole & d/e/f shaft combination. However, limit, fit and tolerances shall be guided by **IS 919 latest revisions**.

Manufacturing of gate structure and hoisting system shall be guided strictly as per below mentioned Indian standard code.

2

Sl. No.	Area of Hydro-mechanical work	IS code
01	Fixed wheel vertical gate structure	IS 4622
02	Radial Gate structure	IS 4623
03	Vertical slide gate	IS 5620
04	Rope drum hoist	IS 6938
05	Inspection and testing of vertical gate	IS 7718
06	Inspection and testing of Radial gate and rope drum hoist	IS 10096 (Part-1&2)
07	Screw hoist	IS 11228
08	Lifting beam for stop log gate	IS 13591
09	Painting system for hydraulic gate	IS 14177
10	Specification of Rubber seal	IS 15466
11	Specification of Steel Wire Ropes	IS 2 266

Dimensional deviation beyond the permissible limit and deviation in physical properties shall attract the rejection of the product.

B. Surface Cleaning:

Surface cleaning is critical for preparing metal surfaces for fabrication and painting. Structural steel sections from rolling mills may have mill scale and rust, which must be removed to ensure proper bonding of paint and other coatings. The cleaning methods include:

1. **Hand Cleaning** – Wire brushing, typically used for small areas. Surfaces are classified into:
 - i) **Grade St-2** – Light cleaning

ii) **Grade St-3** – Thorough cleaning.

2. Blast Cleaning – Most commonly used method.

- i) High-speed projection of abrasive sand or steel particles removes rust and scale.
- ii) Leaves a rough surface ideal for paint adhesion.

3. Flame Cleaning – Uses an oxy-acetylene torch.

- i) Works through differential thermal expansion, causing mill scale to break off.

4. Acid Cleaning – Immersion of steel in acid solution.

- i) Removes rust and scale by chemical reaction.

C. Cutting and Machining

After surface preparation, the next step involves cutting and shaping the steel components to the required size and shape.

Cutting methods include:

- 1. Hydraulic Shearing** – Used for cutting structural sections.
- 2. Flame Cutting/Burning** – Uses a gas flame to cut through thick metal.
- 3. Arc Plasma Cutting** – High-speed cutting using plasma torch.
- 4. Cold Sawing** – Precision cutting with minimal heat.
- 5. Punching and Drilling** – Forming holes for bolted or riveted connections.

Machining Process:

- ❖ Radial drilling machines or NC (Numerically Controlled) drilling machines are used for accurate hole formation.
- ❖ Rolled steel sections may become distorted due to heat or handling.

➤ **Straightening Methods:**

- **Rollers** – Used for long plates.
- **Gag Press** – Used for beams, channels, and angles.
- **Heat Straightening** – Heating localized areas to correct distortion.
- ❖ A press brake is used to form angular bends in steel plates.

D. Fitting and Reaming

Before final assembly, components are fitted together temporarily using bolts or rivets. This includes:

- ❖ Attaching splice plates and other fittings.
- ❖ Correcting minor defects.
- ❖ Hole alignment – Holes are initially punched 4–6 mm smaller and then reamed to the correct size using electric or pneumatic reamers.
- ❖ Final holes should allow smooth insertion of fasteners.

E. Fastening Methods

The strength and durability of the gate structure depend on proper fastening methods:

I. Bolting

- i) Preferred for components that need to be disassembled for maintenance.

- ii) Bolted connections are useful for crane rails and structural components exposed to vibration.

II. Riveting

- i) Less common due to labor intensity.
- ii) Still used in some heavy-duty structural applications.

III. Welding

- i) Most common method for modern gate fabrication.
- ii) Reduces joint size and weight.
- iii) Ensures high strength and minimal distortion.

F. Finishing

Structural members like roller tracks, thrust pads, and thrust bearings require smooth surfaces to ensure proper load transmission. Finishing methods include:

- i) **Sawing** – Precision cutting with clean edges.
- ii) **Milling** – Machining to exact dimensions.
- iii) **Grinding** – Smoothing for uniform surface finish.

A milling machine with high-speed rotary cutters is commonly used to create smooth and even surfaces.

G. Quality Control

Quality control during fabrication ensures that the final gate structure meets the intended design and performance criteria.

I. Fabrication must follow a **Quality Assurance Plan (QAP)** detailing:

- a. Raw material checks.
- b. Dimensional accuracy verification.
- c. Welding quality and alignment checks.

II. Structural misalignment and fabrication errors can reduce gate strength and affect sealing performance.

III. Fabricators should adhere to approved drawings and specifications to avoid performance issues.

H. Painting

Protective coatings are applied to prevent corrosion and ensure long-term durability. Painting involves:

1. Surface Preparation:

- I. Cleaning and degreasing using solvents like mineral spirits or gasoline.
- II. Removal of weld spatter, rust, and contaminants using sandblasting.
- III. Immediate priming to prevent oxidation.

2. Shop Painting:

I. Embedded parts (in concrete):

- a. Two coats of cement latex.

II. Other embedded parts and gate leaf:

- a. Two coats of zinc-rich epoxy primer (75 microns each).
- b. Two coats of coal tar epoxy resin (80 microns each).
- c. Total dry film thickness = 300 microns

3. Hoist and Supporting Structure:**I. Structural components:**

- a. Zinc phosphate primer + micaceous iron oxide + synthetic enamel paint.
- b. Total dry film thickness = 175 microns.

II. Machinery components:

- a. Zinc phosphate primer + aluminium paint or synthetic enamel paint.
- b. Total dry film thickness = 125 microns.

4. Unpainted Surfaces:**I. No paint applied to:**

- a. Machine-finished surfaces.
- b. Surfaces in contact with concrete.
- c. Stainless steel, galvanized, brass, or bronze parts.

5. Inspection and Testing:

- **Viscosity Test** – Ensures proper consistency of paint.
- **Thickness Test** – Checked using an Elcometer.
- **General Appearance** – Uniform, smooth, free from runs and defects.
- **Each coat should dry properly before the next coat is applied.**

I. Inspection and Testing of Painting

Inspection ensures that the recommended practices are followed during painting and that the final finish meets the desired quality. Key inspection points include:

- Paint consistency and proper mixing.
- No painting under high humidity or dew conditions.
- Correct drying time between coats.
- Smooth and even finish without cracks or holidays (uncovered areas).

18.4 Erection (Moderate Overview)

As soon as manufacturing work at workshop is completed, products to be despatched to site for erection. Site should have equipped with required machinery and highly skilled manpower. Contractor shall arrange all sort of facility i.e crane, electricity power, welding equipment, tools and tackles during erection as per work program that should have been submitted by him/her at least 07 days prior to commencement of site activity.

The erection and alignment of embedded parts to be done at those tolerances as prescribed in IS 4622 & IS4623 for proper functioning of gate.

A. General

Erection of gates, embedment, hoist machinery, and structural components involves assembling fabricated structural members to form a complete skeletal structure. The process is typically carried out by a specialized **erection contractor** and requires detailed planning for material delivery, handling, assembly, and connection of components.

Successful erection depends on **proper planning** and execution of the following:

- Timely delivery of materials to minimize storage and additional handling.
- Ensuring temporary supports, falsework, and staging are properly installed and secure.
- Staging and scaffolding should be:
 - Strong and rigid.
 - Stiffened with cross bracers.
 - Decked and boarded to prevent injury to workers and materials.

The accuracy of civil construction and proper erection of embedded metal parts are critical for the smooth operation of hydro-mechanical equipment. Any misalignment or defect in erection can affect the performance of the gate system and lead to operational issues.

B. Material Verification and Storage

- Before erection, fabricated materials must be verified at the site against:
 - Mark numbers
 - Key plans
 - Shipping lists
- Structural components should be stored in an organized manner to:
 - Avoid direct contact with soil or standing water.
 - Ensure that erection marks and component numbers are clearly visible.
 - Facilitate easy handling and retrieval during erection.
- Proper handling during transportation and storage ensures that the components remain undamaged and ready for installation.

C. Sequence of Activities During Erection

1. Receiving and Stacking of Materials:

- Structural components are received from the fabrication workshop and stacked at the site.
- Temporary stacking should not obstruct the erection sequence.

2. Lifting and Placing:

- Heavy components are lifted using cranes or hoists and positioned at the designated location.
- Proper alignment is ensured before securing the members.

3. Temporary Bracing:

- Temporary bracing is installed to maintain stability during erection.
- Bracing should prevent structural deformation or misalignment.

4. Permanent Connection:

- Members are permanently connected using bolting or welding.
- Connections should be aligned and secured according to the design specifications.

5. Cladding and Finishing:

- Once the structural skeleton is in place, external cladding is installed.
- A final coat of paint is applied to protect the structure from corrosion and environmental damage.

D. Key Considerations for Safe and Accurate Erection

- ✓ Safe handling of materials to prevent damage.
- ✓ Proper alignment of structural components before connection.

- ✓ Use of secure scaffolding and bracing to maintain stability.
- ✓ Verification of embedded parts and alignment with civil structures.

18.5 Welding (Brief Overview)

A. Introduction

Metal arc welding is the most commonly used welding process for fabricating, installing, and erecting embedment, gate leaves, and hoists. It involves the use of an electric arc to generate heat, which melts the base metal and electrode to form a strong joint.

Key Features:

- ✓ Immediate heating.
- ✓ Depth of fusion and heating controlled by electrode type, size, and current.
- ✓ Suitable for nearly all metals and positions.
- ✓ Can handle a wide range of thicknesses.

B. Welding Process

1. **Preheating** – Reduces stress and distortion.
2. **Surface Preparation** – Cleaning the weld surface to remove contaminants.
3. **Welding** – Ensuring proper fusion and bead quality.
4. **Post Heating** – Reduces residual stress and increases joint strength.

C. Precautions for Quality Welds

- Each weld bead and layer should be cleaned of slag and spatter before applying the next layer.
- Welds should be free from cracks, tears, and porosity.
- Defective welds should be removed by grinding or chipping and re-welded.
- Complete penetration welds must have the root cleaned and gouged before welding the second side.
- Vertical welding should progress upwards for consistent strength.

D. Welding Defects, Causes, and Remedies

1. Incomplete Penetration

- ❖ **Cause:** Low current, improper electrode angle, or small electrode size.
- ❖ **Effect:** Voids at the root, leading to cracks.
- ❖ **Remedy:** Increase current, use proper electrode size, direct arc at root.

2. Lack of Fusion

- ❖ **Cause:** Dirty surface, rust, scale, or slag.
- ❖ **Effect:** Weak joint strength.
- ❖ **Remedy:** Clean joint surface, increase welding current.

3. Undercut

- ❖ **Cause:** Excessive current, high arc travel speed, improper electrode angle.
- ❖ **Effect:** Reduced cross-section thickness, lower joint strength.
- ❖ **Remedy:** Reduce current, adjust travel speed, use correct electrode angle.

4. Overlap

- ❖ **Cause:** Incorrect electrode manipulation, high current, low welding speed.
- ❖ **Effect:** Weak joint due to lack of fusion.
- ❖ **Remedy:** Reduce current, improve electrode manipulation, grind excess metal.

5. Slag Inclusions

- ❖ **Cause:** Poor cleaning between weld passes, scale, dirt, or rust.
- ❖ **Effect:** Reduced joint strength and possible cracks.
- ❖ **Remedy:** Clean surface thoroughly, use proper welding consumables.

6. Porosity

- ❖ **Cause:** Gas entrapment due to impurities, low current, rapid cooling.
- ❖ **Effect:** Weak joint, reduced strength.
- ❖ **Remedy:** Clean surfaces, adjust welding current and speed.

7. Cracks

- ❖ **Hot Cracks:** Form at high temperatures (above 540°C).
- ❖ **Cold Cracks:** Form at room temperature, usually due to hydrogen embrittlement.
- ❖ **Remedy:** Use proper welding techniques, reduce shrinkage stress, preheat base metal.

E. Post-Weld Fabrication Issues

1. Welding Distortion

- Shrinkage during cooling causes residual tensile stress, leading to distortion.
- Thinner materials and stainless steel are more susceptible to distortion.

Control Measures:

- ✓ Minimize weld size to reduce shrinkage.
- ✓ Use intermittent welds instead of continuous welds.
- ✓ Use fewer but larger weld passes.
- ✓ Weld near the neutral axis to balance shrinkage forces.
- ✓ Use back-step welding technique.
- ✓ Pre-bend or clamp to counteract distortion.
- ✓ Apply thermal stress relieving after welding.

2. Peening

- Used to relieve residual stress by stretching the weld bead.
- Should not be applied on root passes or final passes.

F. Other Issues in Fabrication

1. **Non-Standard Steel Material** – May lack proper carbon content, leading to brittleness.
2. **Import Delays** – Bearings and other critical parts may face supply chain delays.
3. **Lack of Stress Relieving Facilities** – Can lead to residual stress and distortion.
4. **Limited Machinery Capacity** – Inadequate machines for large or complex components.
5. **Poor Quality Control** – Leads to dimensional inaccuracy and poor performance.
6. **Labor Issues** – Strikes or shortage of skilled laborers.
7. **Design Changes** – Mid-project design changes disrupt workflow and cause delays.
8. **Outsourcing Issues** – Lower quality from subcontractors.

G. Summary

Welding is a critical process in gate fabrication and erection. Proper welding techniques, thorough cleaning, and effective distortion control measures are essential for achieving strong, durable joints. Defective welds should be identified and corrected promptly to ensure structural integrity and long-term performance.

18.6 Operation and Maintenance of Gates and Hoists (Brief)

A. General

Proper maintenance of hydraulic gates and hoists is essential for ensuring their smooth and long-term operation. Well-maintained gates improve the efficiency and reliability of water management structures. A comprehensive **Operation and Maintenance (O&M) manual** is necessary to guide operating staff and ensure correct maintenance practices.

B. O&M Manuals

The O&M manual for hydraulic gates and hoists should include:

- ✓ Design features of components.
- ✓ Details of bought-out items with supplier contact details.
- ✓ Operating instructions.
- ✓ Lubrication requirements (type and frequency).
- ✓ Maintenance and repair schedule.

The manual should be customized for each installation, and operating staff should be trained to follow it correctly.

C. Need for Maintenance

Gated structures require regular inspection and maintenance to ensure reliable performance beyond their designed life span. Common causes of gate failure include:

- Poor selection of safety factors during design.
- Corrosion leading to reduced cross-section and strength.

Corrosion Prevention:

- Regular inspection, evaluation, and preventive maintenance.
- Application of protective coatings to prevent rust formation.
- Use of detectors (ultrasonic, magnetic, and X-ray) to assess internal corrosion and metal loss.

D. Operation and Maintenance of Gates and Hoists

1. Trained Personnel:

- Operators should have proper training and experience.
- A logbook should be maintained to record daily operations and issues.

2. History Register:

- Maintains records of past maintenance, repairs, and failures.
- Useful for investigating failures and improving future designs.

3. Expert Consultation:

- Major repairs should be referred to experts.
- Follow IS: 10096 for radial gates and rope drum hoists, and IS: 7718 for vertical and slide gates.

E. Inspection Prior to Erection of Gate

1. Inspection of Embedded Parts:

- Sill beam, roller path, and side seal path should be aligned correctly.
- Yoke girder and trunnion assembly should be positioned accurately.

2. Inspection of Gates and Hoists:

- Dimensional checks after assembly and welding.
- Verify roller and guide wheel alignment.
- Ensure proper tension and lubrication of wire ropes.
- Inspect all welds, bolts, and seals for proper fitment and strength.

F. Inspection After Erection of Gate

1. Critical Checks:

- Ensure proper seating of the gate on embedded parts.
- Remove temporary supports.
- Confirm alignment of gate components (rollers, trunnion, and arms).

2. Functional Checks:

- Lubricate worm reducers, trunnion pins, and gate wheels.
- Tighten all bolts and couplings.
- Check the oil level in gearboxes and hoist units.
- Perform light testing to check seal gaps and alignment.

G. Lubrication Schedule

Part	Lubrication Mode	Lubricant	Frequency
Trunnion pin bush	Pressure grease gun	Servo gear-20	Every 3 months
Gate wheel bearings	Pressure grease gun	Bearing grease	Every 3 months
Guide rollers	Pressure grease gun	Bearing grease	Every 3 months
Hoisting wire rope	Hand applied	Cordium compound	Once a year before monsoon
Worm reducer	Oil bath	Servo HP-30	Maintain indicator level
Line shaft bearings	Pressure grease gun	Bearing grease	Every 6 months
Drum shaft	Pressure grease gun	Chassis grease	Every 3 months

H. Maintenance of Wire Ropes

1. Lubrication:

- Apply cadmium compound or equivalent lubricant regularly.
- Lubricant should be free from harmful substances (acids, alkalis).

2. Inspection:

- Regular checks for wear, broken wires, and corrosion.
- Ensure wire ropes are properly tensioned and wound.

3. Replacement:

- Replace if strength loss exceeds 1/6th of the original strength.

- Discard if outer wires are loose or the rope is kinked.

➤ **Note: The gate should be fabricated as per available drawings/actual measurements and standard which are as follow:**

Gate Body: • Structural Steel (plate/flats/cannels)–IS:2062 • Cast steel components (wheel /guide rollers) –IS:1030 • Bush bearing/Aluminium bronze/ Alloy components– IS: 305/318 • Alloy steel components (wheel/axle, lifting pin)- IS:1570 • CI Ballast weight – IS:210	Bolts, Nuts and washers • Bolts, Nuts and washers – SS-316L • MS/GI (Bolt, Nut and washer)–IS:1363
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18.7 Rubber Seals:

Sl. No.	Item
01	Side rubber seal (hollow bulb musical note type of size flat portion 10mm X16 mm, with 50mm x 8 mm MS clamp plate or as per sample) IS: 11855-1986
02	Bottom rubber seal(Flat type) with 50mm x 8 mm MS clamp plate or as per sample) and as per IS: 11855

Type of Seal:

i) **Musical Note rubber seal** –This can be referred to as P- type seal /J type seal, musical Note Rubber seal is available with either solid bulb or hollow bulb. Hollow bulb seals are recommended for gates operated upto 15 meters, while solid bulbs are used for heads from 15 meters.

ii) **Z type rubber Seal-** These seal are moulded to the required shape and sealing effect is obtained partly due to initial interference with the embedded sealing plate and partly due to the deflection under load. This type of seal is used on gates on the crests of dams and weirs.

iii) **Double stem seal-** These types of seal are preferred for heads exceeding 30 meters. This seal can be used as bottom seal.

iv) **Flat rubber seal-** This seal can be flat type, wedge type, round bottom type. These seal are generally employed as bottom seals.

v) **PTFE cladded rubber seals:** Rubber concept offer PTEF cladding / Teflon cladding over various types of Rubber seals such as Musical Note Rubber Seal/P type rubber seals, Z type rubbers seals, Double stem Rubbers Seal. These will increase the life of Rubber seals. The Seal are fitted on to a gate leaf by means of seal base plates, seal clamps and screws. The seal are so fixed that in a gate closed position they deflected back and bear tightly against seal plates embedded in a gate slot and prevent leakage. This deflection is achieved by a provision of recompression in seal.

Rubber Material for gate rubber seals:

POLYMER / MOC NATURAL RUBBER / Natural & SBR Blended. COLOUR : BLACK FINISH: GOOD (Confirming to IS-11855)			
PROPERTY	TESTING STANDARD	CONDITION	REQUIREMENT
TENSILE STRENGTH	IS-3400 or Equiv.	ORIGINAL	14.5 N/mm x mm (Min)
	IS-3400 or Equiv.	Aged for 48 hours at 70 degree Centigrade	ORIGINAL VALUE - 20% (Max)
ELONGATION AT BREAK	IS-3400 or Equiv.	ORIGINAL	450 % (Min)
	IS-3400 or Equiv.	Aged for 48 hours at 70 degree Centigrade	ORIGINAL VALUE - 20% (Max)
HARDNESS	IS-3400 or Equiv.	ORIGINAL	65 “±5” (Max) Shore A
	IS-3400 or Equiv.	Aged for 48 hours at 70 degree Centigrade	ORIGINAL VALUE +10 points Max.
WATER ABSORPTION	IS-3400 or Equiv.	Seven days at RT	Not more than 10% by mass of water

Physical properties required seals:

- i) Elongation at break, percent, Min 450 IS 3400.
- ii) Tensile strength, N/mm²
- iii) Mass of water absorbed in 7 days, percent, Max .10.
- iv) Tensile strength after accelerated aging test of 48 hrs. in oxygen at 70±1° and 2.1±0.1N/mm pressure shall not be less than 80% of the strength before aging.

18.8 Painting of the Gates, Hydro-mechanical components, and supporting structures:**A. General Guidelines**

- Surface preparation should be followed by primer application within 6 hours to prevent oxidation.
- Primer coats must be followed by finish coats before deterioration.
- Painting should be done at temperatures above 10°C and humidity levels below 90%.
- Each coat should be free from defects (runs, sags, pinholes) and allowed to dry before the next coat.
- Qualified workers should handle painting, and thinners should only be used if necessary.

B. Surface Cleaning

1. Surface Preparation: As per IS 14177 standards.
2. Sand Blast Cleaning: Sand, grit, or shot blasting as per IS 1477 Part-1.

3. **Removal of Contaminants:** Oil, grease, dust, rust, and old paint should be removed using appropriate solvents and tools.

C. Painting of Gates

1. Primer Coat:

- **Canal Gates:** One coat of inorganic zinc silicate (40 ± 5 microns) or two coats of zinc-rich primer (total 40 ± 5 microns).
- **Lifting Beam/Tackles:** Two coats of zinc phosphate primer (40 ± 5 microns each).
- **Exposed Embedded Parts:** One coat of inorganic zinc silicate (40 ± 5 microns).

2. Finishing Coat:

- **Canal Gates:** Two coats of coal tar epoxy paint (total thickness 240 microns).
- **Lifting Beam/Tackles:** Two coats of alkyd-based micaceous iron oxide (40 ± 5 microns each).
- **Exposed Embedded Parts:** Two coats of coal tar epoxy paint (100 ± 5 microns each), total thickness 240 microns.

D. Hoist and Supporting Structure

1. Primer Coat:

- **Structural Components:** Two coats of zinc chromate/zinc-rich epoxy (40 ± 5 microns each).
- **Machinery:** One coat of zinc phosphate primer (40 ± 5 microns).
- **Unmachined Surfaces:** One coat of chlorinated rubber-based zinc chromate primer (40 ± 5 microns).

2. Finishing Coat:

- **Structural Components:** Two coats of alkyd micaceous iron oxide (40 ± 5 microns) + two synthetic enamel coats (100 ± 5 microns each).
- **Machinery:** Three coats of aluminium/synthetic enamel paint (40 ± 5 microns each).
- **Unmachined Surfaces:** Three coats of vinyl resin/chlorinated rubber (30 ± 5 microns each), total thickness 125 microns.

E. Surfaces Not to Be Painted

- Machined surfaces
- Surfaces in contact with concrete
- Stainless steel, brass, bronze, and aluminium alloy surfaces
- Sliding or rolling contact surfaces
- Bare electrical conductors and nameplates

F. Mixing and Thinning of Paint

- Paint should be mixed mechanically and strained to remove impurities.
- Additives (curing agents, catalysts) should be added as per manufacturer's instructions.
- Thinners should only be used if necessary and must be compatible with the paint.

G. Storage of Paint

- Store in a well-ventilated area, protected from heat and sparks.
- Containers should be labeled with batch details and expiry dates.

- Expired or deteriorated paint should not be used.

H. Paint Application

1. Brush Application:

- Use proper brushes as per IS standards.
- Apply in short strokes, followed by smoothing with long strokes.

2. Spray Application:

- Use suitable spray guns and nozzles for the type of paint.
- Hold gun perpendicular to surface and apply evenly.

3. Roller Application:

- Should be avoided unless specified.
- Second coat should be applied at a right angle to the first coat.

18.9 Quality Assurance, Inspection, Testing, and Final Acceptance: -

I. Quality Assurance

The contractor shall submit and finalize manufacturing Quality Plans for all the major components and equipment. These Quality Plans will detail out various tests inspections to be carried out as per the requirement of these Specifications and standards mentioned therein and quality practices and procedures followed by contractor's Quality Control Organization, the relevant reference documents and standards and acceptance norms etc., during all stages of material procurement, manufacture, assembly and final testing / performance testing.

The contractor shall also furnish copies of the reference documents / plant standards / acceptance norms / test and inspection procedure etc., as referred in Quality / reference documents / standard etc. These will be subjected to Engineer-in-Charge's approval without which contractor shall not proceed. Engineer-in-Charge shall reserve the right to add any inspection or test which is felt necessary for completion of the work. These approved documents shall form a part of the contract. In these approved Quality Plans, Engineer-in-Charge shall identify Customer Hold Points (CHP's) i.e. testing checks which shall be carried out in the presence of the Engineer-in-Charge's Engineer or his authorized representative in writing. All deviations to these Specifications, approved Quality Plans and applicable standards must be documented and referred to Engineer-in-Charge along with technical justification for approval and dispositioning.

The contractor shall also submit and finalize field quality plans which will detail out for all the equipment, the quality practices and procedures etc. to be followed by the contractor's site Quality Control Organization during various stages of activities from receipt of material/equipment at site. The field Quality Plans shall also be approved by Engineer-in-Charge.

No material shall be dispatched from the contractor's works before the same is accepted subsequent to pre-dispatch / final inspection including verification of records of all

previous tests/inspection by Engineer-in-Charge's Engineer or his authorized representative and duly authorized for dispatch.

All the vendors/sub-vendors proposed by the contractor for procurement of major bought out items including casting, forging, semi-finished and finished components / equipment, list of which shall be drawn up by the contractor and finalized with the Engineer-in-Charge shall be subject to Engineer-in-Charge's approval. The contractor's proposal shall include vendor / sub-vendor's facilities established at the respective works, the process capability, process stabilization, Quality Control System followed, experience list etc. along with his own technical evaluation of vendor/ sub vendors shall be submitted to the owner for approval. Such approval shall not relieve the contractor from any obligation, duty or responsibility under the contract. This action would, however, not involve Engineer-in-Charge in any complications arising between the contractor and his sub-contractor(s)/vendor / sub-vendors or any other liabilities. The contractor shall also obtain Quality Plans from approved vendor/ sub- vendors from whom he proposes to procure the material and submit these Quality Plans for Engineer-in-Charge's approvals.

Normally, no request for change of vendors / sub-vendors shall be entertained by Engineer-in-Charge. But in the peculiar circumstances if the request for change of vendor/sub-vendors is found reasonable and justified then the same shall be entertained and the decision of Engineer-in-Charge in this respect shall be final and binding. The time consumed for the change of vendor / sub-vendors shall not be excluded from the stipulated time of the completion of the contract. This change shall not relieve the contractor from the responsibility to complete the work within stipulated time in any manner.

Engineer-in-Charge reserves the right to carry out quality audit and quality surveillance of the system and procedures of the contractor. The contractor shall provide all necessary assistance to enable the Engineer-in-Charge to carry out such details and surveillance including Quality Manual.

For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable. Repair/rectification procedures to be adopted to make the job acceptable shall be subjected to the approval of Engineer-in-Charge/ authorized representative.

Before sub-contracting any portion of work, the contractor will take prior approval of Engineer-in-Charge.

All materials used or supplied shall be accompanied by valid and approved material certificates and tests and inspection reports. These certificates and reports shall indicate the heat numbers or other such acceptable identification numbers of the material. The material certified shall also have the identification details stamped on it.

The contractor shall be required to submit **six copies** of the following quality assurance documents **at least four weeks** after dispatch of the equipment:

- (a) Material mill test reports on components as specified in Quality Plan.
- (b) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.

- (c) Non-destructive examination results reports including radiography interpretation reports.
- (d) Factory test result for testing required as per applicable codes and standards referred in the Specifications.
- (e) Inspection reports duly signed by the authorized Engineering representative of the Engineer-in-Charge and contractor for the agreed inspection hold points.
- (f) All the accepted deviations shall be included with complete technical details.

II. Inspection, Testing and Maintenance

General

The guidelines / recommendations for inspection, testing and maintenance of gates and hoists as contained in the relevant Indian Standards viz. **IS 7718, IS 10096, IS 13053, IS 10341** but not limited to, shall be applicable at different stages of the work viz. at the contractor's stage at the time of erection as well 's after erection.

Place of Manufacture and Inspection

The contractor shall state in his tender the place of manufacture, testing and inspection of various portions of the work included in the contract. Authorized representative of the Engineer-in-Charge may be present at the time of any or all tests and the contractor shall provide all necessary facilities for the same. Representatives of the Engineer-in-Charge shall also be entitled to access to contractor's /sub-contractor's work at any time during the manufacture' of equipment and materials. All material entering into the work shall be subject to inspection by Engineer-in-Charge or his authorized representatives and all purchase orders for materials and supplies shall carry a notation to this effect. Copies of all purchase orders and sub-contracts shall be submitted to Engineer-in-Charge at the time of placing the order. Waiving of inspection by Engineer-in-Charge shall not relieve Contractor from the responsibility of supplying material and workmanship acceptable to Engineer-in-Charge. Contractor shall be responsible for proving quality of material and workmanship either by records of inspection or by immediate inspection.

