STANDARD BIDDING DOCUMENT
PROCUREMENT OF
CIVIL WORKS

COMPLETE BIDDING DOCUMENT

GOVERNMENT OF GUJARAT
Water Resources Department

Index

INVITATION FOR BID

(IFB)

NATIONAL COMPETITIVE BIDDING

1. The **Executive Engineer, Ambica Division, Navsari** invites bids for the construction of works detailed in the table.
   The bidders may submit bids for any or all of the following works.

1. TABLE

Package No.	Name of work	Approximate value of works (Rs.)	Bid security (Rs.)	Cost of document	Period of completion	#Class of Registration / Category of contractor if required
1	2	3	4	5	6	7
1.	**Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO-884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.**	**Rs. 7,76,482.47**	**Rs. 8000.00**	**Rs. 900.00**	**4 Months**	**Registered in "E-2" class and above**

2. Prospective / Interested bidder may download the Bid Documents from website https://www.tender.nprocure.com free of cost till the Time and Date as mentioned on online NIT at website https://www.tender.nprocure.com.

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3. However, Bidder who is submitting the Bid Online will have to pay the Bid Document Fee / Tender Fee through Demand Draft only of any Schedule Bank payable at **Navsari** and in favour of '**Executive Engineer, Ambica Division, Navsari**". Once the Bid is received online, Bid Document / Tender Fee will not be refundable. As Per GoG R&B Department's Circular No. PARACH/102/000/IB/221/(59)/C Dated.24/01/2007

The Demand Draft for Bid Document / Tender fee and FDR / Bank Guarantee against Bid Security / EMD shall be submitted in electronic format through online (by scanning) while uploading the bid, this submission shall mean that bid document / tender fee and Bid Security / EMD has been received. Accordingly, the offer of only those shall be opened whose Bid Document / Tender Fee and Bid Security / EMD have been received electronically. However, for the purpose of realization of Demand Draft, and FDR / Bank Guarantee bidder shall send the same in original through R.P.A.D. so as to reach to #` submission within 7 Days from the last day of bid.

Penaltative action for not submitting Demand Draft / FDR / Bank Guarantee in original to Executive Engineer / Tender Inviting Authority by bidder shall be initiated.

WRD GR No. PRC-102014-1-MICell-K.1 Dated: 29/10/2014

4. Bids received online, will be opened on the time, date and place as specified in the online NIT at website www.tender.nprocure.com in the presence of the bidders or their authorized representatives, who wish to remain present.
   If the office happens to be closed on the day of opening of the bids as specified, the bids will be opened on the next working day at the same time and venue.
5. ~~A pre bid meeting will be held on .....at .....hrs. at the office of.....to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in clause 9.2 of 'instructions to Bidders' of the bidding documents.~~
6. #Bid Security (EMD) is equal to 1% of Estimated Amount put to bid / tender and should be rounded off to the next thousand rupees.
7. Other Information is as under:
   A. Agencies can prepare and edit their offers a number of times before the end of the tender submission date and time. After the tender submission date and time, the bidder cannot modify / edit / withdraw their submitted offer in any case. No written or online request in this regard shall be granted.

   B. Offers in physical form will not be accepted in any case.
   C. Demand Draft purchased by the other then bidder and issued after the last date of submission of Bids, will not be considered or accepted.

   D. The cost incurred by the contractor for this offer for clarification or attending discussion, conferences or site visits will not be reimbursed by the Employer or Engineer-in-Charge.

   E. Conditional tender shall not be accepted.

   F. Any changes, addition, alternation made in the prescribed form attached with tender are liable to be rejected.

   G. Any change in format or conditional Bank Guarantee will not be accepted and the bidder will be considered non-responsive.

   H. All the bidders are instructed to fill in information strictly in accordance with the format given in the checklist /qualification document / tender document.

   I. It is mandatory for the bidders to supply each and every information as asked strictly in electronic format at appropriate places only.

   J. Blank / insufficient information shall be treated as nil information and shall result in disqualification.

   K. Even if the bidder has been qualified in a similar or larger size of project in the past, it shall not be deemed to be a ground / reason for not giving required information for this work / bid.