Inspection

All supplies (which include without limitation of raw Materials, components, intermediate assemblies and end products) shall be subject to inspection and test by the Engineer-in-Charge or his authorized representatives to the extent practicable at all times and places. Inspection shall be carried out in accordance with relevant Indian Standards. If any inspection or test is made by the Engineer-in-Charge or his authorized representatives in the premises of the contractor or sub-contractor, the contractor without additional charge shall provide all reasonable facilities and assistance for the safety and convenience of the inspectors in the performance of their duties. If on the request of the Engineer-in-Charge, inspection or test-is made at a point other than the premises of the contractor or sub-contractor of the contractor, it shall be at the expenses of the Engineer-in-Charge except as otherwise provided in the contract, provided that in case of rejection, the Engineer-in-Charge shall not be liable for any reduction in value of sample and used in connection with such inspection and test. All inspections and tests by the Engineer-in-Charge shall be performed in such a manner as not to unduly delay the work. The Engineer-in-Charge reserves the right to charge the contractor any additional cost of inspection and test when supplies are not ready at the time of such inspections and

test. Acceptance or rejection of the supplies shall be made as promptly as practicable after delivery except as otherwise provided in the contract but failure to inspect and accept or reject supplies shall not relieve the contractor of the responsibility for such supplies to be in accordance with the contract requirements.

The inspection and test by the Engineer-in-Charge or his authorized representatives of any supplies or lots thereof does not relieve the contractor from any responsibility regarding defects or other failure to meet the contract requirements which may be discovered prior to the acceptance. Except as otherwise provided in the contract, acceptance shall be conclusive and except as regards latent defects or such gross mistakes as amount to fraud

The contractor shall provide and maintain the inspection system acceptable to the Engineer-in-Charge covering the supplies hereunder. Records of all such inspection work shall be kept complete by the contractor and made available to the Engineer-in-Charge during the performance of the contract and for such longer period as may be specified elsewhere in the contract.

Witnessing Shop Test, Inspection and Training

The Engineer-in-Charge will depute Engineers for the following purposes.

- Witnessing Model Test, Minimum 8 Engineers for four inspection & Shop test weeks (Total 32 Engineers week with 8 roundtrips)
- Training in works Design Office & Minimum 8 Engineers for four weeks (Total 32 Engineer-in-Charges week with 8 roundtrips).

The Engineer-in-Charge shall be free to even use third party inspection for witnessing tests and Inspection

The Engineer-in-Charge or his representative shall have free access to the software(s) used or being utilized by the contractor for Planning and Design of Gates and Hoists both at his office premises and at his shop premises. The Engineer-in-Charge or his representative shall be free to check the design & drawings etc. on his software at any time.

The contractor shall have to impart training to Purchaser's Engineers on various aspects associated with the system and equipment to be supplied as well as on Software Programs used in design and preparation of drawings for the Gates and Hoists etc. of West Bengal Major Irrigation and Flood Management Project so as to enable them to become familiar with the same.

Operational Tests

General

The contractor shall carry out in the presence of project authorities, such tests on the gate equipment to determine that the gate will fulfill the functions for which it has been designed. Tests shall be repeated, if necessary, until successfully carried out to the satisfaction of the Engineer-in-Charge. Leakage tests and operational tests shall be carried out after completion of other portions of the work and when the reservoir is at its full level.

The project authorities shall have the right to carry out such tests also when the reservoir is at a level other than the Full Supply Level.

Dry Test: Operational tests in dry shall be carried out as soon as possible after completion of erection where all controls and permanent power supply have been connected. The tests shall include at least two complete traverses from the maximum raised position to the full closed / seating position. All adjustments, clearance, brakes etc. shall be checked for proper operation.

Wet Test: These tests should simulate the actual operating conditions as closely as possible. At least two complete traverses will be made from the fully closed position to the normal raised position as follows:

- a) When gate is closed, raise to its normally open position in steps and observe the performance including vibration. Lower the gate to the fully closed position in steps and observe the performance of the gate including vibration.
- b) Operation of filling valve shall be tested.
- c) Checkup proper operation of limit switches.

18.10 Gantry Crane: -

i) one electrically operated traveling gantry crane with provision for cross complete in all travel and long travel respect shall be provided for handling the spillway stoplog units with an automatic engaging and disengaging type lifting beam. The gantry crane shall move on the rail tracks provided with necessary end stops and anchors to transport the stoplog units to the maintenance area. The crane shall consist of gantry frames with long traveling mechanisms with machine housing, hoisting and cross traveling equipment and cable reeling drum, operator's cabin, rail safety clamps, controls, limit switches, wire ropes, outside lighting and all other necessary components for its safe, proper and efficient operation. The gantry frames shall be of welded steel construction, except that the high-tensile friction grip and/or fit bolts shall be used for all field connections.

The gantry crane shall be mounted on flat-bottomed rails at E1.134.11 m and shall be sufficient length for the LT drive & CT drive to cover all openings & storage groove provided in the non- overflow block of dam. It is proposed that the crane should be parked over the non-overflow block when not in use. The rails shall be provided complete with all holding down bolts, fishplates, separators, stops, etc, and shall have suitable gaps at the expansion joints in the concrete. Limit switches should also be placed along the track so that the gantry may be accurately positioned over each of the openings. A load plate showing the safe working load shall be fixed to the crane in a position to be easily legible from the operating level. The gantry shall be provided with bumpers, and hold-down devices, which should fit over the rails to prevent the gantry assembly from tipping.

The general appearance of the crane is important, and special attention shall be given to the arrangement of all parts so that the outline of the crane and details shall harmonize with the adjoining civil engineering works.

Electrical power for traveling and hoisting motions shall be provided through a traveling cable and reeling drum arrangement. The supply of cross travel trolley shall be through a festoon type trailing cable supported on suitable wire with movable hook. The operation of gantry crane shall be from an enclosed cabin with a maximum unrestricted view. The gantry shall be provided with necessary brakes (viz' D.C. electromagnetic brakes, as well as thruster brakes), storm anchors' overload protection for hoisting motion, interlock devices, limit switches for extreme position of hoist' long travel, cross travel as well as centering the crane at the centerline of each bay' All drives and hoist gearing will be fully enclosed and housed appropriately. Additional inching controls shall be provided on the long travel (LT) drives. cross travel has been proposed to cater for any transverse movement of the crane required for placement of stoplog units / handling of any maintenance.

ii) Long Travel: Thyristors controlled motors with D.C. electromagnetic brake or/and thrust type brake, connected to at least one driving wheel on each side of end carriage, through gearing and shafting. Both driving wheels shall have a provision of synchronized operation having limit switches for extreme position of travel and corresponding to center of each span with supply through cable reel. All wheels shall be double flanged and shall be designed for interchangeability and easy removal.

iii) cross Travel: Thyristors controlled motor, with D.C. electromagnetic brake, connected to at least one driving wheel on each side of trolley through gearing and shafting. Both driving wheels shall have a provision of synchronized operation having limit switches for extreme positions of travel and also for exact locations over spillway stoplog groove so that the hook is exactly over the lifting points. All wheels shall be double flanged and shall be designed for interchangeability and easy removal.

iv) Interlocks: In addition to usual protective gear the following interlocks shall be provided. suitable interlocks for preventing more than one drive to be in operation simultaneously. Interlock in LT Drives to prevent long travel unless the hook is in its highest position.

v) Lifting Beam: The lifting beam shall be of fabricated steel construction, suitable for handling by gantry crane and equipped with two positively engaging and disengaging type hooks with lifting lugs of stoplogs. It shall be suitable for automatic engaging and disengaging of the units by use of counterweight and lever mechanism. It shall be ensured that once hooks are engaged, they do not get unlocked due to excessive vibrations/lifting forces during raising or lowering operation. A probe and hook release mechanism shall be provided. Two number pilot tubes shall also be provided to facilitate guidance for engagement with corresponding guide stems provided on stoplog units. The lifting beam shall have suitable spring-loaded flanged rollers at both ends. Lifting beam sheave and crane hoist sheave should have similar bush/bearing.

The design of various components of the crane shall be done in accordance with the provisions of Indian Standard specification IS: 3L77 -1999 and IS: BO7-1, g76. Where the provisions of Indian standard Codes conflict with the provisions of these specifications, the provisions of these specifications shall govern. The mechanical parts

of the hoist shall be designed for the specific loads with a factor of safety of five based on the ultimate strength of the materials. The breakdown torque of the motor is taken as 225 % of rated load torque (The motor provided should have characteristics with breakdown torque limiting to 225%). The hoist components shall be checked under BDT condition of the motor. The rope shall have a factor of safety of 6 for normal conditions and of 3 for breakdown torque condition. Due to arrangement of equalizer the design load on the hoisting rope on each side of the gate shall be considered as 50% of the total hoisting load. The hoist mechanism shall be covered by suitable cover frames to protect it from dust, dirt and direct exposure to moisture. Provision shall be made for dial indicators and digital position indicator in the operator's cabin and slack rope detection, overload detection device, limit switches, control panels, staircase to hoist platform, chequered plates/gratings, guard railing etc.

18.11 FOR GATE STRUCTURE INCLUDING STOP-LOG GATE, GANTRY CRANE STRUCTURE, EMBEDDED PARTS AND HOISTING COMPONENTS.

Sl. No.	Item Name of the product	Material Specification	Code reference
01.	Gate: Structural part of gate leaf including skin plate, stiffener, H-girder etc	Structural steel	IS 2062 Gr.E250
02	Stop –log Gate:	Structural steel	IS 2062 Gr.E250
	a) Structural part of gate leaf including skin plate, stiffener, H-girder etc.		
	b) Lifting pin/connecting pin	Corrosion resistance steel	IS 1570(pt-V), Gr. 20, Gr.13
03	Seal	Rubber	IS 11855
04	Lifting Beam		
	a) Structure	Structural steel	IS 2062, Rolled section, IS 808.
	b) Bush	Aluminium Bronze	IS 305, Gr-AB-2
	c) Connecting pin	Stainless Steel	AISI 420
05	Material for hoist +Gantry Girder, Gantry crane, Dogging Device, Walkway		
	a) Base plate, Anchors and lugs	Structural steel	IS 2062, Rolled section, IS 808.
	b) Walkway	Chequered plate	IS 3502
	c) Hand rails, post & Bracket	Structural steel	IS 2062, Rolled section, IS 808.
	d) Rope drum	Cast steel	IS 1030
	e) Gear	Cast steel	IS 1030 Gr.27.54
	f) Pinion	Forged Material	En-9

	g)Shaft	Forged steel	En-9
	h)Bush	Aluminium Bronze	IS 305, Gr-AB-2
	i)Wire rope	Steel	IS 2266
	j)Gantry Girder	Structural steel	IS 2062, Rolled section, IS 808.
	k)Dogging device	Structural steel	IS 2062, Gr. E 250

19. FOR ELECTRICAL WORK:

For electrical works, the guidelines as prescribed in Indian electricity rule-1956 should have to be strictly followed. Supervisor having required competence and Licence from Govt. licensing board to be employed during execution by the contractor. Electrical workers should have required work permit licence. Standard and guidelines in executing the electrical work shall be as mentioned in WBPWD (Electrical) .S.O.R'2017 and any other govt. approved guideline practiced in India.

Sl. No.	Name of item/Work	Code reference
01	Reversible Type Two Pin Plugs and Socket Outlets Without Earthing Connections	IS 370 – 1954
02	Two and Three Terminal Ceiling Roses	IS 371 – 1954
03	Rubber Insulated Cables and Flexible Cords for electrical Power and Lighting (for Working Voltages up to and Including 11 KV) (Tentative – Under revision)	IS 694 – 1953
04	P.V.C. Cables and Cords for Electrical Power and lighting for Working Voltages up to and Including 650 Volts to Earth (Amended) (Tentative – Under revision)	IS 694 – 1960
05	Single Pole 5 Ampere Tumbler Switches for A.C. /D.C.	IS 1087 – 1957
06	Reversible Protected Type Two Pin Plugs and Sockets with Earthing Connections	IS 1119 – 1957
07	Bayonet Cap Lampholders	IS 1258 – 1958
08	Three Pin Plugs and Sockets Outlets	IS 1293 – 1958
09	Metal Clad Switches (Current Rating not Exceeding 100Amperes)	IS 1567 – 1960
10	Metric Sizes of Copper Wires and Conductors for Electrical Purposes	IS 1594 – 1960
11	Polythene Insulated and P.V.C. – Sheathed Cables	IS 1596 – 1962
12	Steel Conduits for Electrical Wiring	IS 1653 – 1960
13	Aluminium Conductors in Insulated Cables	IS 1753 – 1961
14	2-way switches for domestic and similar purpose	IS 4949 – 1969

15	Switches for domestic and similar purpose	IS 3854 – 1966
16	Ceiling roses	IS 371 – 1979
17.A	Boxes for enclosure of electrical accessories: Part – I steel and C.I. boxes	IS 5133 (P-I) – 1969
17.B	Part – II Boxes made for insulating materials	IS 5133 (P-II) – 1969
18	Conduits for electrical installations part – 1 general requirements	IS 9537 (P-I) – 1980
19	Flexible steel conduits for electrical wiring	IS 3480 – 1966
20	Rigid non – metallic conduits for electrical installation	IS 2509 – 1973
21	Interlocking switch socket cutout	IS 4160 – 1967
22	Switch socket – out lets (non – interlocking)	IS 4615 – 1968
23	Link clips electrical wiring	IS 2412 – 1975
24	3-Pin plugs and socket outlets	IS 1293 – 1967
25	Danger notice plates	IS 2551 – 1963
26	Warning symbols for dangerous voltages	IS 9823 – 1978
27	Letter symbols & signs used in Electrical Technology	IS 3722 – 1966
28	Fans and regulators Ceiling Type, Electric	IS 374 – 1979
29	Air circulator Type Fan and Regulators, Electric	IS 2997 – 1964
30	Fan and Regulators, Pedestal Type, Electric	IS 1169 – 1967
31	Fan, Fixed Capacitor	IS 1709 – 1960
32	Flame proof enclosures of Electrical apparatus	IS 2148 – 1968
33	Guides for Electrical equipment for explosive atmosphere	IS 8240 – 1976
34	Guide for selection of Electrical equipment for hazardous areas	IS 5571 – 1979
35	Ballasts for Fluorescent lamps	IS 1534 (P-I) – 1977
36	B.C. lamp holders	IS 1258 – 1979
37	Bi-pin lamp holders for tubular fluorescent lamps	IS 3323 – 1980
38	Holders for starters for tubular fl. Lamps	IS 3324 – 1965
39	Starters for fl. Lamps	IS 2215 – 1968
40	Transistor filament general service Electric lamps	IS 7027 – 1973
41	Tungsten filament general service Electric lamp	IS 418 – 1978
42	Time Switches (1st revision)	IS 1766 – 1978
43	Cross-Linked polyethylene insulated PVC sheathed cables : i) For working voltages up to and incl. 1100V	IS 7098 (P-I) – 1977
	ii) For working voltages up to & incl. 33KV	IS 7098 (P-I) – 1973
44	Lift Cables	IS 4289 – 1967
45	PILC Cables for Electric supply (22 V version)	IS 692 – 1973
46	PILC Cables, St. through jt. Boxes, lead sleeves for up to and incl. 11KV	IS 7093 – 1973
47	PVC insulated PVC sheathed solid conductor Cables not	IS 4288 – 1967

	exceeding 1100V	
48	PVC insulated - do- - do- upto and incl. 1100V	IS 694 – 1977
49.A	PVC insulated (heavy duty) Cables: Part – I for working voltage upto and incl. 1100 V	IS 1554 (P-I) – 1976
49.B	Part – II for - do- for 3.3 KV to 11 KV	IS 1554 (P-II) – 1970
50	PVC insulated sheathed ElectricalCables	IS 5831 – 1970
51	Recommended short circuit ratings of high voltages PVCCables	IS 5819 – 1970
52	Electrical Call Bell & Buzzer for indoor use(Revised)	IS 2268 – 1966
53	Electrical immersion water heater (2ndrevision)	IS 368 – 1977

20. DETAILED SPECIFICATION FOR CCTV CAMERA & IT WORKS

Sr. No.	Specification	Remarks	Preferred make
1	Supply & Installation of 4 MP IPC Fixed Bullet Network Camera 50-60 mtr. IR make Hikvision (model no. DS-2CDIT43G0-I) complete in all respect as per instruction of engineer in-charge.	Fixed bullet camera 4mp 50 to 60 Mtr. IR	Hikvision
2	Supply & Installation of 2 MP IR PTZ Dome CCTV camera Make – Hikvision (model no. DS-2DE4225IW-DE) completes in all respect as per instruction of engineer in-charge.	PTZ 2 MP 100 to 120 Mtr. IR	Hikvision
3	Supply & Installation of 64 channel 4 SATA NVR , Make- Hikvision, (model no- DS-7764NI-M4)complete in all respect as per instruction of engineer in-charge.	64 channel 2 SATA NVR or higher	Hikvision

For the work of providing surveillance system through CCTV camera and allied it work, available code of practices to be adopted.

21. Manufacturers/ OEMs. For surveillance system and IT work.

- i. The prospective OEM shall be the manufacturer of original product and bonafide resourceful reputed manufacturer (Not a member of joint venture or sub-distributor) and must issue Manufacturer Authorization Certificate ink signed by OEM to authorize bidder only in letter head.

- ii. Prospective OEM must have presence in India for last 20 years and having credential of successfully supply and installation in reputed organizations of public and national corporate.
- iii. Prospective OEM must have their presence in Kolkata, India with legal office establishment with minimum 50 manpower present on OEM payroll and minimum 20 years of presence in surveillance industry and having expertise and supplied ITC successfully in reputed Govt./undertaking Govt. and renowned corporate entities.
- iv. Prospective OEM must have after sales support manpower on their payroll and team present locally in Kolkata to address any L3/L4 support immediately.
- v. OEM must not be blacklisted in any national/global certification/data privacy forum or must comply NDAA act.
- vi. OEM must submit any necessary documents subjective to on demand submission supporting the qualification criteria.
- vii. OEM must submit escalation matrix authorized via electronic copy/ duly signed and stamped.
- viii. While submitting the tender, if any of the prescribed conditions are not fulfilled or are incomplete in any form, the tender is liable to be rejected. If any bidder stipulates any condition of his own, such conditional tender is liable to be rejected.
- ix. OEM should not be blacklisted or barred by any Ministry of Government of India or any of the Government / PSUs or any other government department at the time of bidding.

General -- All works shall be carried out in prop– manner. Items of works not covered by the following shall be carried out as per direction of the Engineer-in-Charge and to his satisfaction. Unless otherwise specified in this Section or in the description of item the cost of all stages of works mentioned hereunder shall be deemed to have been included in the rates of items provided in the Schedule.

22. List of Laboratory Equipment (Table 100-2 of MORT&H)

Sl. No	Name of the Project	Number
A)	GENERAL	
1	Weigh Balances	
	a) 5 - 20 kg capacity Electronic type -Accurac– 1 gm	1 No.
	b) 500 gm capaci–y-Electronic Type Accuracy 0.01 gm	1 No.
	c) Electronic 5 kg capacity Accuracy 0.5 gm	1 No.
	d) Platform Balance scale-300 kg capacity	1 No.
	e) Chemical Balance 100 gm capacity-accuracy 0,001 gm	1 No.
2	Oven-electrically operated, thermostatically controlled (including thermometer), stainless steel interior From 0°C to 220°C Sensitivity 1°C	1 No.
3	Sieves : as per IS:460-1962	
	a) I.S. sieves 450 mm internal dia of sieve sets as per BIS of required sieve sizes complete with lid and pan	1 set
	b) IS sieve 200 mm internal dia (brass frame and steel/or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with ltd	2 set
4	Sieve shaker capable of taking 200 mm and 450 mm diasieveelectrically operated with time switch	1 No.
5	200 tonnes compression testing machine	1 No.
6	Stop watches 1/5 sec. accuracy	1 No.
7	Glassware comprising beakers, pipettes, dishes, measuring cylinders (100 to 1000 cc capacity) glass rods and funnels, glass thermometers range 0°C to 100aC and metallic thermometers range upto 300°C.	2 No. each
8	Hot plates 200 mm dia (1500 watt.)	1 No
9	Enamel trays	
	a) 600 mm x 450 mm x 50 mm	2Nos
	b) 450 mm x 300 mm x 40 mm	2Nos
	c) 300 mm x 250 mm x 40 mm	2Nos
	d) Circular plates of 250 mm dia	2Nos
10	Water Testing Kit	1 No.
B)	FOR SOILS	
1	Water still	
2	Liquid limit, grain size distribution and plasticity index device with ASTM grooving tools as per IS:2720	1 No.
3	Sampling pipettes fitted with pressure and suction inlets, 10 ml. Capacity	1 set
C)	FOR CEMENT, CEMENT CONCRETE AND MATERIALS	
1	Water still	
2	Vicat needle apparatus for setting time with plungers as per IS:269-1967	1 No
3	Moulds	

	a) 150 mm x 300 mm ht. Cylinder with capping component along with the capping set and compound as per IS	As Require
	b) Cube 150 mm, and 100 mm (each size)	As Require
4	Flakiness index test apparatus	1 No
5	Aggregate impact test apparatus as per IS:2386 (Part 4) 1963	1 No
6	Los-Angeles abrasion test apparatus as per IS:2386 (Part 4) 1963	1 No
7	Equipment for slump test	1 No
8	Equipment for determination of specific gravity or fine and coarse aggregate as per IS:2386 (Part 3) 1963	1 No
9	Compression and Flexural strength testing machine of 200 T capacity with additional dial for flexural testing	1 No
10	Core cutting machine with 10 cm dia diamond cutting edge	1 No
11	Needle vibrator	2Nos
12	0.5 Cft, 1 Cft cylinder for checking bulk density of aggregate with tamping rod	As required
13	Soundness testing apparatus for cement (<i>Le Chatelier</i>)	1 set

23. The Details of the tests carried out in laboratory will be as below. Few special required tests may be carried out from the outside laboratory approved by the IWD.

Name of the Test (to be conducted in accordance with the relevant Codalprovisions)
Embankment, Concreting & Structures
Gradation of Coarse& Fine Aggregate
FDD Test
Slump tests
pH & TDS Test
Cube Tests
PI
Gradation
AIV
Flakiness Index
Cement
Steel
Curing Compound
Fineness Modulus Test of Sand
Organic Impurities Test of Sand
Bulkage Test of Moist Sand
Cement Test
<i>Soundness by Le Chatelier</i>
<i>Fineness by specific Surface</i>

<i>Compressive Strength</i>
<i>Initial and final setting</i>
<i>Consistency tests</i>
Coarse Aggregate Tests
<i>Loss Angles Abrasion Value</i>
<i>Bulk Density</i>
<i>Elongation Index</i>
<i>Flakiness Index</i>
<i>Sp Gravity and Water Absorption</i>
<i>Impact test</i>
<i>Grading/ Mechanical Analysis</i>
Curing Compound Test
<i>Water Retaliation</i>
<i>Reflection Test</i>
<i>Drying Time Test</i>
Test for Steel
<i>Rebend Test</i>
<i>Bend Test</i>
<i>Tensile /Elongation &Wt/Mt (A) up to 20mm</i>

24. ***“Equivalency of Standards and Codes***

An indicative list of Bureau of Indian Standards (BIS) IS Codes and IRC codes to be followed is as under, unless otherwise specified in the work item in technical specifications.

S. No.	Material / Work Type	IS Code	IS Code Name
1	Earth Work	IS: 1498-1970	Classification and identification of soils for general engineering purposes
		IS: 3764-1992	Safety code for excavation work
2	Form Work	IS: 1730-1989	Dimensions for steel plates, sheets strips and flats for general engineering purposes
		IS: 808-1989	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections
		IS: 723-1972	Specification for Steel Countersunk Head Wire Nails
3	Aggregates	IS: 383-1970	Specification for coarse and fine aggregates from natural sources for concrete
4	Concrete Works	IS: 456-2000	Plain and Reinforced Concrete – Code of Practice
		SP 16	Design Aid for IS: 456
		SP 34	Handbook of Concrete Reinforcement and Detailing
		IS: 516-1959	Method of tests for strength of concrete
		IS: 1199-1959	Methods of sampling and analysis of concrete
		IS: 2386-1963 (Part 1)	Methods of Test for Aggregates for Concrete – Part 1: Particle Size and Shape
		IS: 2386-1963 (Part 2)	Methods of test for Aggregates for Concrete – Part 2: Estimation of deleterious materials and organic impurities
		IS: 2386-1963 (Part 3)	Methods of test for Aggregates for Concrete – Part 3: Specific gravity, density, voids, absorption and bulking
		IS: 2386-1963 (Part 4)	Methods of test for Aggregates for Concrete – Part 4: Mechanical properties
		IS: 2645-2003	Integral Waterproofing Compounds for Cement Mortar and Concrete – Specification

		IS: 3812-2003	Pulverized Fuel Ash – Specification -
		(Part 1)	Part 1: For Use as Pozzolana in Cement, Cement Mortar and Concrete
		IS: 3812-2003 (Part 2)	Pulverized Fuel Ash – Specification – Part 2: For Use as Admixture in Cement Mortar and Concrete
5	Ordinary Portland Cement (OPC) for Masonry and PCC works	IS: 269-1989	Specification for 33 grade Ordinary Portland Cement
		IS: 455-1989	Specification for Portland Slag Cement
		IS: 8112-1989	Specification for 43 grade Ordinary Portland Cement
6	Ordinary Portland Cement (OPC) for RCC works	IS: 12269-1987	Specification for 53 grade Ordinary Portland Cement
7	Portland Pozzolana Cement (PPC) for other concrete work	IS: 1489-1991 (relevant parts)	Specification for Portland Pozzolana Cement
8	MS bars and wires	IS: 280-2006	Mild Steel Wire for General Engineering Purposes
		IS: 432-1982 (Part 1)	Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement–Mild steel and medium tensile steel bars
		IS: 432-1982 (Part 2)	Specification for mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement–Hard drawn steel wire
9	Reinforcement Steel – Tor Steel (cold twisted deformed bars)	IS: 1786-2008	High strength deformed steel bars and wires for concrete reinforcement – Specification
10	Stone Work	IS: 1121-1974 (Part 1 to 4)	Methods of test for determination of strength properties of natural building stones: Part 1 –Compressive strength, Part 2 – Transverse Strength, Part 3 – Tensile Strength, Part 4 – Shear strength
		IS: 1122-1974	Method of test for determination of true specific gravity of natural building stones
		IS: 1123-1975	Method of identification of natural building stones
		IS: 1124-1974	Method of test for determination of water absorption, apparent specific gravity and porosity of natural building stones

		IS: 1125-1974	Method of test for determination of weathering of natural building stones
		IS: 1126-1974	Method of test for determination of durability of natural building stones
		IS: 1127-1970	Recommendations for dimensions and workmanship of natural building stones for masonry work
		IS: 1129-1972	Recommendation for dressing of natural building stones
		IS: 1597-1992 (Part 1 to 2)	Construction of Stone Masonry – Code of Practice: Part 1 – Rubble Stone Masonry, Part 2 – Ashlar masonry
		IS: 1805-1973	Glossary of terms relating to stones, quarrying and dressing
11	Brick Work	IS: 1077-1992	Common burnt clay building bricks – Specification
		IS: 2212-1991	Code of practice for brickworks
		IS: 3495-1992 (Part 1 to 4)	Methods of tests of burnt clay building bricks: Part 1 – Determination of compressive strength, Part 2 – Determination of water absorption, Part 3 – Determination of efflorescence, Part 4 – Determination of warpage
		IS: 5454-1978	Methods of sampling of clay building bricks
12	Structural Steel	IS: 226-1975	Structural Steel (Standard Quality) (Fifth Revision)
		IS-808-1989	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections.
		SP 6	Handbook of Structural Engineers
13	Welding Steel Work	IS: 814-2004	Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel – Specification
		IS 816-1969	Code of practice for use of metal arc welding for general construction in mild steel.
		IS: 822-1970	Code of Procedure for inspect of welds
		IS: 1635-1992	Code of practice for field slaking of building lime and preparation of putty
		IS: 2402-1963	Code of Practice for External Rendered Finishes
		IS: 428-2000	Washable Distemper – Specification

		IS: 3400-2004	Methods of Test for Vulcanized Rubber
		(Part 9)	- Part 9 : Rubber, Vulcanized – Determination of Density
		IS: 4905-1968	Methods for random sampling
		IS: 733-1983	Specification for Wrought Aluminum and Aluminum Alloy Bars, Rods and Sections (for General Engineering Purposes)
		IS: 1868-1996	Anodic Coatings on Aluminum and its Alloys – Specification
14	Sheet Piles	EN 10248-2	Hot rolled sheet piling of non alloy steels.
		IS 2314 - 1986	Indian standard specification for steel sheet piling sections.
15	HDPE Bags	IS-1969 2009	Tensile properties of Fabrics
		IS-14252 2003	Textiles – High Density Polyethylene. (HDPE)/Polyethylene (PP) Woven Sack for Filling Sand
		IS-1964 2001	Methods for Determination of Mass per Unit Length and Mass per Unit Area of Fabrics.
16	Building measurement methods	IS: 2-1960	Rules for Rounding off Numerical Values
		IS: 1200 (Relevant parts)	Measure of method of building and civil engineering works
		SP: 27-1987	Handbook on method of measurement of building works
17	WBM Sub base/Base	IRC:19-2005	Standard Specification and Code of Practice for Water Bound Macadam (Third Revision)
18	Sub base / embankment	IRC:36-2010	Recommended Practice for Construction of Earth Embankments and Sub-Grade for Road Works (First Revision)
19	Gates and Gate Parts	IS: 1030	Carbon steel castingscomponent of Wheel, Guide roller
		IS: 305/318	Bush Bearing
		IS: 1570	Wheel / Axel
		IS: 210	C.I Ballast Weight
		SS: 316	Nuts & Bolts
		IS: 11855 & IS 15466	Rubber Seal
		ASTM: A36	Carbon Steel

		ASTM: A992	High strength Alloy Steel
		IS: 2062	Structural Steel
		AISI: 420 or EN 9	Stem
		IS: 1477	Painting of Ferrous Metals
		IS: 14177: 1994	Painting & surface preparation
		IS 4622:2016	fixed wheel gates
		IS 4623	Structural Design of Radial Gates
		IS 800	General Construction in Steel
		IS 10210	Design of Hydraulic Hoists for Gates
		IS: 816	use of metal are welding for general instruction in mild steel.
		IS 808	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections
20	Gantry Crane	IS 3177	Electric Overhead Travelling Cranes and Gantry Cranes other than Steel Work Cranes
		IS 13591	Criteria for design of lifting beams

Notwithstanding the specifications for all items and supply of materials (including all other items and materials) as mentioned above shall comply to printed Specifications of USoR (I&WD) 2018,I&WD USoR (M&E) 2022,Specifications of SOR (Roads & Bridge works) – Volume III,2018, PWD (WB), Sanitary & Plumbing Works (Volume -II), 2018, PWD (WB) & SOR (Building works) Volume I,2017 PWD (WB), I&WD, Mechanical Circle, SoR 2011, Water Resource Department, Government of Karnataka SoR 2018-19, Government of India, Central Public Works Department, Delhi, SoR (E&M), 2018. The Indian Standard specification and any work not covered there shall be carried out as per best practice adopted in this country according to the direction and satisfaction of the Engineer-in charge.

22.1 THE CONTRACTORS' OBLIGATION

1. Contractor shall mobilise all required Technical staff, Labour, Equipment, identify quarries, check the quality of locally available materials, Install and commission a “Field Laboratory” to ensure quality control, during execution of the work within the stipulated time and as per the specification and drawings, of the Contract Agreement
2. Contractor shall submit in a detailed Construction Program in MS Project including L2 level PERT Chart within 14 days of delivery of Letter of Acceptance, in consultation with and necessary modification of (if required) the Construction Schedule (attached as

- Annexure-A, Appendix to Technical Part, as Technical Proposal Forms under Section IV), and, Quality Assurance Programme as per guidelines and contents provided in "A-1.2, Section A- General Specifications under Section VII-Works' Requirement", for Project Manager's approval.
3. Any agency among the agencies appointed or authorized by the Employer will undertake Independent third-party inspections and testing for supply of material for works and/ or any Executed works. The Contractor shall be wholly responsible to make his own arrangements with the approved third-party inspection agencies for carrying out the required tests.
 4. The Contractor shall be responsible to obtain permission for and provide all facilities to such agency for carrying out such inspections or testing as may be required. The ThirdParty Inspection charges of the agency only will be paid by the employer and all the other costs for such independent inspection and testing shall be borne by the contractor.
 5. The Employer or Project Manager or his authorized representative or authorized agency may make inspections at any of the manufacturing or shipping points at any time in addition to the schedule provided in the specification at the cost of Employer. However, during such inspection, if it is found that any of the items are not being manufactured or shipped in accordance with the specifications, the contractor shall bear all expenses including fees incurred by the employer in respect of such inspection.
 6. If as a result of the inspection or testing referred to in this Clause, the Project Manger Determines that the materials or plant are defective or otherwise not in accordance with the Contract, he may reject the materials or plant and shall notify the contractor accordingly. The Contractor shall then promptly make good the defect or replace the same. All costs incurred by the Project Manager or the Third Party inspection agency for the inspection of the tests shall be determined by the Project Manager and shall be recoverable form the from the contractor and may be deducted from any money's due that the Contractor and the Project Manager shall notify the Contractor accordingly.
 7. Any inspection carried out by the Project Manager shall not relieve the contractor of his obligations under the contract.

22.2 CONTRACTOR'S GENERAL RESPONSIBILITIES

1. The Contractor shall, with due care and diligence, design (to the extent provided for by the Contract), execute and complete the Works and remedy any defects therein accordance with the provisions of the Contract. The Contractor shall provide all superintendence, labour, materials, Plant, Contractor's Equipment and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract. The Contractor shall

- promptly notify the Project Manager, of any error, omission, fault or other defect in the design of or Specification for the Works which he discovers when reviewing the Contract or executing the Works.
2. The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and methods of construction. Provided that the Contractor shall not be responsible (except as stated hereunder or as may be otherwise agreed) for the design or specification of Permanent Works, not prepared by the Contractor. Where the Contract expressly provides that part of the Permanent Works shall be designed by the Contractor, he shall be fully responsible for that part of such Works, notwithstanding any approval by the Employer.
 3. The Contractor shall provide all necessary superintendence during the execution of the Works and as long as thereafter as the Project Manager may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract.
 4. Representative shall receive, on behalf of the Contractor, instructions from the Engineer. If the approval of the representative is withdrawn by the Project Manager, the Contractor shall, as soon as is practicable, having regard to the requirement of replacing him as hereinafter mentioned, after receiving notice of such withdrawal, remove the representative from the Works and shall not thereafter employ him again on the Works in any capacity and shall replace him by another representative approved by the Project Manager.
 5. No public road shall be closed during execution of work and necessary arrangement for smooth movement of traffic shall be made by the contractor at his own cost as per the submitted traffic Management Plan.
 6. The Contractor will also have to implement following activities included under the Resettlement Action Plan (RAP), a copy of which is available in the website of Irrigation and Waterways Department, Govt. of West Bengal (www.wbiwd.gov.in)
 - i) Crop compensation for temporary occupation of land during construction period, for the purpose of temporary storage of C&D wastes and construction of temporary ramps/ haul roads for the period of occupation of such land as per rates fixed by the District Magistrate concerned in consultation with the District Officials of the Agricultural Department. Payment will be made to the contractor out of "Provisional Sum".
 - ii) The Contractor, if required, will have to be engaged in community consultation for implementation of the RAP during the project period.
 7. The Contractor shall be responsible for:
 - (a) the accurate setting-out of the Works in relation to original points, lines and levels of reference given by the Engineer in writing,
 - (b) the correctness, subject as above mentioned, of the position, levels, dimensions and alignment of all parts of the Works, and

- (c) the provision of all necessary instruments, appliances and labour in connection with the foregoing responsibilities.
8. If, any time during the execution of the Works, any error appears in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required so to do by the Project Manager, shall, at his own cost, rectify such error to the satisfaction of the Project Manager, unless such error is based on incorrect data supplied in writing by the Project Manager, in which case the Project Manager shall determine an addition to the Contract Price as per the relevant provisions of the contract and shall notify the Contractor accordingly.
9. The checking of any setting-out or of any line by the Project Manager shall not in any way relieve the Contractor of his responsibility for the accuracy thereof and the Contractor shall carefully protect and preserve all bench-marks, sight-rails, pegs and other things used in setting out the Works.
10. The Contractor shall establish site office for his staff and also make provision of space and furniture for Employer's Representative at his own cost.
11. **Water for works and workforce, Electricity, Power, Fuel etc.**
The contractor at his own expenses should provide water from municipal mains or other sources for the use of work and workmen. The contractor shall be fully responsible to arrange such electricity, power, water, and fuel as may be necessary to complete the works and fulfill his obligations under the Contract. The unit rates and prices quoted by the Bidder in the Bill of Quantities shall include the cost of all electricity, power, water, and fuel as may be required.
12. **Site Office for the supervision for the work**
The Contractor shall at his own cost make available during the progress of the works and until the date of final completion thereof an Office in all respect suitable for the purpose of a Site Office for the Project Manager and its representatives, and a not less than 40 sqm, together with a laboratory as mentioned in Section 6 under Supplementary Information to be established by the Contractor. The office shall contain no less than sufficient number of tables, chairs, steel Almiraahs, a sufficient number of display boards and toilet facilities. All such office, laboratory and other facilities shall be made available within 30 days from the date of commencement of work as per requirements and directions of the Project Manager, including maintenance of the same. The said office shall be removed from the site on the completion of the Work. All dismantled items of the Site Office and furniture items shall be the property of the Contractor at the completion of the work and its onward disposal shall remain the responsibility of the Contractor.
13. The rates for all items of work unless clearly specified otherwise shall include cost of all labour, materials and other inputs involved, complete and as required to the satisfaction of the Project Manager, in the execution of the items.

14. **The Project Manager (s)**, (i.e. Engineer-in-Charge for Civil and Mechanical work) when delegated, shall be the sole deciding authority as to the meaning, interpretation and implications for various provisions of the specifications.
15. Whenever any reference is made to any Indian Standard [e.g. Codes / Standards / Manuals of Bureau of Indian Standard (IS), Indian Roads Congress (IRC), Ministry of Road Transport & Highways (MOR&TH), etc.] it shall be taken as reference to the latest edition with all amendments issued thereto or revisions thereof if any, up to the date of submission of bid.
16. The Work shall be carried out in accordance with drawings, to be issued by the Project Manager. The drawings shall have to be properly co-related to the site conditions before executing the Work, and in case of any difference noticed between site conditions and drawings, final decision, in writing of the Engineer / Project Manager, shall be obtained by the Contractor. The Work shall include the sequence of work activities from clearing the site / leveling if any, correctly laying out the structural footprint, all construction activities thereafter, commissioning and handover of the completed Work to the Employer.
17. **Site:** The 'site' shall mean the land/ or other places on, in, into or through which the Work is to be executed under the Contract or any adjacent land, path or street through which the Work is to be executed under the Contract, or any adjacent land, which may be allotted or used for the purpose of carrying out the Contract.
18. **Store:** The 'store' shall mean the place of storage of construction materials brought to site by the contractor, to be used for execution of the work under the subject contract and also from where materials will be issued to be used at the site of work. The arrangement of land for temporary storage of materials will be the responsibility of the contractor for which the Contractor should acquaint themselves with the ground reality before bidding.
19. **Best:** The word 'best' when used shall mean that in the opinion of the Project Manager, there is no superior material / article and workmanship obtainable in the market and trade respectively.
As far as possible the standard required shall be specified in preference to the word 'best.'
20. **Levels:** Only for Structures/Structural components erected on Dam/ Canal bed, the bed level of the Dam/ canal will be treated as ground level.
21. **Measurements:**
 - a. In booking dimensions, the order shall be consistent and in the sequence of length, width and height or depth or thickness. The Work shall be executed, measured, and quantity

- arrived at as per the metric dimension given in the Schedule / Bill of Quantities, drawings etc.
- b. Rounding off: Rounding off where required shall be done in accordance with IS: 2-1960. The number of significant places rounded in the rounded off value should be as specified.
- 22. Materials:**
- a. Samples of all materials to be used on the Work shall be got approved by the Contractor from the Project Manager, as applicable well in time. The approved samples duly authenticated and sealed shall be kept in the custody of the Project Manager, PIU till the completion of the Work. All materials to be provided by the Contractor shall be brand new and as per the samples approved by the Project Manager.
- b. Materials obtained by the Contractor from the sources approved by the Project Manager shall be subjected to the Mandatory tests. Where such materials do not conform to the relevant specifications, the matter shall be taken up by the Project Manager, as applicable for appropriate action against the defaulters. In all such cases, necessary documents in original and proof of payment relating to the procurement of materials shall be made available by the Contractor to the Project Manager.
- c. Samples, whether submitted for approval to govern bulk supplies or required for testing before use and also the sample of materials bearing 'Standard Mark,' if required for testing, shall be provided free of cost by the Contractor. All other incidental expenditure to be incurred for testing of samples e.g. packaging, sealing, transportation, loading, unloading etc. to the satisfaction of Project Manager shall be borne by the Contractor.
- d. The materials, supplied by the Employer, if any shall be deemed to be complying with the specifications.
- e. Materials stored at site, depending upon the individual characteristics, shall be protected from atmospheric effects due to rain, sun, wind and moisture to avoid deterioration.
- f. Materials like timber, paints etc. shall be stored in such a way that there may not be any possibility of fire hazards. Inflammable materials and explosives shall be stored in accordance with the relevant rules and regulations or as approved by Project Manager in writing so as to ensure desired safety during storage.
- g. Materials like geo-synthetic filter shall be stored in such a manner that it should be protected from getting degraded from UV ray of direct sunlight before laying.
- 23. Safety in Construction:**
- a) The Contractor shall employ only such methods of construction, tools and plant as are appropriate for the type of work or as approved by Project Manager in writing.
- b) The Contractor shall take all precautions and measures to ensure safety of works and workman as per provision of the CoC and Contractor's ESHS-MSIP and shall be fully responsible for the same. Safety pertaining to construction works such as excavation, centering and shuttering, trenching, Sheet Piling, Boulder pitching, blasting if any,

demolition, electric connections, scaffolds, ladders, working platforms, gangway, mixing of bituminous materials, electric and gas welding, use of hoisting and construction machinery shall be governed by WB-PWD Safety Code/any other relevant safety codes and the direction of Project Manager.

22.3 EXECUTION OF CIVIL AND MECHANICAL WORK AND CONSTRUCTION SUPERVISION

According to the type of work of this project, execution & supervision of work extend to two divisions, Civil & Mechanical Division for Civil & Mechanical work respectively and jointly for the structural work involving execution for Civil & Mechanical work in progress at the same time. Each Executive Engineer of the concerned divisions shall be the Engineer-in-Charge in respect of Civil & Mechanical type of work under his jurisdiction. All correspondence concerning rates, claims, change in specifications and/or design and similar important matters will be valid only if accepted/ recommended by the respective Engineer-in-Charge. If any correspondence of above tender is made with Officers other than the Engineer-in-charge for speedy execution of works, the same will not be valid unless copies are sent to the Engineer-in-Charge and also approved by him/her. Instructions given by the Sub-Divisional Officer/Assistant Engineer and the Junior Engineer/Section Officer (SO) on behalf of the Engineer-in-Charge shall also be valid (who have been authorized to carry out the work on behalf of the Engineer-in-Charge) regarding specification, supervision, approval of materials and workmanship. In case of dispute relating to specifications and work, the decision of Engineer-in-Charge shall be final and binding. The Engineer-in-Charge will forward such cases on case to case basis to their Superintending Engineer and finally respective Chief Engineer for its acceptance. However the Chief Engineer of the civil work will take all decisions finally relating to works only after recommendation/ advice of the Concerning Engineer-in-Charge and Superintending Engineer for Civil & Mechanical respectively and Chief Engineer-Mechanical for Mechanical work. Supervision of construction work will be done by the Engineer in Charge for Civil & Mechanical work separately and their site staff on a day-to-day basis and periodically by the concerned Superintending Engineer for Civil & Mechanical work separately and Chief Engineer in charge of the Project.

22.4 O.K. CARD AND THIRD-PARTY INSPECTION

15.3.1 OK Card System

In order to enforce the technical Specifications to promote construction quality, OK card system shall be kept in order to enforce the technical Specifications to promote construction quality and ESHS-MSIP implementation, OK card system shall be kept by the department. The Executive Engineer of works is primarily responsible for executing the works as per design s and Specifications. For this Executive Engineer himself or his authorized representative Assistant Engineer/Junior Engineer will sign the OK

Cards. The OK Card will be prepared and maintained in four copies. One copy each will remain with contractor, Junior Engineer, Assistant Engineer and Executive Engineer in charge of works.

The OK Card for each activity will be initiated by the contractor when he considers that all the preparations to start a particular activity are complete. The OK Card will then be given by the contractor to the concerned Junior Engineer of Dept. The Junior Engineer will confirm whether all the preparations as per provisions and Specifications are complete. If the Junior Engineer finds everything in order, he will, depending upon the competency, get the area/ works examined by the Assistant Engineer/Executive Engineer and after their approval, sign the OK Card and hand over it immediately to the contractor to commence the activity. If the JE of Dep't finds deficiencies in the preparations to start the activity, he will return the OK Card at the earliest, to the contractor with his remarks for rectification of the deficiency. The activity should start only when the deficiencies are removed by the contractor and OK card is signed by the Junior Engineer. The original OK card once initiated should not be destroyed and it should have all the remarks of all the Engineers and compliance report duly entered by the contractor and final OK remarks of the Junior Engineer. While making/ releasing payments, copy of the relevant OK card will be perused by the payment authority. OK card booklet shall be arranged by the contractor according to formats provided by the Engineer.

22.5 AS-BUILT DRAWINGS

The construction drawings shall be updated along with the progress of construction work and all modification and changes are to be incorporated in these drawings. The modified drawings shall be termed "As-Built Drawings", which are to be submitted by the Contractor to the Engineer. These "as-built drawings" shall among other details, include plan, long section and cross-section of the canal linings, embankment, bridge structures and "as-built drawings" of the appurtenant structures. The drawings are to be submitted duly signed by the Contractor in 2 hard copies and 1 soft copy. Taking over certificate of the works shall not be issued by the Engineer in the event of Contractor's failure to submit the aforesaid "As-built drawings" for the entire works. No separate payment shall be made for preparation and submission of "As-built drawings" by the Contractor. It is the responsibility of the Contractor to get these drawings approved by the Engineer.

Environmental and Social Requirements

(As and where applicable under relevant sections)

[The Employer's team preparing the ES requirements should include a suitably qualified Environmental and Social specialist/s.]

In preparing detailed specifications for ES requirements the Borrower should refer to and consider the applicable environmental and social standards in the ESF including the specific requirements set out in the Environmental and Social Commitment Plan (ESCP), ESIA/ESA/ESMP, EHSGs and other GIIPs as well as SEA and SH prevention and management obligations.

The ES requirements should be prepared in manner that does not conflict with the relevant General Conditions of Contract (and the corresponding Particular Conditions of Contract if any), and other parts of the Specifications.

The following is a non-exhaustive list of Sub-Clauses of the Conditions of Contract that make reference to ES matters stated in the Specifications.]

Sub- Clause/Clause No.	Sub-Clause/Clause	Remarks
8.2	Other Contractors	Indicate specific aspects (if any) that require contractor's cooperation such as to conduct environmental and social assessment.
9.4.1, 9.4.2, 9.4.7, 9.4.8	Labor	State applicable requirements in accordance with the labor management procedure.
9.4.6	Facilities for Staff and Labor	-Indicate if access to or provision of services that accommodate physical, social and cultural needs of

Sub-Clause/Clause No.	Sub-Clause/Clause	Remarks
9.4.20	Training of Contractor's Personnel	Contractor's Personnel is required. As set out in the ESCP, specify, details of any training to relevant Contractor's Personnel to be provided by the Employer's Personnel on environmental and social aspects. (whom, what, when, where, how long etc.)
15.2	Contractor to Construct the Works	If the Contract specifies that the Contractor shall design any part of the Permanent Works, state any applicable technical standards and requirements including to address: • climate change considerations, • universal access, • risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events, applicable certification or approval requirements [Refer to ESS4 on requirements for design]
18.2	Health and Safety Obligations	Indicate any additional requirements for the health and safety manual
18.3	Protection of the Environment	Specify any values for emissions, surface discharges, effluent and any other pollutants from the Contractor's activities that shall not be exceeded.
19.1	Archeological and Geological Findings	Specify other requirements if any in accordance with the ESF – ESS8
29.1	Security of the Site	State any additional requirements for the security arrangements (ESS4 of the ESF states the principles of proportionality, GIIP and applicable laws. Include any other requirement set out in the ESCP.

In addition to provisions in the above table, the Employer shall specify the following as applicable.

Management and Safety of Hazardous Materials

As applicable, specify requirements for the management and safety of hazardous materials (see ESF - ESS4 para. 17 and 18 and relevant guidance notes).

Resource Efficiency and Pollution Prevention and Management

As applicable specify Resource Efficiency and Pollution Prevention and Management measures (see ESF -ESS3 and relevant guidance notes).

- ***Resource efficiency***

The Employer shall specify, as applicable, measures for improving efficient consumption of energy, water and raw materials, as well as other resources.

- ***Energy:*** *When the Works have been assessed to involve a potentially significant use of energy, specify any applicable measures to optimize energy usage.*
- ***Water:*** *When the Works have been assessed to involve a potentially significant use of water or will have potentially significant impacts on water quality, specify any applicable measures that avoid or minimize water usage so that the Works' water use does not have significant adverse impacts on communities, other users and the environment.*
- ***Raw material:*** *When the Works have been assessed to involve a potentially significant use of raw materials, specify any applicable measures to support efficient use of raw materials.*
- ***Pollution prevention and management***
 - ***Management of air pollution:*** *specify any measure to avoid or minimize Works related air pollution. See also GCC Sub-Clause 18.3 and the table aboveon Conditions of Contract that make reference to ES matters in the Specification.*
 - ***Management of hazardous and nonhazardous wastes:*** *specify any applicable measures to minimize the generation of waste, and reuse, recycle and recover waste in a manner that is safe for human health and the environment including storage, transportation and disposal of hazardous wastes. See also GCC Sub-Clauses 18.2 and 18.3 and the table aboveon Conditions of Contract that make reference to ES matters in the Specification.*
 - ***Management of chemicals and hazardous materials:*** *specify any applicable measures to minimize and control the release and use of hazardous materials for Works activities including the production, transportation, handling, and storage of the materials. See also GCC Sub-Clauses 18.2 and 18.3 and the table aboveon Conditions of Contract that make reference to ES matters in the Specification.*
- ***Biodiversity Conservation and Sustainable Management of Living Natural Resources***

The Employer shall specify, as applicable, Biodiversity Conservation and Sustainable Management of Living Natural Resources (see ESF - ESS6 and relevant guidance notes). This includes, as applicable:

- *invasive alien species: managing the risk of invasive alien species during the execution of the Works;*
- *sustainable management of living natural resources; and*
- *certification and verification requirements for the supply of natural resource materials where there is a risk of significant conversion or significant degradation of natural or critical habitats.*

See also GCC Sub-Clause 18.3 and the table above on Conditions of Contract that make reference to ES matters in the Specification.

- **Road Safety**
 - *State any specific traffic and road safety requirement, as applicable. See also Sub-Clause 9.3 of the General Conditions of Contract. For details, refer to the Guidance Note on Road safety.*

PAYMENT FOR ES REQUIREMENTS

The Employer's ES and procurement specialists should consider how the Contractor will cost the delivery of the ES requirements. In the majority of cases, the payment for the delivery of ES requirements shall be a subsidiary obligation of the Contractor covered under the prices quoted for other Bill of Quantity items or activities. For example, normally the cost of implementing workplace safe systems of work, including the measures necessary for ensuring traffic and road safety, shall be covered by the Bidder's rates for the relevant works.

NOTE: See the reference of ESMP & ESDD to the Annexure-I & II respectively.

BAR CHART

[illegible]

[illegible]

NB:The above allotted effective time periods against each activity are indicatives. The Agency shall take up the all activity related to U/S & D/S of DAM and other works simultaneously and deploy adequate resources and work in two shifts to ensure completion of all works within the Dam closure period, Dry or Non-Monsoon Period from March to June. Beyond this period from July to Oct i.e. Monsoon & Kharif Irrigation period miscellaneous items relating to procurement of required materials and the other activities like manufacturing & fabrication of mechanical items may be continued. Building works may continue throughout the year but execution of Road works may go on except rainy season.

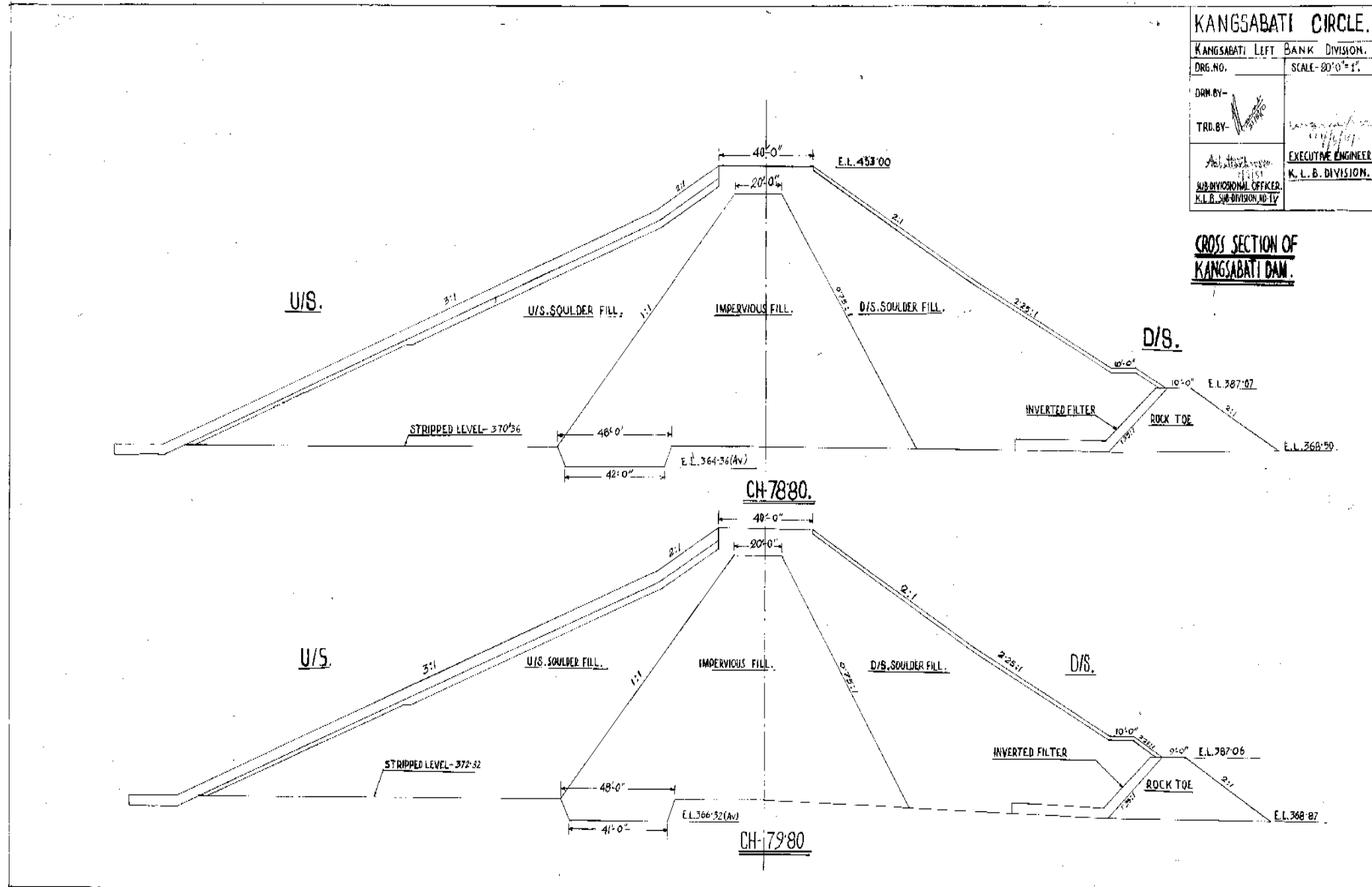
Drawings

List of Drawings:

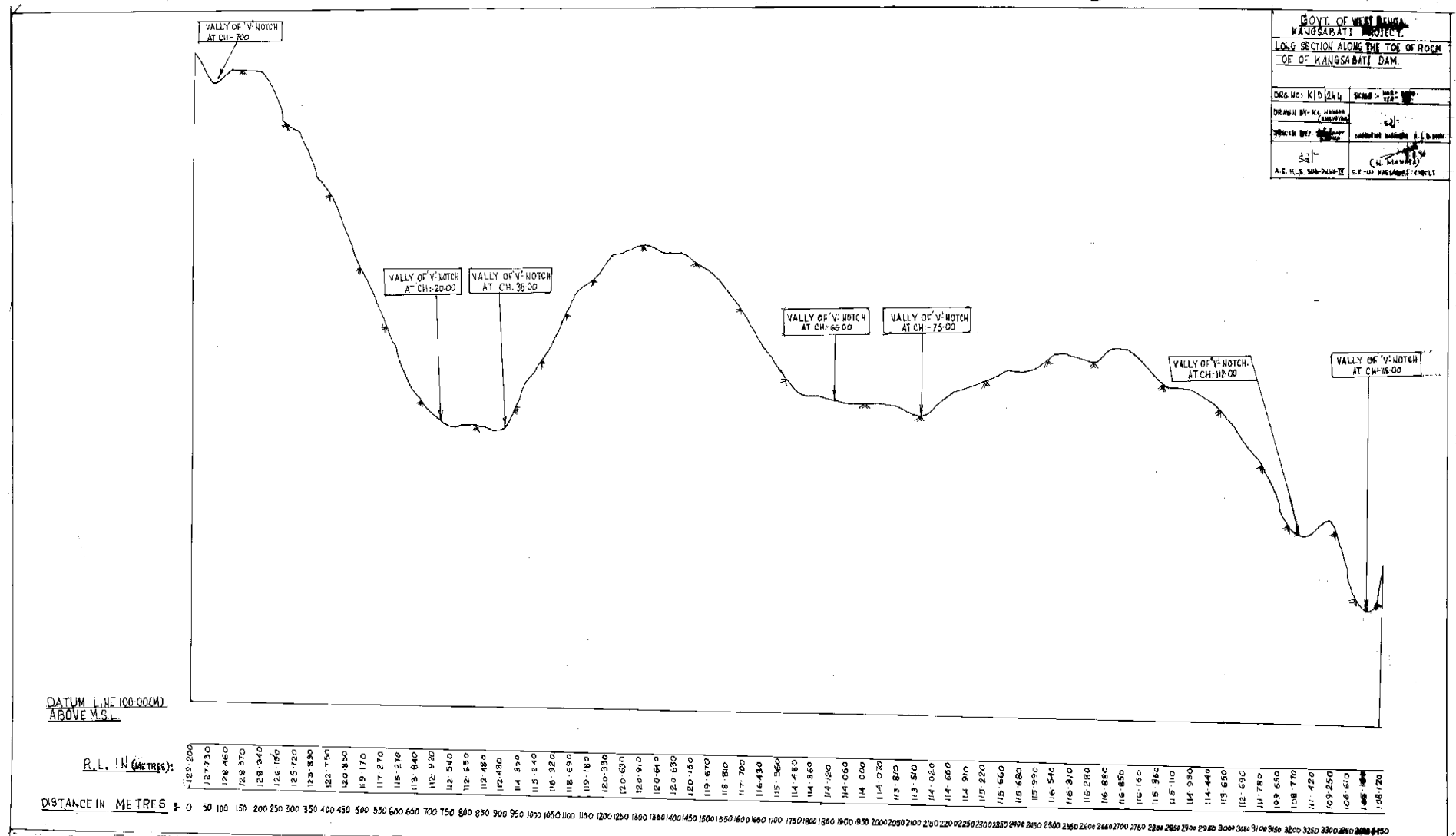
- (1) LAYOUT MAP OF KANGSABATI DAM
- (2) TYPICAL CROSS SECTION OF KANGSABATI DAM
- (3) LONGITUDINAL SECTION OF KANGSABATI DAM
- (4) GATE LEAF OF SPILLWAY GATE
- (5) A LAYOUT OF KANGSABATI LBHR
- (6) EMERGENCY GATE FOR L.B.H.R. GATE
- (7) RUBBER SEAL OF LBHR AND EMERGENCY GATE
- (8) RUBBER SEAL FOR SPILLWAY GATE
- (9) LEAF WITH GIRDER FRAME OF L.B H.R. GATE
- (10) GA DRAWING OF STOPLOG GATES OF SPILWAY
- (11) GA DRAWING OF STOPLOG ADDITIONAL BAY
- (12) LAYOUT DIAGRAM AT PLAN FOR FIXING EMBEDDED PARTS
- (13) ARMS FOR L.B. H.R. GATE

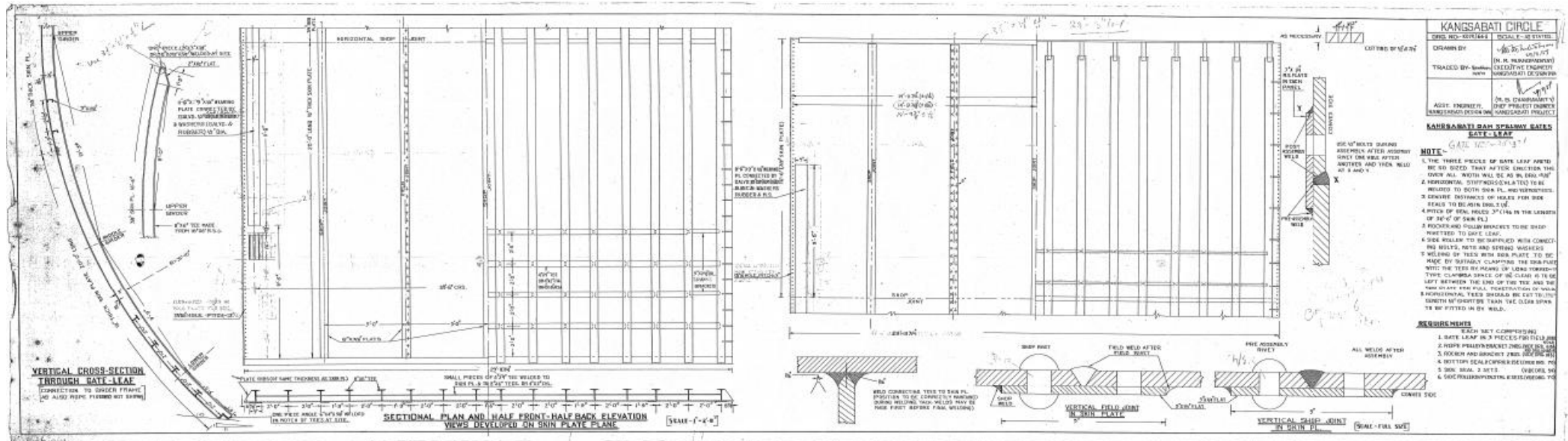
LAYOUT MAP OF KANGSABATI DAM

TYPICAL CROSS SECTION OF KANGSABATI DAM

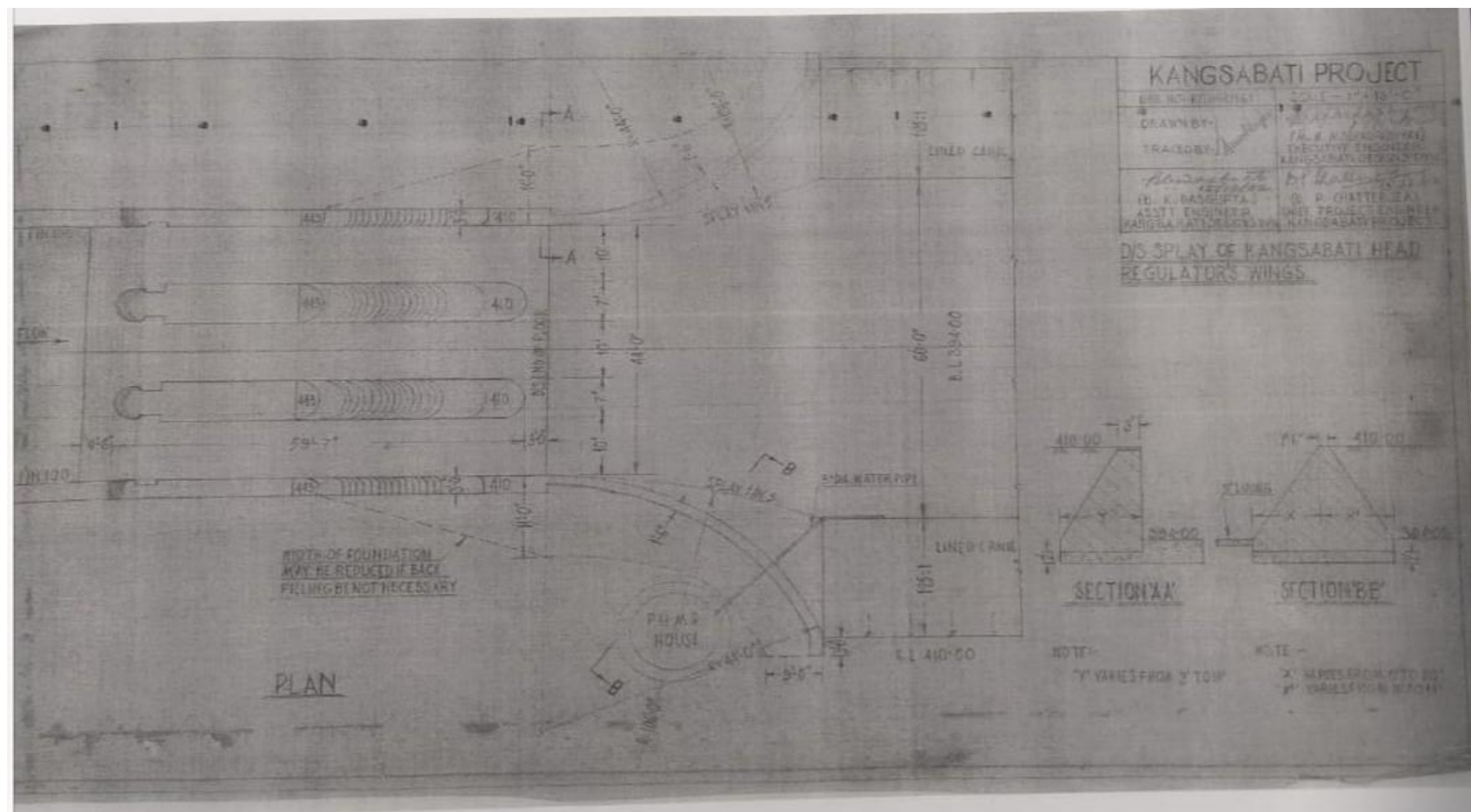


LONGITUDINAL SECTION OF KANGSABATI DAM

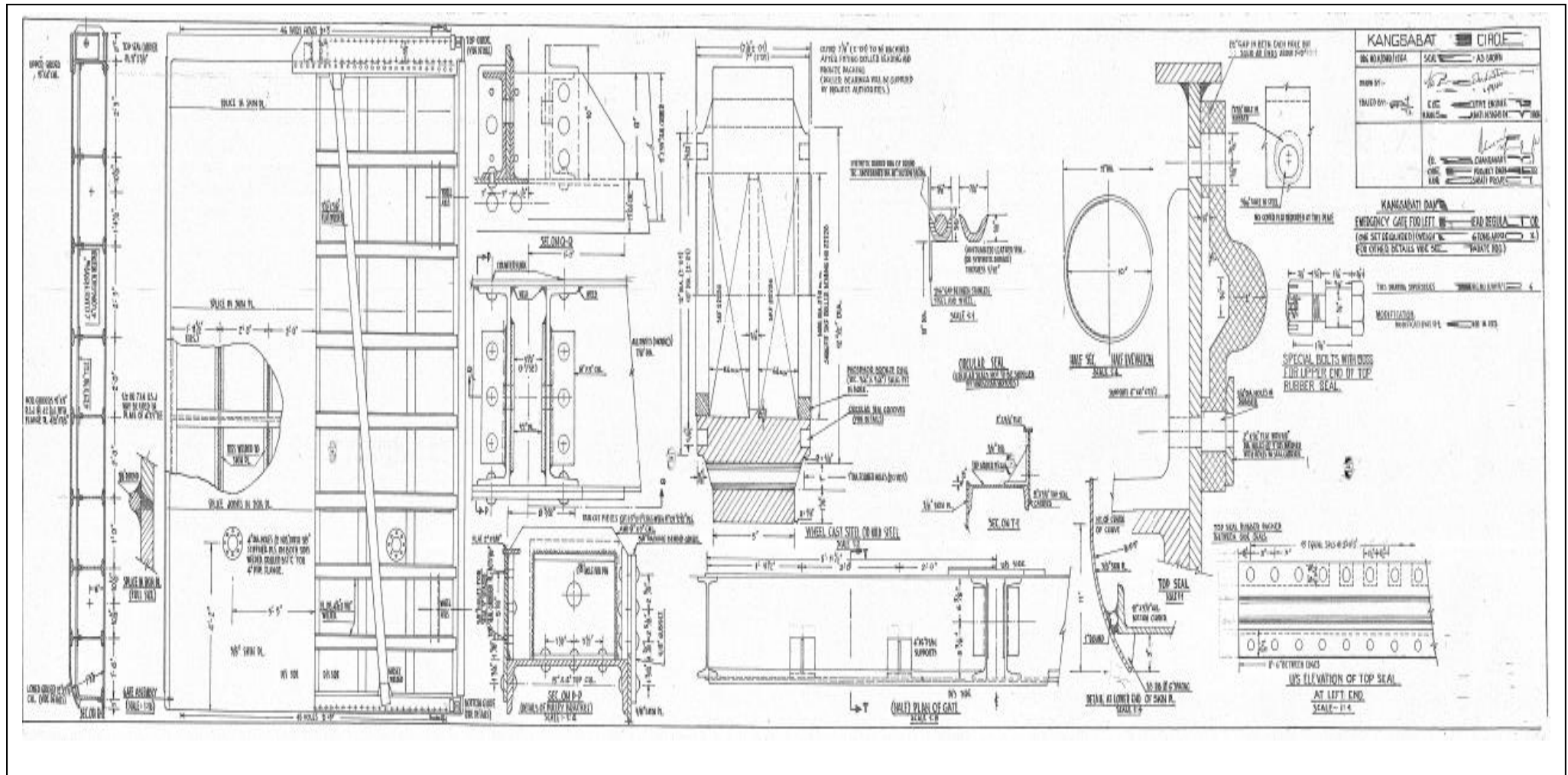




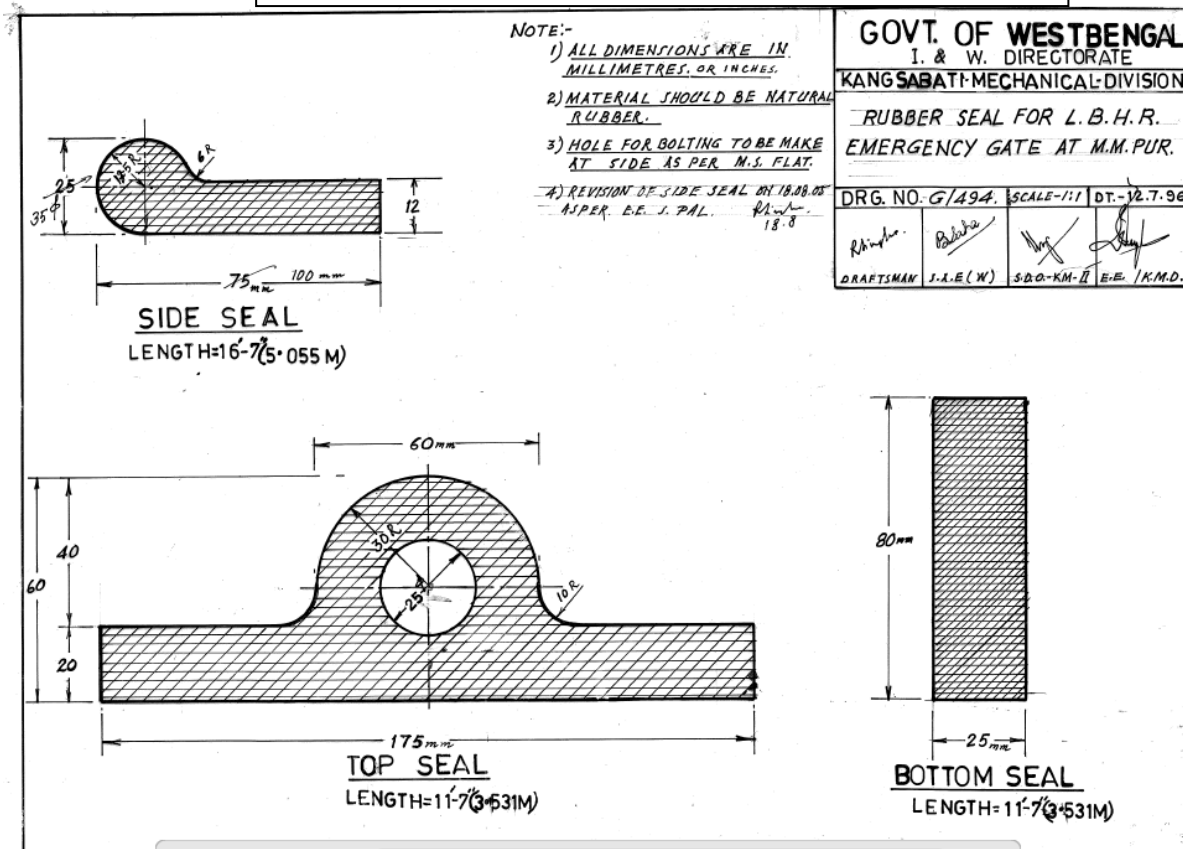
A LAYOUT OF KANGSABATI LBHR



EMERGENCY GATE FOR L.B H.R. GATE



RUBBER SEAL OF LBHR AND EMERGENCY GATE



NOTE: All dimensions are in inches

1) This is traced from Drg. No. KDSR/73-8 of Kang. Circle.

GOVT. OF WEST BENGAL.
I. & W. DIRECTORATE.
KANGSABATI MECHANICAL DIVISION.
SIDE RUBBER SEAL FOR SPILL-WAY GATE AT MUKUTMONIPUR.

DRG. NO.-KMD/G/493 SCALE: 1/2, 1/1 OF 25.6.96

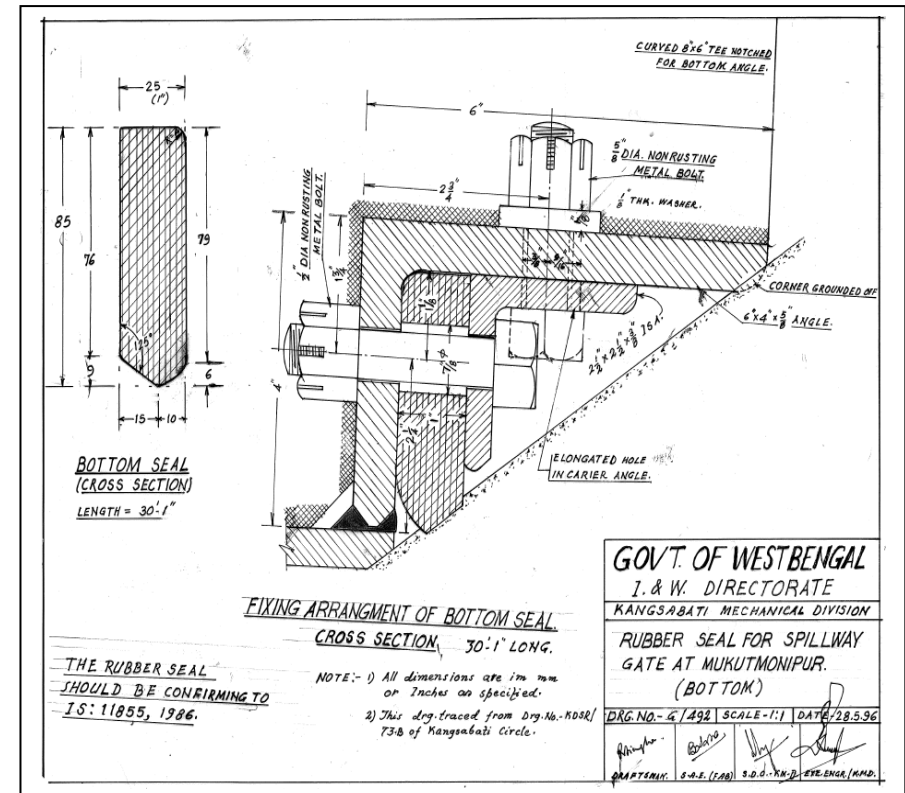
DRGSMAN SAE (W-100) SMO-KM-B TEE ENGR (KMD)

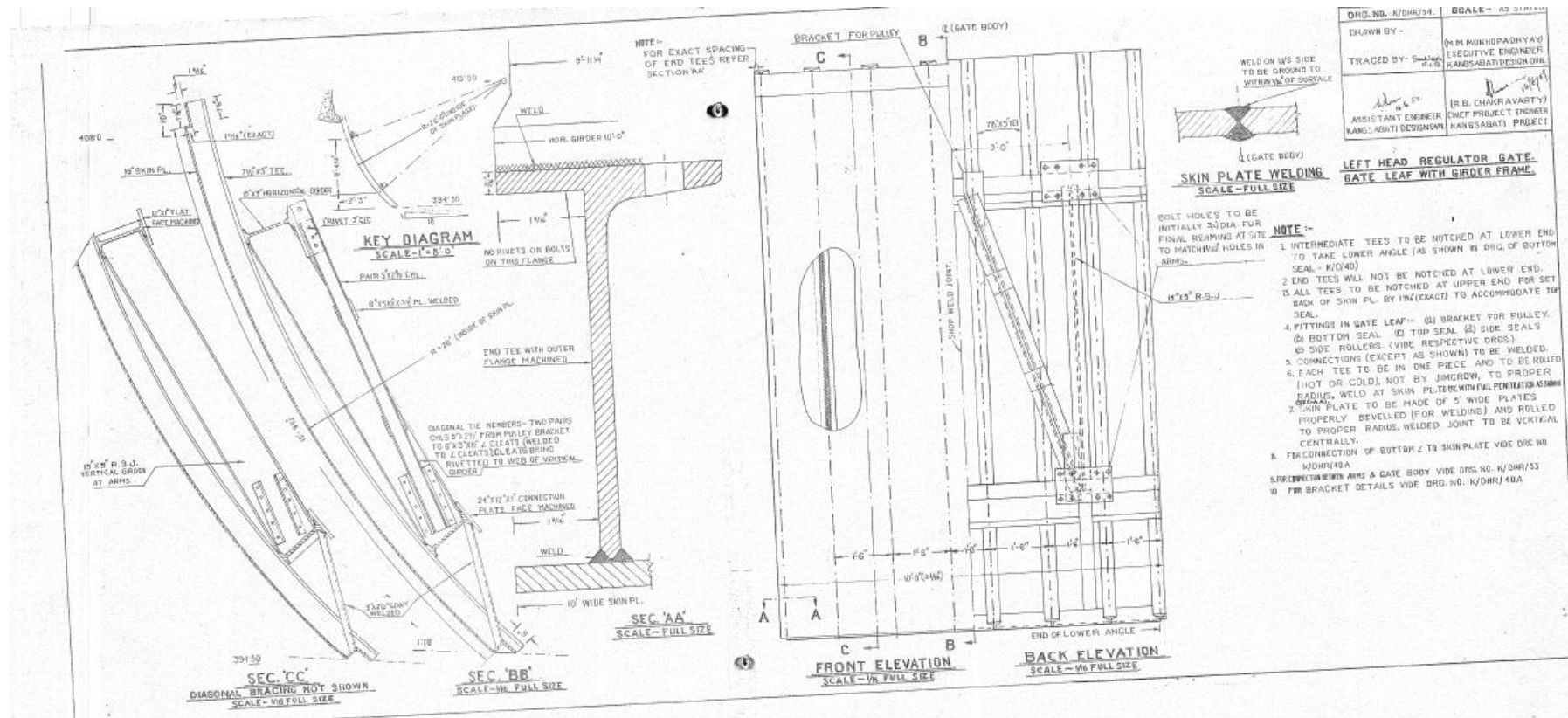
CROSS SECTION OF SIDE SEAL.
37'-0" LONG.

THE RUBBER SEAL SHOULD BE CONFIRMING TO IS:11855, 1986.

FIXING ARRANGEMENT OF SIDE SEAL

30'-0" BETWEEN SEAL PATH

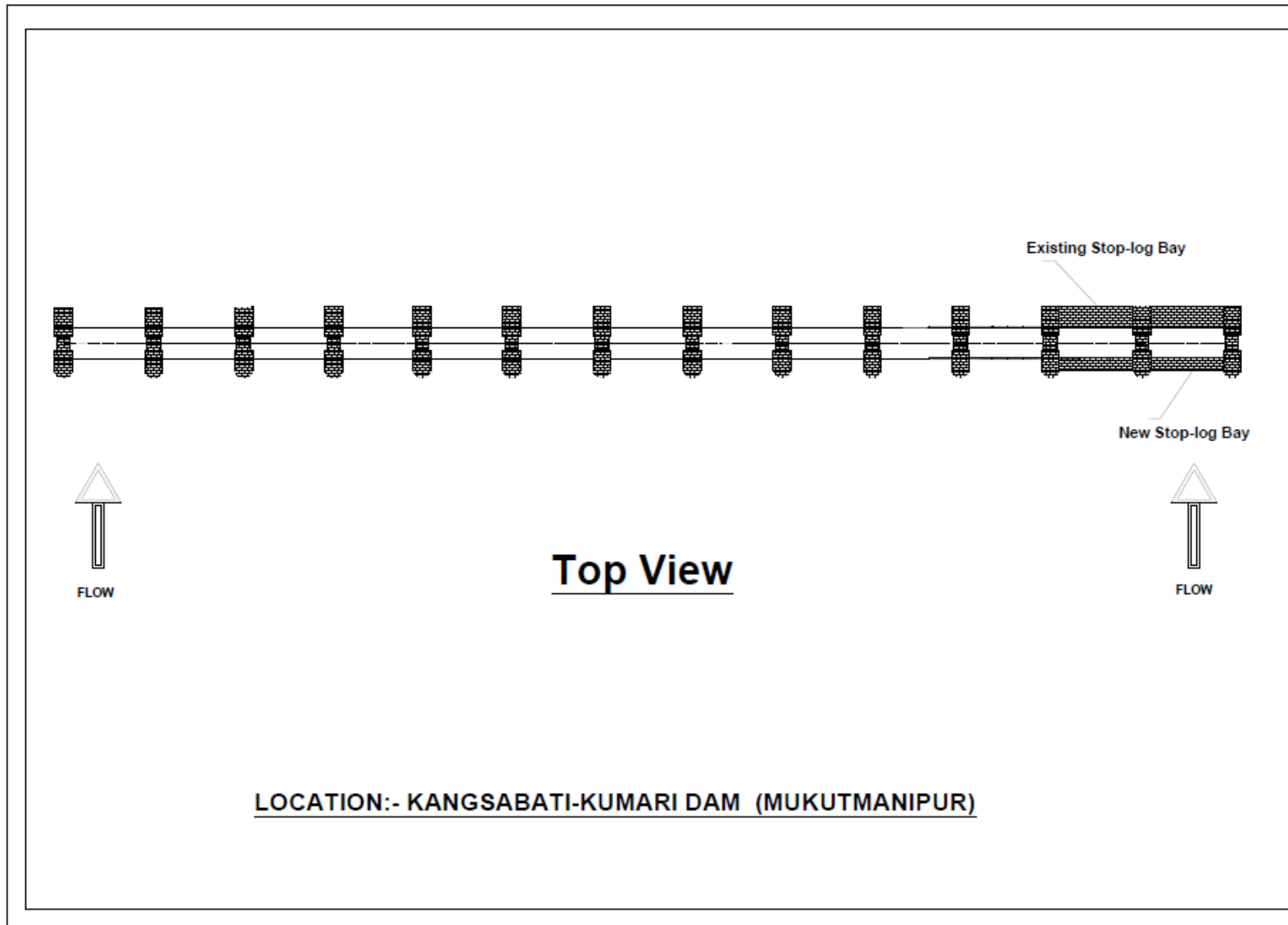




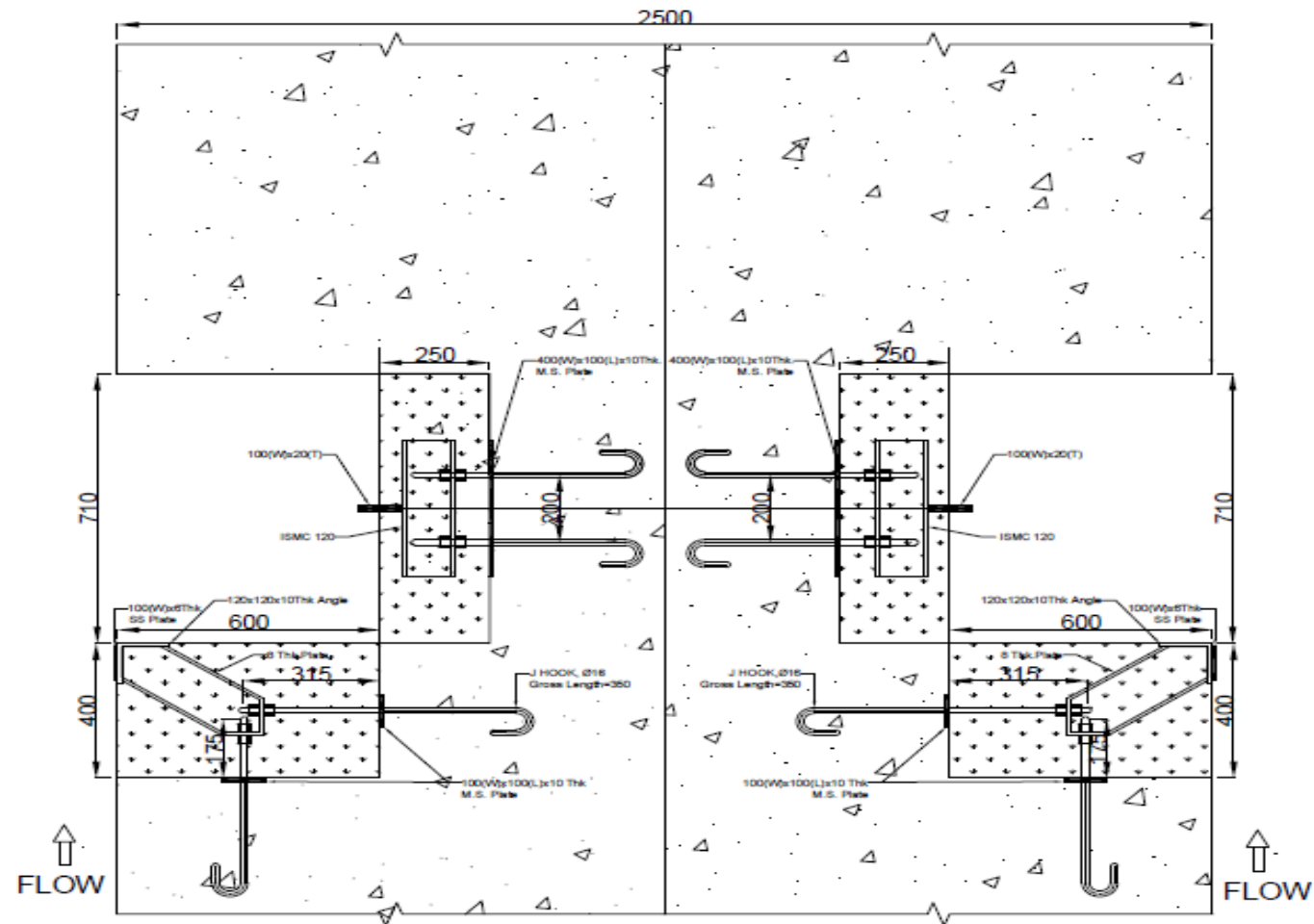
LEAF WITH GIRDER FRAME OF L.B.H.R. GATE

[illegible]

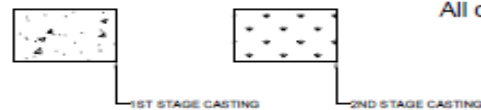
GA DRAWING OF STOPLOG ADDITIONAL BAY



Layout Diagram at plan for fixing Embedded parts on pier (Side Seal Path, Guide Path) for Stop-log Gate at Mukutmanipur Dam.