   L. Information supplied for earlier projects shall not be considered while evaluation of this bid. The Government will not ask for any other information, unless it is found absolutely necessary by the competent authority.

   M. If found necessary, the contractor will be intimated for negotiation,

For the works costing up to Rs. 7.5 crore (WRD Works), Rs. 7.0 crore (ROAD/ BRIDGE/ BUILDING WORKS), Rs. 0.5 Crore (Electrical Works) kindly refer to GoG NWRWS & K Department's Circular No. **Paracha/1097/1397(11)/pa.fa./ MICELL(k-1) dated 18/01/2018 and Dated 30/09/2022**

For the works costing under Rs. 7.5 crore for Construction work of Water Resources Department, Rs. 7.0 crore for Roads, Bridges and Building and Rs. 0.50 crore for Electrical work following documents shall be submitted in electronic format only through online by scanning and the (i) Bid Document Fee / Tender Fee (ii) Bid Security / EMD should be sent in original to the Tender opening authority through RPAD, so as to reach the Executive Engineer within 7 days from last day of submission of Bid.

1. Tender Fee
2. EMD/ EMD Exemption Certificate
3. PAN Card Issued by Income Tax Department.
4. Registration Certificate of appropriate class of contractor
5. GST Registration
6. A solvency certificate of an Amount of 20% (Twenty percent) of estimated cost put to tender will have to be produced along with tender. It shall be of Scheduled Bank or Nationalised Bank or Bank Approved for Government business. Solvency Certificate shall have validity of same calendar year as that of date in which tender is issued.
7. Affidavit (as per Section 2 of SBD Book)
8. Partnership Deed (If Any)
9. Power of Attorney of the signatory of bid (If Any)

SECTION - 1

INSTRUCTIONS TO BIDDERS

(ITB)

Section 1: Instructions to Bidders

Table of Clauses

A. GENERAL

1. Scope of Bid

1.1 The Employer (Named in Appendix to ITB) invites bids for the Construction of works (as defined in these documents and referred to as 'the works") detailed in the table given in IFB. The bidders may submit bids for any or all of the works detailed in the table given in IFB.

1.2 The successful bidder will be expected to complete the works by the intended completion date specified in the Contract data.

1.3 Throughout these bidding documents, the terms 'bid' and 'tender' and their derivatives (bidder/ tenderer, bid / tender, bidding/ tendering, etc.) are synonymous.

2. Source of Funds

2.1 The expenditure on this project will be met from the budget of Govt. of Gujarat.

3. Eligible Bidders

3.1 This Invitation for Bids is open to all eligible bidders.

3.2 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is neither associated, nor has been associated, directly or indirectly, with the consultant or any other entity that has prepared the design, specifications, and other documents for the Project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of the works, and any of its affiliates, shall not be eligible to bid.

4. Qualification of the Bidder

4.1 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary. The proposed methodology should include a program of construction backed with equipment planning and deployment duly supported with broad calculations and quality assurance procedures proposed to be adopted justifying their capability of execution and completion of work as per technical specifications, within stipulated period of completion.

4.2 Deleted

4.3 Deleted

4.4 Deleted

#4.5 QUALIFICATION CRITERIA:
(Applicable for the works which require Pre Qualification) As Per GoG NWRWS & K Department's Circular No. Paracha/1097/1397(11)/pa.fa./MICELL(k-1) Dated.18/01/2018

4.5.1 Qualification will be based on Applicant's meeting all the following minimum pass/ fail criteria regarding the Applicant's general and particular experience, personnel and equipment capabilities and financial positions, as demonstrated by the applicant's responses in the forms attached to the letter of application (specified requirement for joint ventures are given under para 4.6 below) Subcontractors experience and resources shall not be taken in to account in determining the applicants compliance with the qualifying criteria.

To qualify for more than one contract, the applicant must demonstrate having experience and resources sufficient to meet the aggregate of the qualification criteria for each contract given in paragraphs 4.5.4, 4.5.5 and 4.5.9 below

4.5.2 Base year and Escalation

The base year shall be taken as Current financial year

Following enhancement factors will be used for the costs of works executed and the financial figure to a common base value for works completed in India.