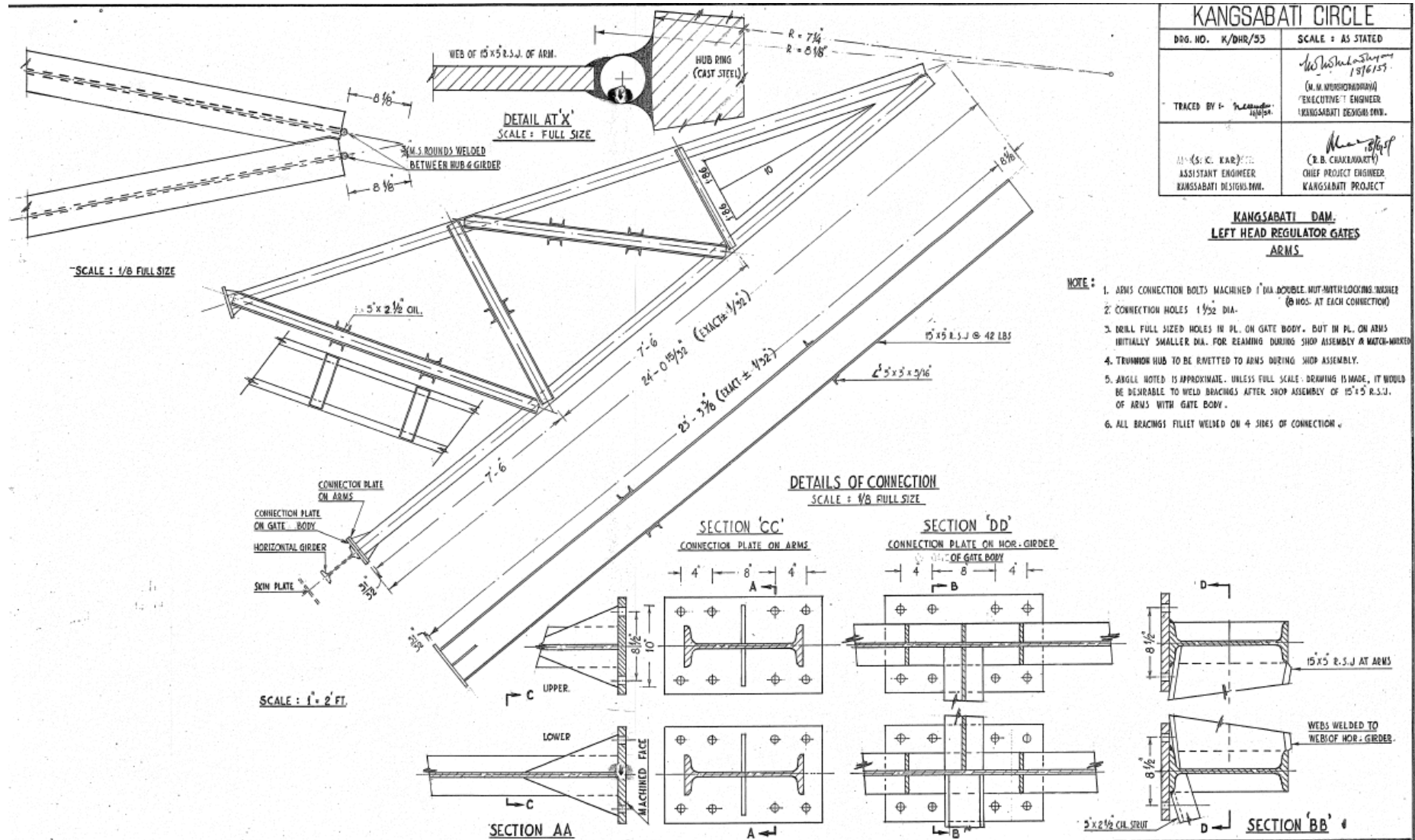


LEGEND:-



All dimension in mm

ARMS FOR L.B.H.R. GATE



Supplementary Information

Irrigation & Waterways Directorate, Govt. of West Bengal offered a work for “Service suitability and health assessment of Kangsabati river dam gate (11 Nos.) at Mukutmanipur” Bankura. These radial lock gates are very old and are in working since 1955. So it was required to conduct the service suitability and health assessment of these gates. Accordingly, a team of CSIR-CMERI, Durgapur visited the site and conducted the above mentioned work from 14.03.23 to 18.03.23 in the presence of site Engineer and site in-charge of Mukutmanipur Dam, Irrigation & Waterways Directorate, Kangsabati Mechanical Division, Govt. of West Bengal.

INSPECTION

a)Visual examination: Visual examination is carried out to assess apparent material damage due to corrosion/erosion and physical damage if any. Visual examination was carried out with naked eyes in accessible locations of the properly cleaned components.

b)Ultrasonic thickness measurement(UT-T): Ultrasonic wall thickness measurement was carried out in gates to determine wall thinning due to corrosion, erosion etc..

c)Magnetic Particle Examination: This technique was adopted on ferrous components for detection of surface and near surface discontinuities by wet fluorescent method as per standard ASTM E709-15

d)Ultrasonic Testing: Ultrasonic Testing technique was used for detection of internal defects and to ensure internal soundness of components for further use as per standard ASTM E114-15.

OBSERVATIONS

- Horizontal and vertical girders at bottom most portion of downstream side was found corroded.
- Fasteners on bottom portion of the gate at downstream side are found corroded.
- All ropes and its connecting links are partially damage.
- Minor pitting is observed on both upstream and downstream side of the gate.
- The Magnetic Particle inspection test result reveals absence of any surface / near surface discontinuity.
- The ultrasonic testing test result reveals absence of any internal defects.
- The ultrasonic wall thickness measurements of the gate were carried out at different accessible areas at both upstream and downstream side to check the minimum thickness of the gate.

The observed thicknesses are tabulated below for all 11 nos spillway gates:

Gate no – 1: Observation of Ultrasonic Wall Thickness measurements
From Downstream Side

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.6	9.3	9.3	9.5	9.3		9.9		9.8	9.6	9.4	9.6	9.2	9.8	9.9
B	9.6	9.3	9.2	9.4	9.2		9.7		9.2	9.5	9.3	9.3	9.4	9.9	9.9
C	9.5	9.2	9.4	9.4	9.1		9.9		9.5	9.3	9.2	9.1	9.2	9.9	9.9
Top Girder															
D	9.6	9.5	9.5	9.6	9.3	10.0	9.6		9.4	9.2	9.3	9.7	9.5	9.4	9.8
E	11.4	12.6	11.9	12.5	12.0	12.6	12.6		12.4	12.4	12.3	12.1	12.2	12.4	12.3
F	13.0	12.4	11.9	12.0	12.3	12.6	13.0		12.3	12.2	12.0	11.9	12.3	12.1	12.7
G	12.6	12.8	12.4	12.5	12.7	12.8	12.9		12.4	12.3	12.3	11.5	12.0	12.2	12.5
Middle Girder															
H	12.5	10.2	12.5	12.9	12.6	13.1	12.9		12.5	12.5	11.9	12.1	12.1	13.4	12.4
I	12.6	11.5	10.9	12.3	12.2	13.3	11.6		13.2	11.5	11.8	11.6	11.8	13.2	12.3
J	12.3	12.3	12.2	12.8	12.5	12.9	13.0		12.7		11.3	12.2	12.2	13.1	12.4
K	12.6	12.7	12.5	11.4	12.5	12.5	12.0			12.2	12.7	12.0	12.5	11.3	10.9
L	12.9	12.7	12.2	12.7	11.9	13.0	13.1			11.3	12.2	12.0	11.9	12.6	
M	12.8	11.5	12.6	12.8	13.2	13.2	13.7		13.2	13.1	11.5	13.3	13.5	12.6	12.7
Bottom Girder															
N	11.6	12.5	13.3	10.9	12.4	13.4	13.7		12.1	13.0	12.2	13.2	12.2	12.6	13.0
O	11.8	10.6	10.3	10.9	10.5	9.7	11.5		12.3	12.5	12.1	9.9	10.8	10.2	

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	11.5	11.5	11.3	10.1	8.9	12.2

Gate no – 2: Observation of Ultrasonic Wall Thickness measurements
From Downstream Side

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.4	9.5	9.5	9.4	9.0	9.5	9.6	10.3	9.3	9.4	9.6	10.0	10.1	9.9	10.1
B	9.6	9.5	9.1	9.5	9.0	9.4	9.7	9.4	9.4	9.4	9.7	9.6	9.7	11.5	10.3
C	10.0	9.7	9.5	9.6	8.7	9.5	11.6	10.5	10.4	9.5	9.5	9.5	10.5	10.1	10.1
Top Girder															
D	9.3	9.9	9.9	8.8	8.6	9.5	9.4	9.3	9.5	9.4	9.7	9.4	9.3	9.9	9.9
E	12.0	12.5	12.4	11.8	12.1	11.3	12.2	11.8	12.6	12.2	11.7	11.6	11.8	12.1	12.1
F	11.9	12.2	12.1	12.0	12.7	11.9	12.2	11.9	12.5	12.6	12.0	11.7	12.0	11.9	11.7
G	13.0	12.5	12.6	12.5	13.0	12.1	11.6	11.5	12.5	12.5	12.1	11.7	12.1	11.6	11.7
Middle Girder															
H	12.0	12.1	12.1	12.0	12.5	11.5	11.5	11.8	12.4	11.6	11.7	12.0	12.4	12.3	11.7
I	12.0	12.0	11.7	12.2	12.1	11.5	12.2	11.5	11.5	12.0	11.6	12.0	11.5	10.1	12.3
J	12.5	12.1	12.5	12.2	11.9	12.2	12.0	11.1	12.1	12.1	12.0	12.0	10.7	11.7	11.7
K	12.1	12.0	12.2	12.1	12.1	11.4	11.5	12.3	12.4	12.2	12.0	11.7	10.7	10.7	11.1
L	10.9	9.9	10.3	12.0	12.4	12.2	12.1	11.9	10.7	12.7	11.3	11.7	9.5	11.5	9.6
M	11.9	11.2	10.8	11.8	12.2	12.0	11.7	8.6	12.4	12.5	12.1	11.9	11.5	11.5	11.9
Bottom Girder															
N	11.7	11.2	12.8	12.0	11.6	11.9	11.6	11.9	11.5	12.1	12.0	11.5	10.7	11.3	10.8
O	9.0	11.2	10.3	10.7	9.0	10.7	10.6	11.1	11.6	12.3	11.5	11.9	11.6	10.8	11.5

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	11.1	9.6	8.9	10.9	11.0	7.2

Gate no **3: Observation of Ultrasonic Wall Thickness measurements**

From Downstream Side

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.5	9.7	9.7	9.8	9.7	9.7	9.5	9.3	9.3	9.2	9.5	9.4	9.2	10.0	10.4
B	9.5	9.4	9.7	9.8	9.7	9.3	9.7	9.4	9.8	9.3	9.1	9.2	9.3	10.0	10.4
C	9.6	9.5	9.4	9.7	9.3	9.4	9.8	9.2	9.3	9.2	9.2	9.4	9.3	10.1	10.2
Top Girder															
D	8.6	9.1	9.2	9.2	9.5	9.2	9.5	8.7	9.5	9.6	9.1	9.0		9.9	9.8
E	11.4	11.2	12.3	11.9	12.5	12.5	12.1	11.8	12.2	12.3	12.3	12.4	12.3	12.2	12.8
F	11.8	11.8	12.2	12.3	12.2	12.3	12.5	12.5	12.6	12.3	12.2	12.2	11.9	12.5	12.0
G	11.9	11.9	12.3	12.5	12.5	12.2	12.3	11.9	12.0	12.3	11.5	12.5	12.2	12.3	12.4
Middle Girder															
H	11.7	11.0	12.1	12.6	12.3	12.1	12.4	12.3	12.3	12.4	12.5	12.4	10.5	12.5	12.0
I	11.5	11.1	12.2	12.1	12.2	12.1	12.2	12.7	12.1	10.2	12.1	11.9	12.5	12.0	12.4
J	11.7	11.2	12.0	11.7	12.4	12.3	12.1	12.0	12.2	12.5	12.2	12.1	11.9	12.3	12.5
K	11.1	11.3	11.0	12.3	12.2	12.3	12.6	11.7	12.5	12.4	12.3	12.4	11.7	12.3	12.5
L	11.0	11.0	10.1	12.2	12.4	12.4	11.8	11.7	12.4	12.5	12.2	11.7	10.7	12.2	10.7
Bottom Girder															
M	10.2	11.5	12.0	12.2	11.9	11.4	12.4	12.4	12.3	11.7	11.7	12.6	12.1	11.9	10.1
N	11.5	11.9	12.0	12.3	12.1	11.6	12.2	11.9	11.9	11.5	11.8	10.9	10.2	11.6	9.9

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	8.7	11.5	11.1		11.2	10.6

Gate no **4: Observation of Ultrasonic Wall Thickness measurements**

From Downstream Side

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.6	10.4	10.1	10.3	9.8	9.7	9.8	9.9	9.5	9.7	9.5	9.7	9.8	9.6	9.5
B	9.1	9.7	10.1	10.0	9.9	9.7	9.6	9.8	9.8	9.7	9.6	9.7	9.7	9.9	9.7
C	10.8	9.5	10.2	10.1	9.8	9.5	9.7	9.5	9.6	9.6	9.5	9.8	9.8	9.7	9.6
Top Girder															
D	9.4	9.4	8.8	9.6	9.5	9.5	9.6	9.3	9.5	9.1	9.5	9.5	9.2	9.9	9.7
E	12.4	12.3	12.0	12.5	12.2	12.5	12.5	12.5	12.4	12.6	11.3	12.2	12.3	12.2	12.5
F	12.2	12.2	12.0	12.5	12.2	12.7	12.8	12.3	12.2	12.7	12.5	12.2	12.5	12.0	12.8
G	12.5	12.5	12.4	12.4	12.3	12.3	12.7	12.7	12.6	12.6	12.7	12.8	12.3	11.5	12.5
Middle Girder															
H	12.7	12.5	12.2	12.5	12.1	12.8	12.6	11.6	12.2	12.7	12.2	12.6	12.7	12.8	12.7
I	12.4	10.9	12.0	12.3	9.9	12.7	11.9	12.6	12.7	12.5	12.1	12.5	11.7	11.8	12.8
J	12.5	11.6	12.2	12.2	12.0	12.7	12.7	12.9	12.3	12.8	12.5	12.7	11.7	11.8	12.7
K	12.1		12.2	12.6	11.4	12.2	12.7	11.7	12.8	12.6	11.5	12.1	11.5	12.7	12.6
L	11.5		11.1	12.2	12.2	12.9	11.9	12.0	12.4	11.7	12.5	12.3	12.3	12.7	12.7
Bottom Girder															
M	11.3	12.7	12.0	12.9	12.6	11.1	11.1	12.2	12.7	12.8	11.0	10.8	12.3	11.9	12.7
N	12.0	12.3	12.3	12.1	11.6	11.9	11.2	11.9	12.5	12.9	12.2	12.5	11.8	11.2	11.1
O	10.4	12.3	10.7	11.9	11.9	11.9	10.1	12.5	11.7	9.8	11.1	9.9	10.2	10.5	10.6

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	11.5	11.0	12.3	12.6	12.6	11.8

Gate no- 5: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.7	9.3	9.3	9.6	9.7	9.7	9.7	9.5	9.3	9.4	9.5	9.4	9.4	9.7	9.7
B	9.6	9.5	9.5	9.7	9.5	9.8	9.7	9.4	9.3	9.5	9.3	9.4	9.4	9.5	9.4
C	9.5	9.5	9.2	9.7	9.5	9.7	9.7	9.3	9.4	9.3	9.1	9.3	9.4	9.4	9.3
Top Girder															
D	8.7	8.5	8.7	9.4	9.2	9.3	10.0	9.1	8.7	9.2	9.4	9.4	9.2	9.0	9.5
E	12.1	12.2	12.1	12.0	12.1	12.5	12.1	12.2	12.3	12.6	12.6	12.8	12.9	12.4	12.2
F	13.7	11.5	12.0	12.2	11.6	12.4	12.5	12.1	12.6	12.7	12.8	12.9	12.9	12.9	12.1
G	12.2	12.3	11.6	12.4	12.0	12.7	12.4	12.5	12.2	12.9	12.7	12.4	12.7	12.2	12.7
Middle Girder															
H	11.5	11.5	10.8	10.1	12.3	11.8	12.3	12.8	12.8	12.2	12.1	11.8	12.7	12.3	11.8
I	12.0	12.2	12.0	12.0	12.2	12.4	12.1	12.3	12.9	12.5	12.1	12.8	12.3	12.1	12.2
J	9.5	11.1	11.8	12.4	11.7	12.2	12.3	11.7	10.5	12.6	12.3	11.3	12.7	12.1	12.2
K	11.9	11.5	11.6	12.4	12.1	12.1	12.2	12.2	11.7	12.4	12.5	11.8	12.3	12.1	11.6
L	11.5	11.6	12.2	11.8		12.1	11.8	12.7		12.1	12.3	12.6	12.4	10.7	11.4
Bottom Girder															
M	11.5	11.2	11.4	11.3	12.3	12.3	12.1	10.8	12.5	12.5	12.2	12.5	12.4	9.9	12.3
N	12.1	12.1	11.9	12.2	12.4	12.2	12.1	11.9	12.4	10.1	12.5	10.9	12.5	11.5	12.0
O	10.7	9.5	10.5	9.5	10.5	11.0	9.3	11.4	12.0	11.8	11.0	11.3	10.2	11.1	9.6

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	11.2	11.3	10.4	11.0	11.9	11.6

Gate no – 6: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.7	9.7	9.8	10.0	9.7	9.8	10.0	9.9	9.9	9.9	9.6	9.5	9.9	9.7	9.4
B	9.7	9.6	9.8	10.0	9.9	10.0	10.3	9.9	10.4	9.8	9.4	9.5	9.7	9.7	9.8
C	9.7	9.6	9.8	9.8	9.8	9.9	10.3	9.8	9.8	9.9	9.1	9.2	9.5	9.6	9.6
Top Girder															
D	9.5	9.3	9.8	9.7	9.4	9.6	9.7	9.6	10.0	9.9	9.3	9.5	9.1	9.5	9.3
E	12.5	12.5	11.6	11.6	11.9	12.0	12.1	12.3	12.0	11.7	12.1	12.4	11.8	12.3	12.2
F	12.4	12.8	12.1	12.5	12.2	12.7	11.9	11.7	12.1	11.7	12.3	11.9	12.1	10.8	12.5
G	12.3	12.3	12.2	12.3	12.5	11.8	11.9	12.2	11.8	11.9	12.0	12.2	11.8	12.2	12.2
Middle Girder															
H	12.3	12.4	12.4	12.3	12.1	11.5	11.9	12.4	11.4	12.0	12.8	12.4	12.3	12.4	12.3
I	12.7	11.3	12.1	12.2	12.0	12.3	12.2	11.9	11.5	11.7	12.3	12.7	12.3	11.8	11.8
J	10.3	12.5	12.5	12.3	11.9	12.3	12.1	12.0	11.2	11.9	12.0	11.5	12.3	11.9	11.5
K	12.3	12.2	12.4	12.5	11.8	11.8	12.0	11.9	11.7	11.9	12.3	11.9	12.5	12.1	12.0
L	11.8	12.1	11.8	12.2	12.3	12.3	10.5	12.7	11.2	11.7	12.1	12.3	12.2	12.5	11.8
Bottom Girder															
M	11.7	11.7	11.9	12.2	11.5	11.7	11.1	12.0	11.8	10.9	11.9	11.8	11.9	12.2	12.0
N	11.3	11.7	11.3	11.0	11.5	11.8	11.7	10.8	10.5	11.6	11.2	10.8	10.7	12.0	11.9
O	11.5	11.5	10.5	11.0	12.2	11.7	10.5	11.9	11.5	9.8	10.6	11.6	11.5	10.4	11.0

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value		11.4	11.5	9.5	10.5	9.7

Gate no – 7: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.1	9.7	8.9	9.2	9.2	9.6	9.7	9.4	9.4	9.7	9.5	10.0	9.5	9.6	9.8
B	9.0	9.3	8.8	9.2	9.2	9.3	9.3	9.5	9.3	9.7	9.5	9.2	10.0	9.7	9.7
C	9.2	9.1	9.1	9.1	10.1	9.8	9.0	9.3	9.4	9.7	9.1	9.1	9.8	9.5	9.1
Top Girder															
D	8.6	8.6	8.5	9.2	8.5	9.0	9.6	9.2	9.2	8.7	9.6	10.0	9.5	9.0	9.0
E	11.5	12.6	12.3	12.3	12.6	12.3	12.5	12.5	11.8	11.5	11.7	12.2	12.0	12.0	12.5
F	12.2	12.5	12.0	12.5	12.5	12.5	12.6	12.5	10.6	12.2	12.5	12.1	11.9	12.0	12.5
G	12.5	12.2	12.4	12.5	12.5	12.4	11.9	12.4	12.6	12.1	11.2	12.5	11.3	12.0	12.6
Middle Girder															
H	11.9	12.1	12.4	12.3	12.3	12.2	12.2	12.2	12.0	12.3	12.1	12.0	12.8	12.3	
I	11.8	12.1	12.5	12.0	12.5	12.2	12.0	12.5	12.3	12.5	11.0	10.1	12.1	11.5	12.0
J	11.8	11.8	11.2	12.3	12.5	12.0	12.3	11.9	11.9	12.5	10.5	12.0	12.3	12.3	12.1
K	12.0	12.3	12.7	12.5	12.5	12.2	12.7	12.3	11.5	12.2	12.1	12.0	12.3	12.2	12.3
L	11.5	11.2	12.5	12.4	12.5	12.5	12.0	12.5	12.0	12.3	11.5	11.8	11.8	12.0	11.7
Bottom Girder															
M	11.5	12.2	12.2	12.5	12.8	11.3	11.7	12.4	11.6	10.5	12.2	12.4	12.0	12.6	12.1
N	12.2	12.0	12.5	12.5	12.5	12.2	11.5	11.8	12.4	11.9	12.2	11.8	10.7	10.7	12.6
O	10.7	10.8	12.4	11.5	10.9	11.7	10.8	11.7	12.3	10.6	11.5	11.5	12.3	12.3	10.5

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	10.6	11.1	9.7	10.5	11.1	11.4

Gate no – 8: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.7	9.8	9.3	9.5	9.3	9.3	9.8	9.7	9.5	9.3	9.5	9.7	9.8	9.8	9.9
B	9.8	9.9	9.5	9.6	9.7	9.7	9.9	10.0	9.2	9.1	9.7	9.9	9.5	9.9	9.8
C	9.6	9.5	9.6	9.5	9.3	9.6	9.7	9.5	9.1	9.2	9.7	9.7	9.7	9.3	9.7
Top Girder															
D	9.5	9.2	9.0	9.1	9.1	9.8	9.1	9.2	9.1	9.2	9.5	9.4	9.4	9.7	9.5
E	12.5	12.4	12.4	12.5	12.4	11.8	12.2	11.7	12.1	12.4	12.0	12.2	12.2	12.8	12.4
F	12.4	12.5	12.7	12.7	12.2	12.2	12.0	12.0	12.4	12.6	11.7	12.7	12.3	12.6	12.2
G	12.7	12.7	12.6	12.1	12.7	11.1	11.8	11.9	12.4	12.4	11.8	12.6	12.2	12.2	12.7
Middle Girder															
H	11.7	12.2	12.7	12.6	11.8	12.2	11.2	11.7	12.3	12.2	12.4	11.9	11.0	12.5	12.6
I	12.6	12.9	12.7	12.3	12.7	11.3	11.8	11.9	12.5	12.4	11.6	12.6	12.4	12.6	12.5
J	12.4	12.6	12.6	12.6	12.7	12.2	12.1	11.3	12.1	12.7	11.9	12.5	10.0	12.4	12.7
K	11.2	12.5	12.9	12.6	12.4	11.8	11.7	12.3	12.2	12.7	12.6	12.5	12.0	10.9	12.5
L	11.7	12.6	12.6	12.4	12.7	11.7	---	10.9	12.4	12.6	12.0	12.3	12.2	11.9	12.3
Bottom Girder															
M	12.2	12.5	12.6	13.0	12.6	11.6	11.6	11.6	12.5	12.3	11.9	12.3	12.1	11.1	12.1
N	11.4	12.4	12.5	12.9	12.4	11.8	12.1	10.3	12.2	12.5	11.7	12.2	12.5	12.6	9.5
O	10.3	11.3	11.8	11.6	12.1	11.3	11.8	11.0	12.4	12.5	8.7	11.1	8.3	11.6	10.0

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	11.1	12.3	9.3	11.5	11.2	12.2

Gate no – 9: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.6	9.7	9.8	10.0	9.6	9.5	9.5	9.2	9.1	9.2	9.2	9.5	9.3	9.5	9.8
B	9.7	9.4	9.7	10.2	10.4	9.7	9.5	9.5	9.9	9.1	9.7	9.4	9.4	9.8	10.0
C	10.5	10.2	9.7	10.1	10.2	9.4	9.4	9.0	9.1	9.1	9.2	9.2	9.7	9.9	9.6
Top Girder															
D	9.5	9.4	8.9	9.6	9.5	9.5	9.3	9.1	9.7	9.4	9.2	9.2	9.1	9.7	9.5
E	12.8	12.5	12.1	12.3	12.1	12.7	12.3	12.2	12.2	12.2	12.3	12.2	12.5	12.1	12.0
F	13.2	13.0	12.3	12.2	12.0	12.4	12.5	11.2	12.1	12.1	12.5	12.4	12.4	12.2	11.9
G	12.2	13.0	11.9	12.1	11.9	12.2	12.4	12.2	12.1	12.3	12.4	12.5	12.3	12.3	12.4
Middle Girder															
H	12.4	12.7	11.7	12.1	12.3	12.4	12.0	12.5	12.0	12.2	12.2	12.4	11.5	12.5	12.6
I	12.5	13.0	11.5	12.3	11.9	12.5	12.7	12.0	11.9	11.9	11.8	12.5	11.5	12.3	12.1
J	12.7	12.7	12.3	12.5	12.1	12.1	12.3	12.4	12.7	12.5	12.4	12.3	12.0	12.5	12.8
K	12.7	11.5	12.3	11.7	11.7	12.6	12.0	12.1	11.9	12.5	12.9	12.5	12.5	12.5	12.5
L	12.9	13.0	12.1	11.9	11.9	11.9	11.6		12.4	12.3	12.5	12.7	11.7	12.2	11.8
Bottom Girder															
M	12.4	11.5	12.4	11.9	12.0	12.5	12.4	10.3	12.0	12.4	12.1	12.5	12.7	12.1	10.4
N	12.1	12.5	9.9	11.9	12.3	12.7	12.7	11.3	10.2	11.9	12.5	10.3	12.7	12.4	10.9
O	10.6	10.2	11.9	11.3	11.4	11.4	11.5	9.3	11.6	11.5	11.5	11.2	11.5	11.5	11.5

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	11.4	11.0	11.3	11.5	10.3	10.8

Gate no. – 10: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.9	10.1	9.1	9.3	9.7	9.7	9.7	9.4	9.5	10.1	9.5	9.8	9.8	10.0	9.8
B	10.0	9.8	9.5	9.3	11.7	9.5	9.5	9.3	10.0	9.9	9.6	9.9	9.79	9.9	10.0
C	9.8	9.9	9.2	9.4	9.7	9.4	9.5	9.3	9.9	9.9	9.7	9.9	9.9	9.8	9.7
Top Girder															
D	9.2	9.6	9.1	9.7	9.0	9.1	9.5	9.5	9.6	9.6	9.4	9.5	9.5	9.6	9.5
E	12.1	12.1	12.7	12.5	12.4	12.1	12.2	12.0	12.2	12.3	11.4	12.2	12.0	11.4	11.4
F	12.0	12.0	12.5	12.6	12.9	11.9	12.3	11.9	12.5	12.2	12.2	12.1	12.0	11.6	11.6
G	11.8	11.8	12.3	11.9	12.7	12.4	12.5	12.6	11.8	12.5	10.5	12.1	12.4	11.0	12.6
Middle Girder															
H	12.0	12.0	12.0	12.8	12.7	12.3	12.3	12.2	12.5	12.2	12.1	12.6	12.5	12.0	12.1
I	11.8	12.0	9.3	12.2	12.5	12.5	12.5	11.9	11.5	12.4	12.5	11.9	12.1	11.8	12.2
J	12.2	12.2	12.7	12.6	12.7	12.6	12.4	12.2	12.2	12.2	12.5	12.1	11.9	12.0	11.4
K	12.1	12.0	12.4	12.7	12.5	12.4	12.2	11.8	12.3	12.3	12.4	12.6	12.9	11.7	11.7
L	11.2	11.9	11.6	12.5	12.6	11.5	11.6	10.5	12.2	12.4	12.5	12.5	12.5	8.5	12.0
Bottom Girder															
M	11.9	12.0	10.3	12.6	12.5	12.4	11.3	11.6	11.8	10.0	12.0	10.9	11.6	10.2	12.1
N	11.7	11.8	12.6	11.3	12.5	10.8	12.3	11.8	11.9	12.2	12.0	12.1	11.6	11.5	11.5
O	10.9	11.0	12.1	12.8	9.4	11.1	12.0	10.9	11.3	11.5	11.5	11.1	12.2	11.1	9.3

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	8.9	11.5	9.6	11.8	11.5	10.3

Gate no. – 11: Observation of Ultrasonic Wall Thickness measurements**From Downstream Side**

Points	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	9.5	9.4	9.7	9.7	9.5	9.6	9.7	9.5	9.7	9.7	9.6	9.9	9.9	9.8	9.9
B	9.3	10.0	9.6	9.7	9.7	9.5	9.5	9.4	9.7	9.7	9.7	9.8	9.7	9.5	9.7
C	9.5	9.3	9.7	9.9	9.6	9.6	9.6	9.2	9.9	9.7	9.7	9.8	9.7	9.9	9.7
Top Girder															
D	9.3	8.6	9.5	9.5	9.4	9.1	9.8	9.4	9.0	8.9	9.4	9.7	9.2	9.0	9.1
E	12.3	12.1	12.2	12.4	11.8	12.2	12.2	12.3	12.3	12.1	12.6	12.5	12.4	11.8	11.8
F	12.4	12.3	12.5	12.5	12.4	12.1	12.1	12.2	11.9	12.1	12.5	11.2	12.3	11.9	11.4
G	12.4	12.1	12.3	12.3	12.2	12.3	12.2	12.2	12.2	12.5	12.0	12.4	11.9	11.6	11.9
Middle Girder															
H	12.6	12.7	12.2	12.6	12.5	12.0	12.3	12.1	12.2	12.2	11.5	12.2	11.4	11.9	12.8
I	13.0	11.6	12.2	11.7	12.4	11.8	12.1	12.0	12.5	12.4	12.2	11.6	12.0	11.6	12.2
J	12.7	11.9	12.4	12.2	12.6	12.1	11.0	12.3	12.5	12.2	12.2	12.4	12.3	10.8	11.9
K	12.5	12.0	12.5	12.6	12.0	12.0	11.8	12.1	12.7	12.5		12.1	11.4	12.0	12.1
L	12.2	12.5	11.8	12.7	12.5	12.2			12.5	11.8	11.9	12.1	12.6	11.6	12.1
Bottom Girder															
M	12.3	11.3	12.0	12.7	12.4	11.4	11.6	12.1	11.8	11.8	11.8	11.8	12.1	10.6	12.1
N	11.5	11.5	12.3	12.2	11.5	12.3	11.8	12.1	11.2	12.3	10.8	10.1	11.3	11.8	11.8
O	11.5	12.3	11.2	10.2	12.2	9.7	11.7	9.7	10.8	10.1	12.3	11.8	11.2	10.9	10.9

From Upstream Side Bottom Portion

Points	1	2	3	4	5	6
Value	10.6	11.4	10.5	10.5	9.6	11.1

1,2,3... and A, B, C..... are the position of thickness measurement.

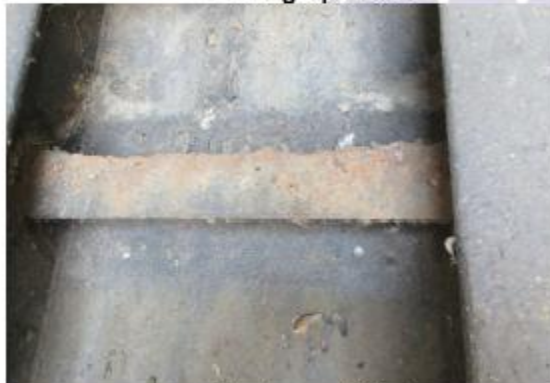
- The test result reveals absence of any internal defects.



Photograph No:1



Photograph No:2



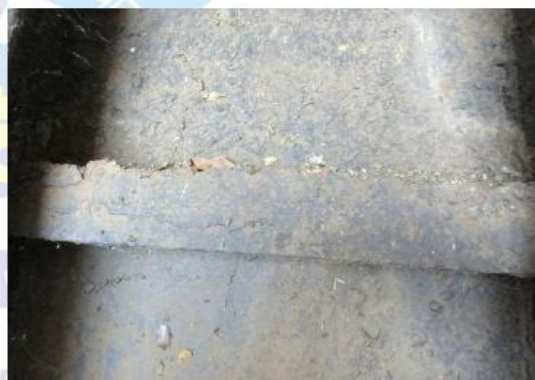
Photograph No:3



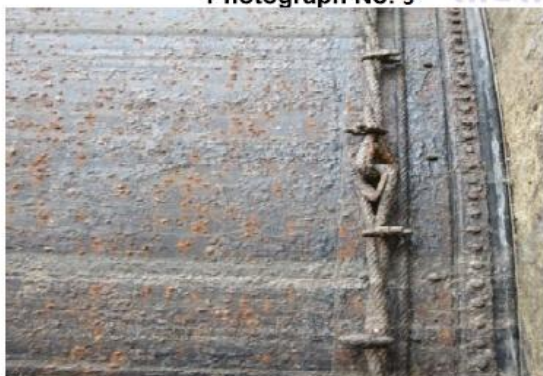
Photograph No:4



Photograph No: 5



Photograph No: 6



Photograph No: 7



Photograph No: 8

RECOMMENDATIONS:

If the maintenance work of the gates is done properly and no abnormalities observed in future, it has been recommended that the gates may be suitable for further service for about another 2 years. However, it has been suggested for health check-up after every two years for further service suitability.

The anti-rust paint may be suggested to apply in every two years of interval to prevent corrosion. Better surface cleaning like sand blasting and other methods may be applied before anti rust painting for good adherence. To improve good structural stability, the corroded stiffeners/ girders may be replaced in different portions of the gates.

CONCLUSION

Non-Destructive examination comprising of Visual, Magnetic Particle and Ultrasonic Thickness Gauge Measurement reveal severe corrosion at horizontal and vertical girders including stiffeners at bottom most portion of downstream side of all the gates. To improve good structural stability, the corroded stiffeners/girders of bottom most portion may be replaced as early as possible. However, the top and middle girders and adjacent stiffeners are found to be in good condition.

So, it may be concluded that the 11 No. Spillway Gates of Kangsabati Dam are suitable for service with periodic repair and maintenance.

PRESENT PHOTOGRAPHS AT SELECTED LOCATION

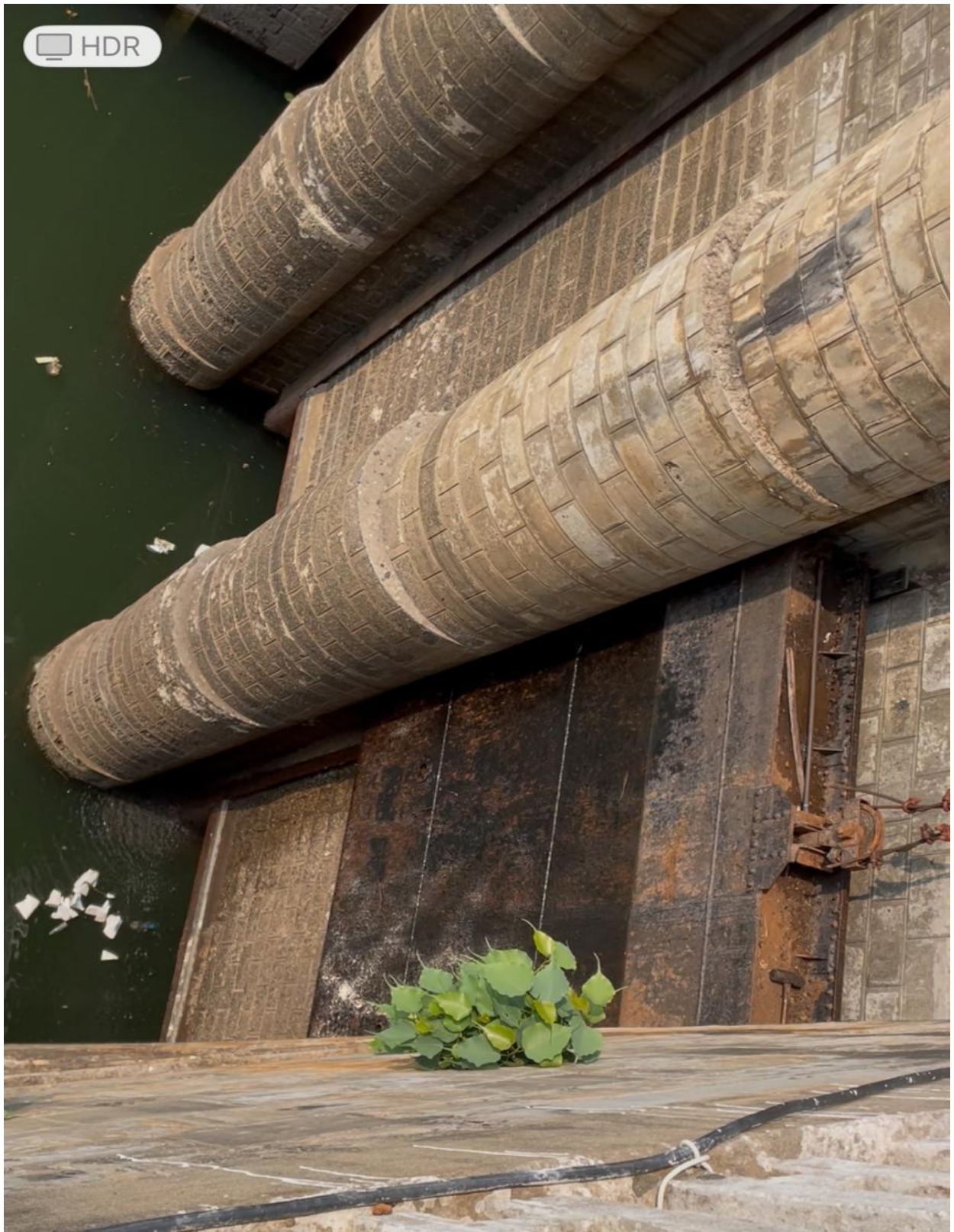
Existing manual trally and stoplog gate of spillway



Kangsabati spillway gate



LBHR radial gate



LBHR Emergency gate



LBHR Emergency gate trolley



Spillway damaged rubber seal

PART 3 – Conditions of Contract and Contract Forms

Section VIII - General Conditions of Contract

These General Conditions of Contract (GCC), read in conjunction with the Particular Conditions of Contract (PCC) and other documents listed therein, should be a complete document expressing fairly the rights and obligations of both parties.

These General Conditions of Contract have been developed on the basis of considerable international experience in the drafting and management of contracts, bearing in mind a trend in the construction industry towards simpler, more straightforward language.

General Conditions of Contract

A. General

1. Definitions

Boldface type is used to identify defined terms.

- (a) The **Accepted Contract Amount** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.
- (b) The **Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump-sum contract. It includes a lump-sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.
- (c) The **Adjudicator** is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 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 46 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 57.1.
- (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) **Day works** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated

Materials and Plant.

- (n) A **Defect** is any part of the Works not completed in accordance with the Contract.
- (o) The **Defects Liability Certificate** is the certificate issued by Project Manager upon correction of defects by the Contractor.
- (p) The **Defects Liability Period** is the period **named in the PCC** pursuant to GCC Sub-Clause 38.1 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 document 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.
- (ii) “**Contractor’s Personnel**” refers to all personnel whom the Contractor utilizes on the Site or other places where the Works are carried out, including the staff, labor and other employees of each Subcontractor.
- (jj) “**Key Personnel**” means the positions (if any) of the Contractor’s personnel that are stated in the Specification.
- (kk) “**ES**” means Environmental and Social (including Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH)).
- (ll) “**Sexual Exploitation and Abuse**” “(SEA)” means the following:

Sexual Exploitation is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another;

Sexual Abuse is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or

under unequal or coercive conditions.

- (mm) **“Sexual Harassment” “(SH)”** is defined as unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature by the Contractor’s Personnel with other Contractor’s or Employer’s Personnel; and
- (nn) **“Employer’s Personnel”** refers to the Project Manager and all other staff, labor and other employees (if any) of the Project Manager and of the Employer engaged in fulfilling the Employer’s obligations under the Contract; and any other personnel identified as Employer’s Personnel, by a notice from the Employer or the Project Manager to the Contractor.

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,
 - (d) Particular Conditions of Contract,
 - (e) General Conditions of Contract, including Appendices,
 - (f) Specifications,
 - (g) Drawings,
 - (h) Bill of Quantities,¹ 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**.
- 3.2 Throughout the execution of the Contract, the Contractor shall

¹ In lump-sum contracts, delete “Bill of Quantities” and replace with “Activity Schedule.”

comply with the import of goods and services prohibitions in the Employer's country when

(a) as a matter of law or official regulations, the Borrower's country 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, the Borrower's Country prohibits any import of goods from that country or any payments to any country, person, or entity in that country.

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| 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. |
| 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. |
| 7. Subcontracting | 7.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations. The Contractor shall require that its Subcontractors execute the Works in accordance with the Contract, including complying with the relevant ES requirements and the obligations set out in Sub-Clause 28.1. |
| 8. Other Contractors | <p>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.</p> <p>8.2 The Contractor shall also, as stated in the Specifications or as instructed by the Project Manager, cooperate with and allow appropriate opportunities for the Employer's or any other personnel, notified to the Contractor by the Employer or Project Manager, to conduct any environmental and social assessment.</p> |

9. Personnel and Equipment

- 9.1 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.
- 9.2 The Project Manager may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Key Personnel (if any), who:
- (a) persists in any misconduct or lack of care;
 - (b) carries out duties incompetently or negligently;
 - (c) fails to comply with any provision of the Contract;
 - (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment;
 - (e) based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Works;
 - (f) has been recruited from the Employer's Personnel;
 - (g) undertakes behavior which breaches the Code of Conduct for Contractor's Personnel (ES).

If appropriate, the Contractor shall then promptly appoint (or cause to be appointed) a suitable replacement with equivalent skills and experience.

Notwithstanding any requirement from the Project Manager to remove or cause to remove any person, the Contractor shall take immediate action as appropriate in response to any violation of (a) through (g) above. Such immediate action shall include removing (or causing to be removed) from the Site or other places where the works are being carried out, any Contractor's Personnel who engages in (a), (b), (c), (d), (e) or (g) above or has been recruited as stated in (f) above."

- 9.3 The Contractor shall take all necessary safety measures to avoid the occurrence of incidents and injuries to any third party associated with the use of, if any, Equipment on public roads or other public infrastructure. The Contractor shall monitor road safety incidents and accidents to identify negative safety issues, and establish and implement necessary measures to resolve them.

9.4 Labor

- 9.4.1 *Engagement of Staff and Labor.* The Contractor shall provide and employ on the Site for the execution of the Works such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Country.

Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation and welfare facilities in accordance with GCC Sub-Clause 9.4.6, of the Contractor's Personnel, and for all payments in connection therewith.

The Contractor shall provide the Contractor's Personnel information and documentation that are clear and understandable regarding their terms and conditions of employment. The information and documentation shall set out

- 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;

- (b) loss of or damage to Equipment;
- (c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and
- (d) personal injury or death.

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 an 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

15.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

15.2 If the Contract specifies that the Contractor shall design any part of the permanent Works, the Contractor shall take into account the Employer's requirements which may include, if stated in the Specifications:

- (a) designing structural elements of the Works taking into account climate change considerations;
- (b) applying the concept of universal access (the concept of universal access means unimpeded access for people of all ages and abilities in different situations and under various circumstances; and
- (c) considering the incremental risks of the public's potential exposure to operational accidents or natural hazards, including extreme weather events.

16. The Works to Be Completed

16.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the

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| by the Intended Completion Date | <p>Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.</p> <p>16.2 The Contractor shall not carry out mobilization to the Site unless the Project Manager gives approval, an approval that shall not be unreasonably delayed, to the measures the Contractor proposes to address environmental and social risks and impacts, which at a minimum shall include applying the Management Strategies and Implementation Plans (MSIPs) and Code of Conduct for Contractor's Personnel submitted as part of the Bid and agreed as part of the Contract.</p> <p>The Contractor shall submit, to the Project Manager for its approval any additional MSIPs as are necessary to manage the ES risks and impacts of ongoing Works. These MSIPs collectively comprise the Contractor's Environmental and Social Management Plan (C-ESMP). The Contractor shall review the C-ESMP, periodically (but not less than every six (6) months), and update it as required to ensure that it contains measures appropriate to the Works. The updated C-ESMP shall be submitted to the Project Manager for its approval.</p> |
| 17. Approval by the Project Manager | <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> |
| 18. Health, Safety and Protection of the Environment | <p>18.1 The Contractor shall be responsible for the safety of all activities on the Site.</p> <p>18.2 The Contractor shall:</p> <ul style="list-style-type: none"> (a) comply with all applicable health and safety regulations and Laws; (b) comply with all applicable health and safety obligations specified in the Contract; (c) take care for the health and safety of all persons entitled to be on the Site and other places, if any, where the Works are being executed; |

- (d) keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons;
- (e) provide fencing, lighting, safe access, guarding and watching of the Works until the issue of the Contract Completion Certificate;
- (f) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land;
- (g) provide health and safety training of Contractor's Personnel as appropriate and maintain training records;
- (h) actively engage the Contractor's Personnel in promoting understanding, and methods for, implementation of health and safety requirements, as well as in providing information to Contractor's Personnel, training on occupational safety and health, and provision of personal protective equipment without expense to the Contractor's Personnel;
- (i) put in place workplace processes for Contractor's Personnel to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation which they have reasonable justification to believe presents an imminent and serious danger to their life or health.
- (j) Contractor's Personnel who remove themselves from such work situations shall not be required to return to work until necessary remedial action to correct the situation has been taken. Contractor's Personnel shall not be retaliated against or otherwise subject to reprisal or negative action for such reporting or removal;
- (k) where the Employer's Personnel, any other contractors employed by the Employer, and/or personnel of any legally constituted public authorities and private utility companies are employed in carrying out, on or near the site, of any work not included in the Contract, collaborate in applying the health and safety requirements, without prejudice to the responsibility of the relevant entities for the health and safety of their own personnel; and
- (l) establish and implement a system for regular (not less than six-monthly) review of health and safety performance and the working environment.

Subject to GCC Sub-Clause 16.2, the Contractor shall submit to the Project Manager for its approval a health and safety manual

which has been specifically prepared for the Works, the Site and other places (if any) where the Contractor intends to execute the Works.

The health and safety manual shall be in addition to any other similar document required under applicable health and safety regulations and laws.

The health and safety manual shall set out all the health and safety requirements under the Contract,

(a) which shall include at a minimum:

- (i) the procedures to establish and maintain a safe working environment without risk to health at all workplaces, machinery, equipment and processes under the control of the Contractor, including control measures for chemical, physical and biological substances and agents;
- (ii) details of the training to be provided, records to be kept;
- (iii) the procedures for prevention, preparedness and response activities to be implemented in the case of an emergency event (i.e. an unanticipated incident, arising from both natural and man-made hazards, typically in the form of fire, explosions, leaks or spills, which may occur for a variety of different reasons including failure to implement operating procedures that are designed to prevent their occurrence, extreme weather or lack of early warning);
- (iv) remedies for adverse impacts such as occupational injuries, deaths, disability and disease;
- (v) the measures to be taken to avoid or minimize the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases,
- (vi) the measures to be implemented to avoid or minimize the spread of communicable diseases (including transfer of Sexually Transmitted Diseases or Infections (STDs), such as HIV virus) and non-communicable diseases associated with the execution of the Works, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. This includes taking measures to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent Contract-

related labor;

- (vii) the policies and procedures on the management and quality of accommodation and welfare facilities if such accommodation and welfare facilities are provided by the Contractor in accordance with GCC Sub-Clause 9.4.6; and

- (b) any other requirements stated in the Specification

18.3 Protection of the environment

The Contractor shall take all necessary measures to:

- 18.3.1 protect the environment (both on and off the Site); and

- 18.3.2 limit damage and nuisance to people and property resulting from pollution, noise and other results of the Contractor's operations and/ or activities.

The Contractor shall ensure that emissions, surface discharges, effluent and any other pollutants from the Contractor's activities shall exceed neither the values indicated in the Specifications, nor those prescribed by applicable laws.

In the event of damage to the environment, property and/or nuisance to people, on or off Site as a result of the Contractor's operations, the Contractor shall agree with the Project Manager the appropriate actions and time scale to remedy, as practicable, the damaged environment to its former condition. The Contractor shall implement such remedies at its cost to the satisfaction of the Project Manager.

19. Archaeological and Geological Findings

- 19.1 All fossils, coins, articles of value or antiquity, structures, groups of structures, and other remains or items of geological, archaeological, paleontological, historical, architectural or religious interest found on the Site shall be placed under the care and custody of the Employer. The Contractor shall:

- (a) take all reasonable precautions, including fencing-off the area or site of the finding, to avoid further disturbance and prevent Contractor's Personnel or other persons from removing or damaging any of these findings;
- (b) train relevant Contractor's Personnel on appropriate actions to be taken in the event of such findings; and
- (c) implement any other action consistent with the requirements of the Specifications and relevant laws.

The Contractor shall, as soon as practicable after discovery of any such finding, notify the Project Manager of such discoveries and carry out the Project Manager's instructions for

dealing with them.

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| 20. Possession of the Site | 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 stated in the PCC , the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event. |
| 21. Access to the Site | 21.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager (including the Bank staff or consultants acting on the Bank's behalf, stakeholders and third parties, such as independent experts, local communities, or non-governmental organizations), including to carry out environmental and social audit, as appropriate, 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 | <p>22.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.</p> <p>22.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and subconsultants to keep, accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.</p> <p>22.3 Inspections & Audit by the Bank</p> <p>Pursuant to paragraph 2.2 e. of Appendix A to the GCC- Fraud and Corruption, the Contractor shall permit and shall cause its agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and personnel, to permit, the Bank and/or persons appointed by the Bank to inspect the site and/or the accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have such accounts, records and other documents audited by auditors appointed by the Bank. The Contractor's and its Subcontractors' and subconsultants' attention is drawn to GCC Sub-Clause 25.1 (Fraud and Corruption) which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Bank's prevailing sanctions procedures).</p> |
| 23. Appointment of the Adjudicator | 23.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the |

Adjudicator, the Employer will request the Appointing Authority **designated in the PCC**, to appoint the Adjudicator within 14 days of receipt of such request.

- 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 by the hour at the **rate specified in the PCC**, together with reimbursable expenses of the types **specified in the PCC**, and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision shall be final and binding.
- 24.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the places **specified in the PCC**.

25. Fraud and Corruption

- 25.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, 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 disclosed 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.

26. Stakeholder

- 26.1 The Contractor shall provide relevant contract- related

Engagement

information, as the Employer and/or Project Manager may reasonably request to conduct Stakeholder engagements. “Stakeholder” refers to individuals or groups who:

- (i) are affected or likely to be affected by the Contract; and
- (ii) may have an interest in the Contract.

The Contractor may also directly participate in Stakeholder engagements, as the Employer and/or Project Manager may reasonably request

**27. Suppliers(other
than
Subcontractors)**

27.1 **Forced Labor:** The Contractor shall take measures to require its suppliers (other than Subcontractors) not to employ or engage forced labor including trafficked persons as described in GCC Sub-Clause 9.4.14. If forced labor/trafficking cases are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

27.2 *Child Labor:* The Contractor shall take measures to require its suppliers (other than Subcontractors) not to employ or engage child labor as described in GCC Sub-Clause 9.4.15. If child labor cases are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

27.3 *Serious Safety Issues:* The Contractor, including its Subcontractors, shall comply with all applicable safety obligations, including as stated in GCC Sub-Clause 18.2. The Contractor shall also take measures to require its suppliers (other than Subcontractors) to adopt procedures and mitigation measures adequate to address safety issues related to their personnel. If serious safety issues are identified, the Contractor shall take measures to require the suppliers to take appropriate steps to remedy them. Where the supplier does not remedy the situation, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to manage such risks.

27.4 *Obtaining natural resource materials in relation to supplier:* The Contractor shall obtain natural resource *materials* from suppliers that can demonstrate, through compliance with the applicable verification and/ or certification requirements, that obtaining such materials is not contributing to the risk of significant conversion or significant degradation of natural or critical habitats such as unsustainably harvested wood

products, gravel or sand extraction from river beds or beaches.

If a supplier cannot continue to demonstrate that obtaining such materials is not contributing to the risk of significant conversion or significant degradation of natural or critical habitats, the Contractor shall within a reasonable period substitute the supplier with a supplier that is able to demonstrate that they are not significantly adversely impacting the habitats.

28. Code of Conduct

28.1 The Contractor shall have a Code of Conduct for the Contractor's Personnel.

The Contractor shall take all necessary measures to ensure that each Contractor's Personnel is made aware of the Code of Conduct including specific behaviors that are prohibited, and understands the consequences of engaging in such prohibited behaviors.

These measures include providing instructions and documentation that can be understood by the Contractor's Personnel and seeking to obtain that person's signature acknowledging receipt of such instructions and/or documentation, as appropriate.

The Contractor shall also ensure that the Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Works will be carried out, as well as in areas outside the Site accessible to the local community and project affected people. The posted Code of Conduct shall be provided in languages comprehensible to Contractor's Personnel, Employer's Personnel and the local community.

The Contractor's Management Strategy and Implementation Plans shall include appropriate processes for the Contractor to verify compliance with these obligations.

29. Security of the Site

29.1 The Contractor shall be responsible for the security of the Site, and:

- (a) for keeping unauthorized persons off the Site;
- (b) authorized persons shall be limited to the Contractor's Personnel, the Employer's Personnel, and to any other personnel identified as authorized personnel (including the Employer's other contractors on the Site), by a notice from the Employer or the Project Manager to the Contractor.

Subject to GCC Sub-Clause 16.2, the Contractor shall submit for the Project Manager's No-objection a security management plan that sets out the security arrangements for the Site

The Contractor shall (i) conduct appropriate background checks

on any personnel retained to provide security; (ii) train the security personnel adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms), and appropriate conduct towards Contractor's Personnel, Employer's Personnel and affected communities; and (iii) require the security personnel to act within the applicable Laws and any requirements set out in the Specifications.

The Contractor shall not permit any use of force by security personnel in providing security except when used for preventive and defensive purposes in proportion to the nature and extent of the threat.

In making security arrangements, the Contractor shall also comply with any additional requirements stated in the Specification.”

B. Time Control

30. Program and Progress Reports

- 30.1 Within the time **stated in the PCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump-sum contract, the activities in the Program shall be consistent with those in the Activity Schedule. 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.
- 30.2 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.
- 30.3 The Contractor shall monitor progress of the Works and submit to the Project manager progress report and any updated Program showing the actual progress achieved and the effect of the progress achieved on the timing of the remaining Works, including any changes to the sequence of the activities, at intervals no longer than the period **stated in the PCC**. If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount **stated in the PCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of lump-sum Contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the

Project Manager.

30.4 Unless otherwise stated in the Specifications, each progress report shall include the Environmental and Social (ES) metrics set out in Appendix B.

30.5 In addition to the progress reports, the Contractor shall inform the Project Manager immediately of any allegation, incident or accident in the Site, which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, Project Manager's personnel or Contractor's Personnel. This includes, but is not limited to, any incident or accident causing fatality or serious injury; significant adverse effects or damage to private property; or any allegation of SEA and/or SH. In case of SEA and/or SH, while maintaining confidentiality as appropriate, the type of allegation (sexual exploitation, sexual abuse or sexual harassment), gender and age of the person who experienced the alleged incident should be included in the information.

The Contractor, upon becoming aware of the allegation, incident or accident, shall also immediately inform the Project Manager of any such incident or accident on the Subcontractors' or suppliers' premises relating to the Works which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, or Contractor's, its Subcontractors' and suppliers' personnel. The notification shall provide sufficient detail regarding such incidents or accidents. The Contractor shall provide full details of such incidents or accidents to the Project Manager within the timeframe agreed with the Project Manager.

The Contractor shall require its Subcontractors and suppliers (other than Subcontractors) to immediately notify the Contractor of any incidents or accidents referred to in this Subclause.

**31. Extension of the
Intended
Completion
Date**

31.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

31.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in

assessing the new Intended Completion Date.

- 32. Acceleration**
- 32.1 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.
- 32.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.
- 33. Delays Ordered by the Project Manager**
- 33.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.
- 34. Management Meetings**
- 34.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.
- 34.2 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.
- 35. Early Warning**
- 35.1 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.
- 35.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

C. Quality Control

- 36. Identifying**
- 36.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such

- Defects** 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.
- 37. Tests** 37.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specifications 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.
- 38. Correction of Defects** 38.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is **defined in the PCC**. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.
- 38.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.
- 39. Uncorrected Defects** 39.1 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.

D. Cost Control

- 40. Contract Price²** 40.1 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.
- 41. Changes in the Contract Price³** 41.1 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

² In lump-sum contracts, replace GCC Sub-Clauses 40.1 as follows:

40.1 The Contractor shall provide updated Activity Schedules within 14 days of being instructed to by the Project Manager. The Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for materials on site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.

³ In lump-sum contracts, replace entire GCC Clause 41 with new GCC Sub-Clause 41.1, as follows:

41.1 The Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

allow for the change. 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.

41.2 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.

42. Variations

42.1 All Variations shall be included in updated Programs⁴ produced by the Contractor.

42.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Contractor shall also provide information of any ES risks and impacts of the Variation. 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.

42.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

42.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

42.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

42.6 If the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC Sub-Clause 41.1 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.

⁵

42.7 Value Engineering: The Contractor may prepare, at its own cost, a value engineering proposal at any time during the

⁴ In lump-sum contracts, add "and Activity Schedules" after "Programs."

⁵ In lump-sum contracts, delete this paragraph.

performance of the contract. The value engineering proposal shall, at a minimum, include the following;

- (a) the proposed change(s), and a description of the difference to the existing contract requirements;
- (b) a full cost/benefit analysis of the proposed change(s) including a description and estimate of costs (including life cycle cost) the Employer may incur in implementing the value engineering proposal;
- (c) a description of any effect(s) of the change on performance/functionality; and
- (d) a description of the proposed work to be performed, a program for its execution and sufficient ES information to enable an evaluation of ES risks and impacts.

The Employer may accept the value engineering proposal if the proposal demonstrates benefits that:

- (a) accelerates the contract completion period; or
- (b) reduces the Contract Price or the life cycle costs to the Employer; or
- (c) improves the quality, efficiency, safety or sustainability of the Facilities; or
- (d) yields any other benefits to the Employer,

without compromising the functionality of the Works.

If the value engineering proposal is approved by the Employer and results in:

- (a) a reduction of the Contract Price; the amount to be paid to the Contractor shall be the **percentage specified in the PCC** of the reduction in the Contract Price; or
- (b) an increase in the Contract Price; but results in a reduction in life cycle costs due to any benefit described in (a) to (d) above, the amount to be paid to the Contractor shall be the full increase in the Contract Price.

43. Cash Flow Forecasts

43.1 When the Program,⁶ is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

44. Payment Certificates

44.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the

⁶ In lump-sum contracts, add “or Activity Schedule” after “Program.”

cumulative amount certified previously.

- 44.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.
- 44.3 The value of work executed shall be determined by the Project Manager.
- 44.4 The value of work executed shall comprise the value of the quantities of work in the Bill of Quantities that have been completed.⁷
- 44.5 The value of work executed shall include the valuation of Variations and Compensation Events.
- 44.6 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.
- 44.7 If the Contractor was, or is, failing to perform any ES 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:
- (a) failure to comply with any ES 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;
 - (b) failure to regularly review C-ESMP and/or update it in a timely manner to address emerging ES issues, or anticipated risks or impacts;
 - (c) failure to implement the C-ESMPe.g. failure to provide required training or sensitization;
 - (d) failing to have appropriate consents/permits prior to undertaking Works or related activities;
 - (e) failure to submit ES report/s (as described in Appendix

⁷ In lump-sum contracts, replace this paragraph with the following: "The value of work executed shall comprise the value of completed activities in the Activity Schedule."

- B), or failure to submit such reports in a timely manner;
- (f) failure to implement remediation as instructed by the Project Manager within the specified timeframe (e.g. remediation addressing non-compliance/s).

45. Payments

- 45.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.
- 45.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.
- 45.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.
- 45.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

46. Compensation Events

- 46.1 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.

46.2 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.

46.3 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.

46.4 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.

47. Tax

47.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract

Price or are a result of GCC Clause 49.

- 48. Currencies** 48.1 Where payments are made in currencies other than the currency of the Employer's country **specified in the PCC**, the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.

- 49. Price Adjustment** 49.1 Prices shall be adjusted for fluctuations in the cost of inputs only if **provided for in the PCC**. If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type specified below applies to each Contract currency:

$$P_c = A_c + B_c I_{mc}/I_{oc}$$

where:

P_c is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."

A_c and B_c are coefficients⁸**specified in the PCC**, representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and

I_{mc} is the index prevailing at the end of the month being invoiced and I_{oc} is the index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."

- 49.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

- 50. Retention** 50.1 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.
- 50.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC Sub-Clause 57.1, half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has

⁸ The sum of the two coefficients A_c and B_c should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulae for all currencies, since coefficient A_c , for the nonadjustable portion of the payments, is a very approximate figure (usually 0.15) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency are added to the Contract Price.

passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an “on demand” Bank guarantee.

51. Liquidated Damages

- 51.1 The Contractor shall pay liquidated damages to the Employer at the rate per day **stated in the PCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount **defined in the PCC**. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor’s liabilities.
- 51.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC Sub-Clause 45.1.

52. Bonus

- 52.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day **stated in the PCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

53. Advance Payment

- 53.1 The Employer shall make advance payment to the Contractor of the amounts **stated in the PCC** by the date **stated in the PCC**, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The Guarantee shall remain effective until the advance payment has been repaid, but the amount of the Guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.
- 53.2 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.
- 53.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the

Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

54. Securities 54.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount **specified in the PCC**, by a bank or surety acceptable to the Employer, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a Bank Guarantee, and until one year from the date of issue of the Certificate of Completion in the case of a Performance Bond.

55. Dayworks 55.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

55.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done.

55.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

56. Cost of Repairs 56.1 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

57. Completion 57.1 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.

58. Taking Over 58.1 The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.

59. Final Account 59.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and

certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

60. Operating and Maintenance Manuals

60.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates **stated in the PCC**.

60.2 If the Contractor does not supply the Drawings and/or manuals by the dates **stated in the PCC** pursuant to GCC Sub-Clause 60.1, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount **stated in the PCC** from payments due to the Contractor.

61. Termination

61.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

61.2 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 Fraud and Corruption, as defined in paragraph 2.2 a of the Appendix A to the GCC, in competing for or in executing the Contract, then the Employer may, after giving

fourteen (14) days written notice to the Contractor, terminate the Contract and expel him from the Site.

61.3 Notwithstanding the above, the Employer may terminate the Contract for convenience.

61.4 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.

61.5 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 61.2 above, the Project Manager shall decide whether the breach is fundamental or not.

62. Payment upon Termination

62.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as **specified 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.

62.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

63. Property

63.1 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.

64. Release from Performance

64.1 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.

65. Suspension of Bank Loan or Credit

65.1 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 to it within the 28 days for payment provided for in GCC Sub-Clause 45.1, the Contractor may immediately issue a 14-day termination notice.

66. Force Majeure**66.1 Definition of Force Majeure**

In this Clause, "Force Majeure" means an exceptional event or circumstance:

- (a) which is beyond a Party's control,
- (b) which such Party could not reasonably have provided against before entering into the Contract,
- (c) which, having arisen, such Party could not reasonably have avoided or overcome, and
- (d) which is not substantially attributable to the other Party

Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

- (i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
- (ii) rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war,
- (iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel and other employees of the Contractor and Subcontractors ,
- (iv) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
- (v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.
- (vi) Spread of any Pandemic diseases

66. Force Majeure 66.2 Notice of Force Majeure

If a Party is or will be prevented from performing any of its obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

The Party shall, having given notice, be excused performance of such obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

66.3 Duty to Minimise Delay

Each Party shall at all times use all reasonable endeavors to minimise any delay in the performance of the Contract as a result of Force Majeure. A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure

66.4 Consequences of Force Majeure

If the Contractor is prevented from performing any of his obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 66.2 [*Notice of Force Majeure*], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Clause 46 [*Compensation Events*] to:

- (a) an extension of time for any such delay, if completion is or will be delayed, under Clause 31 Extension of the Intended Completion Date, and
- (b) if the event or circumstance is of the kind described in subparagraphs (i) to (iv) of Sub-Clause 66.1 [*Definition of Force Majeure*] and, in the case of subparagraphs (ii) to (iv) occurs in the Country, payment of any such Cost.

After receiving this notice, the Engineer shall proceed in accordance with Clause 4 [*Project Manager's Decisions*] to agreed or determine these matters.

66.5 Force Majeure Affecting Sub- Contractor

If any Sub-contractor is entitled under any contract or agreement relating to the works to relief force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

66.6 Optional Termination, Payment and Release

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force

APPENDIX A TO GENERAL CONDITIONS

Fraud and Corruption

(Text in this Appendix shall not be modified)

1. Purpose

- 1.1 The Bank's Anti-Corruption Guidelines and this annex apply with respect to procurement under Bank Investment Project Financing operations.

2. Requirements

- 2.1 The Bank requires that Borrowers (including beneficiaries of Bank financing); bidders/applicants/proposers), consultants, contractors and suppliers; any sub-contractors, sub-consultants, service providers or suppliers; any agents (whether declared or not); and any of their personnel, observe the highest standard of ethics during the procurement process, selection and contract execution of Bank-financed contracts, and refrain from Fraud and Corruption.

- 2.2 To this end, 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;
- ii. "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;
- 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;
- 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;
- v. "obstructive practice" is:

- (a) 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
- (b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 2.2 e. below.

- b. Rejects a proposal for award if the Bank determines that the firm or individual recommended for award, 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. In addition to the legal remedies set out in the relevant Legal Agreement, may take other appropriate actions, including declaring misprocurement, if the Bank 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 process, selection and/or execution 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. Pursuant to the Bank's Anti- Corruption Guidelines and in accordance with the Bank's prevailing sanctions policies and procedures, may sanction a firm or individual, either indefinitely or for a stated period of time, including by publicly declaring such firm or individual ineligible (i) to be awarded or otherwise benefit from a Bank-financed contract, financially or in any other manner;⁹ (ii) to be a nominated¹⁰ sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract; and (iii) to receive the proceeds of any loan made by the Bank or otherwise to participate further in the preparation or implementation of any Bank-financed project;
- e. Requires that a clause be included in bidding/request for proposals documents and in contracts financed by a Bank loan, requiring (i) bidders(applicants/proposers), consultants, contractors, and suppliers, and their sub-contractors, sub-consultants, service providers, suppliers, agents personnel, permit the Bank to inspect¹¹ all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the Bank.

⁹ For the avoidance of doubt, a sanctioned party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and bidding, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.

¹⁰ A nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider (different names are used depending on the particular bidding document) is one which has 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.

¹¹ Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Bank or persons appointed by the Bank to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.

APPENDIX B

Environmental and Social (ES) Metrics for Progress Reports

[Note to Employer: the following metrics may be amended to reflect the specifics of the Contract. The Employer shall ensure that the metrics provided are appropriate for the Works and impacts/key issues identified in the environmental and social assessment]

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 that require treatment and all fatalities;*
- 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. Health services: 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 communicable diseases (including STDs) sensitization and/or training, no. workers receiving training (in the reporting period and in the past); same questions for gender sensitization, flag person training.
- iv. number and date of SEA and SH prevention sensitization and/or training events, including number of workers receiving training on Code of Conduct for Contractor's Personnel (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. number of allegations of SEA and SH) received in the reporting period and number of unresolved past grievances by date received, complainant's age and sex, 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, road safety and vehicles/equipment*:
- i. traffic and road safety incidents and accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;
 - ii. traffic and road safety incidents and 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 clean-ups, 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 SEA and SH 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

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 specified, all Particular Conditions of Contract should be filled in by the Employer prior to issuance of the bidding document. Schedules and reports to be provided by the Employer should be annexed.

A. General	
GCC 1.1 (d)	The financing institution is: The World Bank
GCC 1.1 (r)	The Employer is Chief Engineer-(M & E), Irrigation & Waterways Directorate, 2nd Floor Jalasampad Bhaban, Saltlake, Kolkata-91, email-cemeiwd@gmail.com , on behalf of Irrigation & Waterways Department, Government of West Bengal
GCC 1.1 (v)	The Intended Completion period for the whole Works shall be 540 days including monsoon season from the date of commencement.
GCC 1.1 (y)	The Project Managers or Engineer or Engineer–In–Charge, by the Employer, all having the same meaning and connotation are: 1. Executive Engineer, Kangsabati Canals Division No.II, Khatra, Bankura-722140 (eMail ID: k.c.div.no.II@gmail.com). FOR CIVIL WORKS 2. Executive Engineer, Kangsabati Mechanical Division, Khatra, Bankura-722140, eMail ID: kmd.khatra@gmail.com. FOR MECHANICAL WORKS The employer shall provide for the same in writing, to act as Project Manager. “The Executive Engineer for specific Civil or Mechanical works shall have the total responsibility of the Project to be constructed by the contractor including supplying of the detailed engineering drawing & designs, quality checking of construction materials, participating in the process of testing of materials to be used for construction of the works under the Project, day to day supervision, quality assurance, contract administration and management, checking and certification of the interim bills and final bills submitted by the contractor.
GCC 1.1 (aa)	The Site is located at Mukutmanipur, Khatra block of Bankura District, West Bengal and is defined in drawings No. [1.]
GCC 1.1 (dd)	The Start Date shall be XX/XX/2026[+10 days from the date of issuance of Notice to Proceed]
GCC 1.1 (hh)	The Works consists of : i) Repair of Spillway railing, Construction roof truss at KangsabatiBunglow. ii) Dismantling of old Charge-man office and construction of new

	Charge-man office. iii) Construction of civil part of new stoplog bay of spillway emergency gate. iv) Major repairing works of all 11 (eleven) nos. spillway radial gates, for strengthening of the gate shutters. v) Replacement of the emergency gate for the spillway, consisting of 5 parts. vi) Replacement of the existing gantry girder and its rail. vii) Replacement of Left Bank Head Regulator gate structure with its emergency gate & its embedded parts. viii) Erection of new gantry crane with its lifting beam ix) CCTV Surveillance etc. Identification number of Contract is WBIW/CTU/CE(ME)/DRIP/RFB-01/2026-27						
GCC 1.1 (ii)	The following is added as GCC 1.1. (ii) “ES” means environmental and social (including sexual exploitation and assault (SEA)).						
GCC 1.1 (jj)	GCC 1.1 (jj) is replaced with the following: “Key Personnel are the Contractor’s personnel named in GCC 9.1 of the Particular Conditions of Contract.” The following is added as GCC 1.1. (jj) “Sexual Exploitation and Assault” “(SEA)” stands for the following: Sexual exploitation is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another. In Bank financed operations/projects, sexual exploitation occurs when access to or benefit from a Bank financed Goods, Works, Non-consulting Services or Consulting Services is used to extract sexual gain. Sexual assault is defined as sexual activity with another person who does not consent. It is a violation of bodily integrity and sexual autonomy and is broader than narrower conceptions of “rape”, especially because (a) it may be committed by other means than force or violence, and (b) it does not necessarily entail penetration.						
GCC 2.2	Sectional Completions are: NOT APPLICABLE						
GCC 2.3(i)	The following documents also form part of the Contract: <table><tr><th>S. No.</th><th>Document</th><th>Description of the document</th></tr><tr><td>1.</td><td>Construction Methodology</td><td>Construction methodology given in bid amended as per comments of employer given in letter of acceptance.</td></tr></table>	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.
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. Quality Assurance Programme prepared as per guidelines and contents provided in “A-1.2, SECTION A -GENERAL SPECIFICATIONS under Section VII- Works’ Requirement” submitted within 14 days of delivery of Letter of Acceptance and as approved by the Project Manager.
	3.	Fraud and Corruption	Appendix A – Fraud and Corruption
	4.	Environmental and Social	Appendix B - Environmental and Social (ES) Metrics for Progress Reports.
	5.	JV Agreement	Joint Venture Agreement (for JVs only).
	6.	Construction Programme	A detailed Construction Programme in MS project including L2 PERT Chart to be submitted within 14 days of delivery of Letter of Acceptance, in consultation with and necessary modification of (if required) the Construction Schedule (attached as Annexure-A, Appendix to Technical Part, in Technical Proposal Forms under Section IV) and as approved by the Project Manager.
	4.	Environmental and Social	Appendix B - Environmental and Social (ES) Metrics for Progress Reports.
	5.	Others	(i) Preamble to BOQ (ii) Scope of Work (iii) Supplementary Information All the three documents stated above have been provided in Section VII.
	[list any other documents]		
GCC 3.1	The language of the contract is <i>English</i> . The law that applies to the Contract are the laws of Union of India.		
GCC 4.1	The following is inserted as a sub-paragraph at the end of GCC 4.1: “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.”		
GCC 5.1	The Project manager <i>may</i> delegate any of his duties and responsibilities.		

GCC 7	The first sentence of GCC 7. 1 is modified as: “The Contractor may subcontract with the approval of the Project Manager upto a ceiling specified in PCC, but may not assign the Contract without the approval of the Employer in writing.” The following sub-clauses are inserted at the end of GCC 7.1: “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 along with 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.) ”
GCC 7.1	The ceiling for sub-contractor is 20% [This is in addition to what was stated

	<i>in bid and incorporated in contract agreement.]. Hiding information about any sub-contracting not authorized by the Employer shall be treated as violation of Appendix A to General Conditions (Fraud and Corruption).</i>
GCC 8.1	Schedule of other contractors: <i>Not Applicable</i>
GCC 9	The following is inserted as a sub-clause at the end of GCC 9.2: “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.” The following sentence is deleted from first paragraph of GCC 9.4.1: “The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Country.” GCC 9.4.3 and GCC 9.4.4 are deleted. The following sub-clauses are inserted at the end of GCC 9.4: “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 Contractor¹. 9.6 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 and Social (ES) 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

¹Based on Government Directives.

	by the Employer. 9.7 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. 9.8 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.”
GCC 9.1	Key Personnel and equipment: GCC 9.1 is replaced with the following: 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. The Contractor shall have a Code of Conduct for the Contractor’s Personnel, and shall ensure that each Contractor’s Personnel is provided a copy of this Code of Conduct, written in a language comprehensible to that person, and shall seek to obtain that person’s signature acknowledging receipt of the same. The Contractor shall also ensure that the Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Works will be carried out, as well as in areas outside the Site accessible to the local community and project affected people. The posted Code of Conduct shall be provided in languages comprehensible to Contractor’s Personnel, Employer’s Personnel and the local community. <i>[insert the name/s of each Key Personnel agreed by the Employer prior to Contract signature, Schedule of Key Personnel and equipment as indicated in accepted bid & construction methodology].</i> To be done during Contract signing
GCC 9.2	The following is inserted as GCC 9.2 (e), (f), and (g): “(e)based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Works; (f) has been recruited from the Employer’s Personnel without due clearance; (g) breaches the Code of Conduct for the Contractor’s Personnel (ES).”

GCC 9.10	The following is inserted as GCC 9.10: “The Contractor shall provide the Contractor’s Personnel information and documentation that are clear and understandable regarding their terms and conditions of employment. The information and documentation shall set out their rights under relevant labour Laws applicable to the Contractor’s Personnel (which will include any applicable collective agreements), including their rights related to hours of work, wages, overtime, compensation and benefits, as well as those arising from any requirements in the Specification; and shall also include the Code of Conduct for Contractor’s Personnel. The Contractor’s Personnel shall be informed when any material changes to their terms or conditions of employment occur.”																				
GCC 9.11	The following is inserted as GCC 9.11: “The Contractor shall provide appropriate training to relevant Contractor’s Personnel on ES aspects of the Contract, including appropriate sensitization on prohibition of SEA, and health and safety training. As stated in the Specification or as instructed by the Project Manager, the Contractor shall also allow appropriate opportunities for the relevant Contractor’s Personnel to be trained on ES aspects of the Contract by the Employer’s Personnel. The Contractor shall provide training on SEA, including its prevention, to any of its personnel who has a role to supervise other Contractor’s Personnel.																				
GCC 13.1	The minimum insurance amounts and deductibles shall be: <i>[Employers should fill these columns carefully in consultation with insurance companies. It should not be left blank]</i> <table><tr><th>S.No.</th><th>Description</th><th>Minimum cover for Insurance</th><th>Maximum deductible for Insurance</th></tr><tr><td>(i)</td><td>Works and Plant and Materials which are incorporated in works</td><td>17.17 Crores</td><td>5% of Claim amount subject to a minimum of Rs 50,00,000 /- for normal losses and Rs. 1,00,00,000/- for AOG/Collapse/Major Perils</td></tr><tr><td>(ii)</td><td>Loss or damage to Construction Equipment</td><td>3.00 Crore</td><td>Do</td></tr><tr><td>(iii)</td><td>Other Property</td><td>1.00 Crore</td><td>Do</td></tr><tr><td>(iv)</td><td>Personal injury or death insurance:</td><td>1.00 Crore</td><td>In accordance with the statutory requirements applicable in India</td></tr></table>	S.No.	Description	Minimum cover for Insurance	Maximum deductible for Insurance	(i)	Works and Plant and Materials which are incorporated in works	17.17 Crores	5% of Claim amount subject to a minimum of Rs 50,00,000 /- for normal losses and Rs. 1,00,00,000/- for AOG/Collapse/Major Perils	(ii)	Loss or damage to Construction Equipment	3.00 Crore	Do	(iii)	Other Property	1.00 Crore	Do	(iv)	Personal injury or death insurance:	1.00 Crore	In accordance with the statutory requirements applicable in India
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		a)for other people;		
		b) for Contractor’s Employees	In accordance with the statutory requirements applicable in India	
GCC 14.1	Site Data are: Reflected in the drawings which are specific to the bid and are part of this bid document. [Kangsabati Dam, Mukutmanipur, Block-Khatra, Bankura, West Bengal]			
GCC 15.2	The following is added as sub-clause 15.2: “If so instructed by Project Manager, the Contractor shall submit to the Project Manager for review, a health and safety manual, specifically prepared for the Works, the Site and other places (if any) where the Contractor intends to execute the Works. The manual shall be in addition to any other similar document required under applicable health and safety regulations and Laws. The health and safety manual and its updates shall bereviewed along with the Contractor’s Environmental and Social Management Plan (C-ESMP) described in sub-clause 16.2.” Delete GCC sub-clauses 15.2.1 and GCC 15.2.2.			
GCC 16.1 (add new 16.2)	ES Management Strategies and Implementation Plans The following is inserted as a new sub-clause 16.2: “16.2 The Contractor shall not carry out mobilization to Site (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) unless the Project manager gives consent, a consent that shall not be unreasonably delayed, that appropriate measures are in place to address environmental and social risks and impacts, which at a minimum shall include applying the Management Strategies and Implementation Plans (MSIPs) and Code of Conduct for Contractor’s Personnel submitted as part of the Bid and agreed as part of the Contract. The Contractor shall submit, to the Project manager for Review any additional MSIPs as are necessary to manage the ES risks and impacts of ongoing Works (e.g. excavation, earth works, bridge and structure works, stream and road diversions, quarrying or extraction of materials, concrete batching and asphalt manufacture). These MSIPs collectively comprise the Contractor’s Environmental and Social Management Plan (C-ESMP). The Contractor shall review the C-ESMP, periodically (but not less than every six (6) months), and update it as required to ensure that it contains measures appropriate to the Works. The updated C-ESMP shall be submitted to the Project manager for Review.”			
GCC 20.1	The Site Possession Location(s): Kangsabati Dam Site, Mukutmanipur, Khatra, Bankura. The Site Possession Dates shall be (To be mentioned in the Notice to			

	Proceed)
GCC 23.1 & GCC 23.2	Name of the agreed Adjudicator <i>Sri Kausik Chattopadhyay, Ex- Secretary Irrigation & Waterways Department, Government of West Bengal.</i> <i>Address: 19, Salimpur lane, Dhakuria, Kolkata- 700031</i> The daily fee for this proposed Adjudicator shall be: <i>Rs 10,000 per day.</i> The biographical data of the proposed Adjudicator is as follows: Education:B.E.Civil, (Shibpur C.U.) M.Tech (IIT Madras.) Experience: Worked in Irrigation & Waterways Department, GoWB for 36 years in the capacity of AE, EE, SE, CE, and Secretary to the GOWB in Design& Research, Construction etc. within I&WD. Age:67 years Nationality: Indian Present Position: RetiredSecretary to the Govt. of W.B, I&WD, GoWB
GCC 24.3	Daily rate and types of reimbursable expenses to be paid to the Adjudicator: <i>Rs 10,000 per day Plus reimbursable expenses (actual boarding, lodging, travel & other incidental expenses)</i>
GCC 24.4	The procedure for adhoc arbitration will be as follows: (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* Indian Council of Arbitration/ President of the Institution of Engineers (India)/The International Centre for Alternative Disputes Resolution (India). (b) 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, then the Indian Council of Arbitration both in cases of Foreign Contractor as well as Indian Contractor, shall appoint the Arbitrator. A certified copy of the order of the Indian Council of Arbitration making such an appointment shall be furnished to each of the parties. (c) 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. (d) Arbitration proceedings shall be held at Kolkata, West Bengal, India and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English. (e) 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. (f) 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 * Indian Council of Arbitration/President of the Institution of Engineers (India)/The International Centre for Alternative Disputes Resolution (India). (g) The Arbitrator should give final award within 120 days of starting of the proceedings <i>[indicate the days (Between 120-180) by which arbitrator should give award]</i>. (h) 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. "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. The arbitral tribunal shall consist of 3 Arbitrators, arbitration proceedings shall be held at Kolkata, West Bengal, India and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English". <i>[ICA rules provide for arbitration tribunal of 3 arbitrators if the value of claim is over Rs. 1 crore unless the parties have agreed otherwise for a sole arbitrator]</i>.
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B. Time Control	
GCC 30.1	The Contractor shall submit for approval a Program for the Works within 14 days of delivery of the Letter of Acceptance. Any revision in Program should only be agreed in writing. <i>[This program should be in adequate detail and generally conform to the program submitted along with bid. Deviations, if any from that should be clearly explained and should be satisfactory to the Project Manager]</i>
GCC 30.3	The period between Program updates is 14 days. The amount to be withheld for late submission of an updated Program is INR 5,00,000/- The period for submission of progress reports is 30 days.
GCC 31	GCC 31.1 is replaced with the following: “31.1 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 the agreed milestones without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.” In GCC 31.2, replace the words “Intended Completion Date” at the first occurrence by the words “Intended Completion Date/ Milestones”; and at the second occurrence by the words “Intended Completion Date/ Milestone”.
GCC 34	GCC 34.1 is replaced with the following: “Either the Project Manager or the Contractor may require the other to attend a management meeting (which will be held at the place indicated in PCC. The periodicity shall 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 30.1, the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.”
GCC 34.1	Venue of management meeting will be Office of the Superintending Engineer, South West Mechanical & Electrical Circle, I&W Dte, DVC New Colony, Durgapur-02.
C. Quality Control	
GCC 36	The following sub-clause is inserted at the end of GCC 36.1: “36.2 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."
GCC 37	The following sub-clauses are inserted before GCC 37.1, and GCC 37.1 is re-numbered as GCC 37.3: "GCC 37.1 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. Compliance with the QA/QC systems shall not relieve the Contractor of any of his duties obligations or responsibilities under the Contract. GCC 37.2 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."
GCC 38.1	The Defects Liability Period is: 365 days.
GCC 39.1	The following notes are added at the end of GCC 39.1: <i>"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.</i> <i>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 61.2(e)."</i>
GCC 36	The following sub-clause is inserted at the end of GCC 36.1: "36.2 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."
D. Cost Control	
GCC 41	GCC 41.1 is replaced with the following, and existing GCC 41.2 is re-numbered as GCC 41.3: "41.1 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 is less than the quantity of the item in BOQ and is 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 41.2 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.”
GCC 42	In GCC 42.2, the first sentence is modified as follows: “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 Contractor shall also provide a description of the varied work performed or to be performed, including details of the resources and methods adopted or to be adopted by the Contractor.” In the first sentence in GCC 42.3, after the words ‘If the Contractor’s quotation is unreasonable’, the following is added: <i>“[or if contractor fails to provide the Project Manager with a quotation within a reasonable time specified by Project Manager in accordance with GCC 42.2]”</i>
GCC 42.7	Provisions related to Value Engineering do not apply.
GCC 43.1	The second sentence in GCC 43.1 is replaced with the following: “The cash flow forecast shall be in Indian Rupees.”
GCC 44	At the end of GCC 44.1 after the word ‘previously’, the following words are added: “alongwith details of measurement of the quantity of works executed in a tabular form approved by the Project Manager” At the end of GCC 44.2 after the words ‘the Contractor’, the following words are added: “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 53.1 (Secured Advance)”
GCC 45	GCC 45.1 is replaced with the following: “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 up to the date when the late payment is made at the rate stated in the PCC.” A new sub-clause 45.5 is added after sub-clause 45.4: “45.5 The Contractor shall open an Escrow Account with his bank for the purpose of receiving all the payments as well as incurring expenditure under this Contract. The Account shall be open to verification and audit at any time by the Employer or designee of the Employer. This account will be controlled solely by the Contractor’s Project Officers (Project Manager and/or Finance Manager or equivalent designate). No other Contractor employees or associates will have access to the Project Account or the funds therein. The Contractor shall report monthly on the status of this account including actual bank account statements. The Contractor shall provide all Account statements as requested by the Employer.”
GCC 45.1	Interest rate for Delayed payment is 5% per annum
GCC 45.3	All payments (and deductions) shall be paid or charged in Indian Rupees.
GCC 45.5	[Deleted]
GCC 47	The following sub-clause is inserted before GCC 47.1, and GCC 47.1 is re-numbered as GCC 47.2: “47.1 The rates quoted by the Contractor shall be deemed to be inclusive of the GST 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.” In first line of the re-numbered GCC 47.2, replace the words ‘the date 28 days before’ with the words ‘the deadline for’.
GCC 48	All payments shall be made in Indian Rupees.
GCC 49	GCC 49.1 is replaced with the following: “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 up to 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 44.1] 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: $R_{sn} = (V_{sn} + S_{sn}) \text{ minus (amount of secured advance recovered in the same period + value of works executed under variations for which price adjustments will be worked separately based on terms mutually agreed between the Project Manager and the Contractor)}$ 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
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	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”[<i>Labour</i>], “E_n”[<i>Equipment</i>], “M_n”[<i>Material</i>], are the current cost indices or reference prices for period “n”, each of which is applicable to the relevant tabulated cost element [<i>Labour, Equipment, Steel, Cement, Fuel/Lubricants, Bitumen, others</i>] 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 “L₀”, “E₀”, “M₀”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 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.”
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GCC 49.1	Price Adjustment : NOT APPLICABLE									
GCC 50.1	The proportion of payments retained (Retention Money) shall be 6% from each bill subject to the maximum of 5% of final contract price.									
GCC 50.2	The last line of GCC 50.2 is replaced with the following: “On completion of the whole works the Contractor may substitute the balance retention money with an “on demand” Bank guarantee.”									
GCC 51	In the first sentence of GCC 51.1, the following words are inserted after the words ‘Intended Completion Date’: “(for the whole of the works or the milestones as stated in the PCC)” The following is inserted as a sub-paragraph at the end of GCC 51.1: “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.” In the first sentence in GCC 51.2 the following words are inserted after the words ‘Intended Completion Date’: “including milestones”									
GCC 51.1	The liquidated damages for the whole of the Works are 0.05% of the final Contract Price per day. The maximum amount of liquidated damages for the whole of the Works is 10% of the final Contract Price									
GCC 52.1	Provisions related to Bonus do not apply.									
GCC 53	The following is inserted as a new sub-clause 53.4: “The Project Manager shall make advance payment in respect of materials intended for but not yet incorporated in the Works in accordance with conditions stipulated in the PCC.”									
GCC 53.1	Advance Payments shall be made in Indian Rupees only. The amount of the Advance Payments are: <table><tr><td><u>Nature of Advance</u></td><td><u>Amount (Rs.)</u></td><td><u>Conditions to be fulfilled</u></td></tr><tr><td>1. Mobilization</td><td>5% of the Contract price</td><td>On submission of unconditional Bank Guarantee. (to be drawn before end of 20% of Contract period)</td></tr><tr><td>2. Equipment (This advance is not applicable for equipment already owned or hired/leased</td><td>75% for new equipment. Total amount will be subject to a maximum of 5% of the Contract price.</td><td>After equipment is brought to site as per agreed construction program (provided the Project Manager is satisfied that the</td></tr></table>	<u>Nature of Advance</u>	<u>Amount (Rs.)</u>	<u>Conditions to be fulfilled</u>	1. Mobilization	5% of the Contract price	On submission of unconditional Bank Guarantee. (to be drawn before end of 20% of Contract period)	2. Equipment (This advance is not applicable for equipment already owned or hired/leased	75% for new equipment. Total amount will be subject to a maximum of 5% of the Contract price.	After equipment is brought to site as per agreed construction program (provided the Project Manager is satisfied that the
<u>Nature of Advance</u>	<u>Amount (Rs.)</u>	<u>Conditions to be fulfilled</u>								
1. Mobilization	5% of the Contract price	On submission of unconditional Bank Guarantee. (to be drawn before end of 20% of Contract period)								
2. Equipment (This advance is not applicable for equipment already owned or hired/leased	75% for new equipment. Total amount will be subject to a maximum of 5% of the Contract price.	After equipment is brought to site as per agreed construction program (provided the Project Manager is satisfied that the								

	<i>by the contractor.)</i> <i>equipment is required for performance of the contract) and on submission of unconditional Bank Guarantee for amount of advance.</i> 3. Secured advance for Not Applicable. non-perishable materials brought to site (The advance payment will be paid to the Contractor no later than 15 days after fulfillment of the above conditions). Repayment of advance payment for mobilization and equipment: The advance shall be repaid with percentage deductions from the interim payments certified by the Project Manager under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the contractor has reached not less than 15 percent of the Contract Price or 9 months from the date of payment of first installment of advance, whichever period concludes earlier, and shall be made at the rate of 15% (Fifteen percent) of the amounts of all Interim Payment Certificates until such time as the advance has been repaid, always provided that the advance shall be completely repaid prior to the expiry of the original time for completion. Repayment of secured advance: NA
GCC 54	GCC 54.1 is replaced with the following: “The Performance Security and an Environmental and Social (ES) 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 amount specified in the PCC, and shall be issued by a Nationalized or Scheduled bank in India. The Performance Security including additional security for unbalanced bids, and the ES Performance Security, shall be valid until a date 28 days from the date of issue of the Certificate of Completion. <u>If the</u> terms of the Performance Security and additional security, specify its expiry date, and the Contractor has not become entitled to receive the Completion Certificate by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security and additional security, until the end of extended Completion Period.”
GCC 54.1	The Performance Security amount is Five percent of the Accepted Contract Amount plus Ten percent of Contract price as additional security for unbalanced bids [in terms of ITB Clause 41.2], if the accepted bid value is

	below 20% of the Estimated amount and Environmental and Social (ES) Performance Security amount is One Percent of the Accepted Contract Amount. The standard forms of Performance Security and if applicable ES Security acceptable to the Employer shall be unconditional Bank Guarantees from Scheduled or Nationalized banks in India of the types as presented in Section X of the Bidding Document. Throughout this bidding document the term 'performance security', unless the context clearly indicates otherwise, means and includes both 'the performance security and the ES performance security' to be submitted by the successful bidder in the amounts specified above.
E. Finishing the Contract	
GCC 59.1	The following is added after the words 'issue a payment certificate' at the end of GCC 59.1: "within 56 days of receiving the contractor's revised account"
GCC 60.1	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 be. The date by which "as built" drawings (in scale 1:25) 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.
GCC 60.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC 60.1 is Rs.5,00,000/-
GCC 61	The following sub-clauses are added after GCC 61.2 (h): "(i) The contractor has contravened Clauses 7 and 9 of GCC. (j) The contractor does not adhere to the agreed construction program, agreed ES-MSIP [Clause 30 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 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."
GCC 61.2 (g)	The maximum number of days is: 200 days after commencement of works
GCC 61.2(l)	Hiding any information regarding changes in roles and responsibilities of JV members, which is not authorized by the Employer, shall also be treated as

	violation of Appendix A to General Conditions (Fraud and Corruption).
GCC 62	The following is added after the words ‘issue of the certificate’ in the first sentence of GCC 62.1; “less other recoveries due in terms of contract, less taxes to be deducted at source [TDS] as per applicable law,” The following is added after the words ‘date of the certificate’ at the end of GCC 62.2: “less other recoveries due in terms of contract, less taxes to be deducted at source [TDS] as per applicable law”
GCC 62.1	The percentage to apply to the value of the work not completed, representing the Employer’s additional cost for completing the Works, is 20%.

Appendices

Appendix 1

Salient Features of Labour & Environment Protection Laws²**SALIENT FEATURES OF SOME MAJOR LABOUR LAWS
APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND
OTHER CONSTRUCTION WORK**

(a)	<u>Employees Compensation Act 1923</u> : The Act provides for compensation in case of injury, disease or death arising out of and during the course of employment.
(b)	<u>Payment of Gratuity Act 1972</u> : 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)	<u>Employees P.F. and Miscellaneous Provision Act 1952 (since amended)</u> : 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)	<u>Maternity Benefit Act 1961</u> : The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
(e)	<u>Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act, 2013</u> : 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)	<u>Contract Labour (Regulation & Abolition) Act 1970</u> : 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)	<u>Minimum Wages Act 1948</u> : The Employer is supposed to pay not less than the

²This 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 2

Tables of Adjustment Data

(Cl. 49 of GCC)

Table 1: Coefficients governing the adjustment for changes in cost

SL No .	Co-Efficient Name	Symbol	S1 (E/W)	S2 (Controlled Concrete M20 & above)	S3 (Sheet Pile)	S4 (Boulder Pitching)	S5 (Road Works)	S6 (Miscellaneous Works)
1	Fixed	A	20	20	20	20	20	20
2	Labour [L]	B	17	14	3	17	17	17
3	Steel[S]	C	X	30	73	X	X	X
4	Cement [C]	D	X	20	X	X	X	X
5	Plant Equipment spares [E]	E	38	8	2	X	6	12
6	Diesel and Petroleum products [D]	F	25	6	2	14	2	6
7	Bitumen [B]	G	X	X	X	X	X	X
8	Others [O]	0	X	2	X	49	55	45
	Total		100 %	100%	100%	100%	100%	100%

BOQ SCHEDULES

[The following Schedules are for example only. The schedules may be modified and specified as appropriate for each work]

Schedule 1(S1): Earth Work In Formation

Schedule 2(S2): Controlled Concrete including Reinforcement

Schedule 3(S3): Sheet Pile

Schedule 4(S4): Boulder Pitching with Allied Work

Schedule 5(S5): Road Works

Schedule 6(S6): Miscellaneous Work*

*: Involves Woodwork, EUC Bullahs, Polythene Sheet, Brick Flat Soiling, Polybags, Expansion Joints, etc.

Table 2: Cost Indices and Reference Prices (applicable for specific items) for adjustment in contract prices [as per GCC 45].

WPI with base 2011-2012= 100 on the Base Date

Base Date = Deadline for submission of bids

S. No.	Cost Element	Sym bol	Indices or Cost on the Base Date	Index for adjustment	Sources of Index
[1]	[2]	[3]	[4]	[5]	[6]
1.	Fixed	a			
2.	Labour	b	L _o - all India average Consumer Price Index(CPI) Number for Industrial Workers for Kolkata, West Bengal. Centre ⁴² (Base 2016 = 100) on the base date.	L _n -CPI for the month for which the IPC is related	Labour Bureau, Ministry of Labour and Employment, Government of India.
3.	Steel	c	S _o – Whole-sale Price Index (WPI) for Steel [<i>Steel Long</i>]	S _n -WPI for the month which is two months prior to the month to which IPC is related	Economic Advisor, Ministry of Commerce and Industry, Government of India.
4.	Cement	d	C _o -WPI for Manufacture of Cement, lime and plaster	C _n -WPI for the month which the cement is brought to site or one month prior to the month to which IPC is related, whichever is less	Economic Advisor, Ministry of Commerce and Industry, Government of India
5.	Plant & Equipment spares	e	E _o -WPI for “Manufacture of machinery for mining, quarrying, construction”	E _n – WPI for the month to which IPC is related	Economic Advisor, Ministry of Commerce and Industry, Government of India
6.	Diesel ⁴³	f	Do-Unit Cost from the identified depot on the base date	D _n -Unit Cost for on the first day of the month to which the IPC relates	From the Mourigram (in Howrah) Depot
7.	Others	h	Oo- All India Wholesale Price Index(WPI) for all commodities	On- All India WPI for all commodities for the month to which IPC is related	Economic Advisor, Ministry of Commerce and Industry, Government of India

IPC – Interim Payment Certificate

⁴² The Centre to be specified should be the relevant one for which CPI is published by the Labour Bureau.

⁴³ The PCC specifies the identified depot for the rate of diesel for the base date and the applicable date or price adjustment.

Appendix -3³ 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 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.

³ If ITB 51 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.

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, ES performance security if applicable, and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

NOTIFICATION OF AWARD

Letter of Acceptance

[on letterhead paper of the Employer]

[The Letter of Acceptance shall be the basis for formation of the Contract as described in ITB Clause 47. 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.]

..... *[date]*

To: *[name and address of the Contractor]*

Subject: *[Notification of Award Contract No]*

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 Accepted Contract Amount of *[insert amount in numbers
 and words]*, as corrected and modified¹ in accordance with the Instructions to Bidders is
 hereby accepted by our Agency.

You are requested to furnish the Performance Security, plus additional security for unbalanced bids in terms of ITB Clause 41, and ES Performance Security *[Delete ES Performance Security if it is not required under the contract]* in the form detailed in ITB Clause 50 for amounts² of Rs., and Rs. specified therein, 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 50.2 will be taken in accordance with the Conditions of Contract. The securities shall be valid upto 28 days from the date of completion i.e. upto and shall be as per the Performance Security Form and the ES Performance Security Form *[Delete reference to the ES Performance Security Form if it is not required under the contract]*, included in Section X -Contract Forms, of the bidding document.

[Choose one of the following statements:]

We accept that _____ *[insert the name of Adjudicator proposed by the Bidder]* be appointed as the Adjudicator³.

[or]

We do not accept that _____ *[insert the name of the Adjudicator proposed by the Bidder]* be appointed as the Adjudicator, and by sending a copy of this

¹Delete “corrected and” or “and modified” if not applicable. See Notes on Standard Form of Agreement, next page.

²Insert amounts for (i) Performance Security, plus additional security for unbalanced bids in terms of ITB Clause 41; and (ii) ES Performance Security respectively.

³To 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.

Letter of Acceptance to _____ */insert name of the Appointing Authority*], the Appointing Authority, we are hereby requesting such Authority to appoint the Adjudicator in accordance with ITB 51.1 and GCC 23.1⁴.

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

We have reviewed the construction methodology submitted by you alongwith 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 ES requirements as per Clause 26 of General Conditions of Contract within 14 days of receipt of this letter of acceptance.

Authorized Signature:

Name and Title of Signatory:

Name of Agency:

⁴To 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.

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 50.1, 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 theday 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.
 - (i) This Agreement
 - (ii) the Letter of Acceptance
 - (iii) the Contractor’s Bid including completed schedules and priced bill of quantities,
 - (iv) the addenda Nos _____(if any)
 - (v) the Particular Conditions
 - (vi) the General Conditions of Contract, including appendix;
 - (vii) the Specification
 - (viii) the Drawings
 - (ix) Construction Program, Methodology, Quality Assurance Program, ES Management Strategies and Implementation Plans, and Code of Conduct for Contractor’s Personnel (ES)
 - (x) Joint Venture Agreement [for JVs only]; and
 - (xi) any other document **listed in the PCC** as forming part of the Contract.
3. In consideration of the payments to be made by the Employer to the Contractor as specified 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 specified 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 Contractor⁵]* (hereinafter called "the Applicant") 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 Applicant 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 Applicant such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Applicant, up to a total of _____ *[amount of guarantee⁶]* _____ *[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 Applicant 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 Applicant shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

⁵*In the case of a JV, insert the name of the Joint Venture*

⁶*An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract less provisional sums, if any, plus additional performance security for unbalanced bids if any, and denominated in Indian Rupees.*

This guarantee shall be valid until⁷, 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.

⁷*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 and Social Performance Security

ES – Bank Guarantee

[Guarantor letterhead or SWIFT identifier code]

ES 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 Contractor⁸]* (hereinafter called "the Applicant") 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 Applicant shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his Environmental and Social (ES) obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Applicant such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Applicant, up to a total of _____ *[amount of guarantee⁹]* _____ *[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 Applicant 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 Applicant shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

⁸*In the case of a JV, insert the name of the Joint Venture*

⁹*An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract less provisional sums, if any, and denominated in Indian Rupees.*

This guarantee shall be valid until¹⁰, 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.

¹⁰*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"*

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, Subclause 49.1 ("Advance Payment") of the above-mentioned Contract, _____ *[name and address of Contractor¹¹]* (hereinafter called "the Applicant") 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 guarantee¹²]* _____ *[in words]*.

We, the _____ *[bank or financial institution]*, as instructed by the Applicant, 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 Applicant, 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 Applicant, 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 Applicant. Consequently any demand for payment under this guarantee must be received by us at this office on or before that date.

¹¹In the case of a JV, insert the name of the Joint Venture

¹²An 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 contractor¹³]* (hereinafter called "the Applicant") 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 Applicant, 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 words¹⁴]* upon receipt by us of your first demand in writing accompanied by a written statement stating that the Applicant 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 Applicant on its account number _____ at _____ *[name and address of Bank]*.

¹³In the case of a JV, insert the name of the Joint Venture

¹⁴The 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.

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]

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

Attachment 1**Amendments for Permitting Standstill Period¹⁵
(Refer ITB Clause 44)**

In works contracts where it is proposed to permit Standstill Period [*in the case of high risk or specialized/complex works only*], the following corrections shall be incorporated in this document

1. Instructions to Bidders & Bid Data Sheet**1.1 Insert ITB 44.1 as under:**

44.1 The Contract shall be awarded not earlier than the expiry of the Standstill Period. The duration of the Standstill Period is **specified in the BDS**. Where only one Bid is submitted, the Standstill Period shall not apply.

1.2 Insert ITB 45.1 as under:

45.1 When a Standstill Period applies, it shall commence when the Employer has transmitted to each Bidder (that has not already been notified that it has been unsuccessful) the Notification of Intention to Award the Contract to the successful Bidder. The Notification of Intention to Award shall contain, at a minimum, the following information:

- (a) the name and address of the Bidder submitting the successful Bid;
- (b) the Contract price of the successful Bid;
- (c) the names of all Bidders who submitted Bids, and their Bid prices as readout, and as evaluated;
- (d) a statement of the reason(s) the Bid (of the unsuccessful Bidder to whom the letter is addressed) was unsuccessful, unless the price information in (c) above already reveals the reason;
- (e) the expiry date of the Standstill Period;
- (f) instructions on how to request a debriefing and/or submit a complaint during the standstill period.

1.3 Substitute ITB 47.1 as under:

47.1 Prior to the expiration of the Bid Validity Period and upon expiry of the Standstill Period, specified in BDS ITB 44.1 or any extension thereof, or upon satisfactorily addressing a complaint that has been filed within the Standstill Period, the Employer shall transmit the Letter of Acceptance to the successful Bidder. The Letter of Acceptance shall specify the sum that the Employer will pay the Contractor in consideration of the execution of the contract (hereinafter and in the Conditions of Contract and Contract Forms called “the Contract Price”).

1.4 Insert ITB 48 as under:**48. Debriefing by the Employer**

¹⁵These are instructions for the Borrower and should be removed from final bid document.

48.1 On receipt of the Employer’s Notification of Intention to Award referred to in ITB 45.1, an unsuccessful Bidder has three (3) Business Days to make a written request to the Employer for a debriefing. The Employer shall provide a debriefing to all unsuccessful Bidders whose request is received within this deadline.

48.2 Where a request for debriefing is received within the deadline, the Employer shall provide a debriefing within five (5) Business Days, unless the Employer decides, for justifiable reasons, to provide the debriefing outside this timeframe. In that case, the standstill period shall automatically be extended until five (5) Business Days after such debriefing is provided. If more than one debriefing is so delayed, the standstill period shall not end earlier than five (5) Business Days after the last debriefing takes place. In any case, irrespective of the circumstances, all debriefings shall be completed within 10 business days. The Employer shall promptly inform, by the quickest means available, all Bidders of the extended standstill period.

48.3 Where a request for debriefing is received by the Employer later than the three (3)-Business Day deadline, the Employer should provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of Public Notice of Award of contract. Requests for debriefing received outside the three (3)-day deadline shall not lead to extension of the standstill period.

48.4 Debriefings of unsuccessful Bidders may be done in writing or verbally. The debriefing will cover only the bid of particular bidder requesting the debriefing, and not the bids of the competitors. The Bidder shall bear its own costs of attending such a debriefing meeting.

1.5 Insert ITB 52 as under:

52. Procurement Related Complaint

52.1 The procedures for making a Procurement-related Complaint are as specified in the BDS.

1.6 Insert BDS ITB 44 as under:

ITB 44 Standstill Period

The Standstill Period is 10 Business Days *[note: the minimum number of Business Days is ten (10)]* after the date the Employer has transmitted to all Bidders that submitted a Bid, the Notification of its Intention to Award the Contract to the successful Bidder.

Note: Where a Bidder has previously received notification, in accordance with ITB 34.1, that its Technical Part of Bid failed to meet the requirements of the bidding document, the Bidder will not receive a Notification of Intention to Award the Contract.

[If this Bidding process is in response to an emergency situation recognized by the Bank state: “No Standstill Period applies to this Bidding process.”]

1.7 Insert BDS ITB 52.1 as under:

ITB 52.1

The procedures for making a Procurement-related Complaint are detailed in the “Procurement Regulations for IPF Borrowers (Annex III).” If a Bidder wishes to make a

Procurement-related Complaint, the Bidder should submit its complaint following these procedures, in writing (by the quickest means available, that is either by email or fax), to:

For the attention: *[insert full name of person receiving complaints]*

Title/position: *[insert title/position]*

Employer: *[insert name of Employer]*

Email address: *[insert email address]*

Fax number: *[insert fax number]* **delete if not used**

In summary, a Procurement-related Complaint may challenge any of the following:

1. the terms of the Bidding Documents;
2. the Employer's decision to exclude a Bidder from the procurement process prior to the award of contract; and
3. the Employer's decision to award the contract.

.....
.

2. Contract Forms

2.1 Insert the Form 'Notification of Intention to Award' as under:

.....
.

Notification of Intention to Award

[This Notification of Intention to Award shall be sent to each Bidder that submitted a Bid, unless the Bidder has previously received notice of exclusion from the process at an interim stage of the procurement process]

[Send this Notification to the Bidder's Authorized Representative named in the Bidder Information Form]

For the attention of Bidder's Authorized Representative

Name: *[insert Authorized Representative's name]*

Address: *[insert Authorized Representative's Address]*

Telephone/Fax numbers: *[insert Authorized Representative's telephone/fax numbers]*

Email Address: *[insert Authorized Representative's email address]*

[IMPORTANT: insert the date that this Notification is transmitted to Bidders. The Notification must be sent to all Bidders simultaneously. This means on the same date and as close to the same time as possible.]

DATE OF TRANSMISSION: This Notification is sent by: *[email/fax]* on *[date]* (local time)

Notification of Intention to Award

Employer: *[insert the name of the Employer]*

Project: *[insert name of project]*

Contract title: *[insert the name of the contract]*

Country: *[insert country where RFB is issued]*

Loan No. /Credit No. / Grant No.: *[insert reference number for loan/credit/grant]*

RFB No: *[insert RFB reference number from Procurement Plan]*

This Notification of Intention to Award (Notification) notifies you of our decision to award the above contract. The transmission of this Notification begins the Standstill Period. During the Standstill Period, you may:

- a) request a debriefing in relation to the evaluation of your Bid, and/or
- b) submit a Procurement-related Complaint in relation to the decision to award the contract.

1. The successful Bidder

Name:	<i>[insert name of successful Bidder]</i>
Address:	<i>[insert address of the successful Bidder]</i>
Contract price:	<i>[insert contract price of the successful Bid]</i>

2. Other Bidders *[INSTRUCTIONS: insert names of all Bidders that submitted a Bid. If the Bid's price was evaluated include the evaluated price as well as the Bid price as read out.]*

Name of Bidder	Bid price	Evaluated Bid price (if applicable)
<i>[insert name]</i>	<i>[insert Bid price]</i>	<i>[insert evaluated price]</i>
<i>[insert name]</i>	<i>[insert Bid price]</i>	<i>[insert evaluated price]</i>
<i>[insert name]</i>	<i>[insert Bid price]</i>	<i>[insert evaluated price]</i>
<i>[insert name]</i>	<i>[insert Bid price]</i>	<i>[insert evaluated price]</i>
<i>[insert name]</i>	<i>[insert Bid price]</i>	<i>[insert evaluated price]</i>

3. Reason/s why your Bid was unsuccessful

[INSTRUCTIONS: State the reason/s why this Bidder's Bid was unsuccessful. Do NOT include: (a) a point by point comparison with another Bidder's Bid or (b) information that is marked confidential by the Bidder in its Bid.]

4. How to request a debriefing

DEADLINE: The deadline to request a debriefing expires at midnight on *[insert date]* (local time).

You may request a debriefing in relation to the results of the evaluation of your Bid. If you decide to request a debriefing your written request must be made within three (3) Business Days of receipt of this Notification of Intention to Award.

Provide the contract name, reference number, name of the Bidder, contact details; and address the request for debriefing as follows:

Attention: *[insert full name of person, if applicable]*

Title/position: *[insert title/position]*

Agency: *[insert name of Employer]*

Email address: *[insert email address]*

Fax number: *[insert fax number] delete if not used*

If your request for a debriefing is received within the 3 Business Days deadline, we will provide the debriefing within five (5) Business Days of receipt of your request. If we are unable to provide the debriefing within this period, the Standstill Period shall be extended by five (5) Business Days after the date that the debriefing is provided. If this happens, we will notify you and confirm the date that the extended Standstill Period will end.

The debriefing may be in writing, by phone, video conference call or in person. We shall promptly advise you in writing how the debriefing will take place and confirm the date and time.

If the deadline to request a debriefing has expired, you may still request a debriefing. In this case, we will provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of the Contract Award Notice.

5. How to make a complaint

Period: Procurement-related Complaint challenging the decision to award shall be submitted by midnight, *[insert date]* (local time).

Provide the contract name, reference number, name of the Bidder, contact details; and address the Procurement-related Complaint as follows:

Attention: *[insert full name of person, if applicable]*

Title/position: *[insert title/position]*

Agency: *[insert name of Employer]*

Email address: *[insert email address]*

Fax number: *[insert fax number] delete if not used*

At this point in the procurement process, you may submit a Procurement-related Complaint challenging the decision to award the contract. You do not need to have requested, or received, a debriefing before making this complaint. Your complaint must be submitted within the Standstill Period and received by us before the Standstill Period ends.

Further information:

For more information see the [Procurement Regulations for IPF Borrowers \(Procurement Regulations\)](https://policies.worldbank.org/sites/ppf3/PPFDocuments/Forms/DispPage.aspx?docid=4005) [https://policies.worldbank.org/sites/ppf3/PPFDocuments/Forms/DispPage.aspx?docid=4005] (Annex III). You should read these provisions before preparing and submitting your complaint. In addition, the World Bank's Guidance "[How to make a Procurement-related Complaint](http://www.worldbank.org/en/projects-operations/products-and-services/brief/procurement-new-framework#framework)" [http://www.worldbank.org/en/projects-operations/products-and-services/brief/procurement-new-framework#framework] provides a useful explanation of the process, as well as a sample letter of complaint.

In summary, there are four essential requirements:

1. You must be an 'interested party'. In this case, that means a Bidder who submitted a Bid in this bidding process, and is the recipient of a Notification of Intention to Award.
2. The complaint can only challenge the decision to award the contract.
3. You must submit the complaint within the period stated above.
4. You must include, in your complaint, all of the information required by the Procurement Regulations (as described in Annex III).

6. Standstill Period

DEADLINE: The Standstill Period is due to end at midnight on *[insert date]* (local time).

The Standstill Period lasts ten (10) Business Days after the date of transmission of this Notification of Intention to Award.

The Standstill Period may be extended as stated in Section 4 above.

If you have any questions regarding this Notification please do not hesitate to contact us.

On behalf of the Employer:

Signature: _____

Name: _____

Title/position: _____

Telephone: _____

Email: _____

.....
.

2.2 Substitute the first note in Italics in the Form ‘Notification of Award’ as under:

[The Letter of Acceptance shall be the basis for formation of the Contract as described in ITB Clause 47. This Standard Form of Letter of Acceptance shall be filled in and sent to the successful Bidder only upon expiry of the Standstill Period, specified in BDS ITB 42.1 or any extension thereof, or upon satisfactorily addressing a complaint that has been filed within the Standstill Period, subject to any review by the World

*Bank required
under the Loan
Agreement.]*