Year	Financial Year	Multiplying factor
Base year of inviting tender	2024-2025	1.00
-1	2023-2024	1.10
-2	2022-2023	1.21
-3	2021-2022	1.33
-4	2020-2021	1.46
-5	2019-2020	1.61

Applicant should indicate actual figures of costs and amount for the works executed by them without accounting for the above-mentioned factors.

In case the financial figures and value of completed works are in foreign currency the above enhanced multiplying factors will not be applied. Instead, the current market exchange rate (State Bank of India BC Selling rate as on the last date of submission of the bid) will be applied for the purpose of conversion of the amount in foreign currency into India rupees.

4.5.3. General Experience.

The Applicant shall meet with the following minimum criteria:

(a) Achieved a minimum annual financial turnover of Rs.----Crore for works in progress and completed in all classes of civil engineering construction works in any one year, over the last five financial years.

(b) Experience in successfully completing or substantially completing at least one contract of similar work (……) of at least 40 percent of the value of proposed contract within the last five financial years.

The works may have been executed by the applicant as prime contractor or as a member of a joint venture or as a nominated sub-contractor. As subcontractor, he should have acquired the experience of execution of all major items of works under the proposed contract. In case a project has been executed by a joint venture, weight towards experience of the project would be given to each joint venture in proportion to their financial participation in the joint venture if work executed jointly otherwise as per the scope of work define in Joint Venture agreement.

Substantially completed works means those works which are at least 90 % completed as on the date of submission (i.e. gross value of work done up to the last date of submission is 90 % or more of the original contract price) and continuing satisfactorily.

For these, a certificate from the employers shall be submitted along with the application incorporating clearly the name of the work, contract value, billing amount, date of commencement of works, satisfactory performance of the contractor and any other relevant information.

(the experience certificate should be signed by the officer not below the rank of EE)

4.5.4. Personnel Capabilities.

Availability for his work of personnel with adequate experience as required; as per **Appendix.**

4.5.5. Equipment Capabilities

Based on the studies carried out by the Engineer, the minimum suggested major equipment to attain the completion of works in accordance with the prescribed construction schedule are shown in the Appendix.

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 to 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.

4.5.6. Financial Position

The Applicant should give undertaking that he has access to, or has available, liquid assets (aggregate of working capital, cash in hand and uncommitted bank guarantees) and / or credit facilities up to 25 percent of the value of the contract / contracts applied.

4.5.7. The audited balance sheets for the last five years should be submitted, which must demonstrate the soundness of the applicant's financial position, showing long – term profitability including an estimated financial projection for the next two years If necessary, the employer will make inquiries with the applicant's bankers.

4.5.8. Litigation History

The Applicant should provide accurate information on any litigation or arbitration resulting from contracts completed or under execution by him over the last five financial years. A consistent history of awards against the Applicant or any partner of a joint venture may result in failure of the applicant.

4.5.9. Disqualification

Even though the applicants meet the above criteria, they are subject to be disqualified if they have:

Made misleading or false representation in the forms, statements submitted, and / or

Record of poor performance such as abandoning the work, rescinding of contract for which the reasons are attributable to the non – performance of the contractor; consistent history of litigation awarded against the applicant or financial failure due to bankruptcy. The rescinding of contract of a joint venture on account of reasons other than non – performance, such as Most Experienced partner of joint venture pulling out, court directions leading to breaking up of a joint venture before the start of work, which are not attributable to the poor performance of the contractor will, however, not affect the qualification of the individual partners.

4.5.10. The bidder who have applied for corporate Debt Restructuring (CDR) / facing recovery proceedings from financial institutions / facing winding up processing / those under BIFR in the last 5 financial year shall be considered for bid qualification. However if the bank / financial institution has accepted the proposal of debt restructuring on or before the last date of online submission, the same shall be considered for further evaluation. An affidavit by bidder along with certificate from bank must be produced in such cases. In case of Joint Venture agreement, this provision shall be applicable for both lead partner and JV partner.

#4.6 JOINT VENTURE: (Maximum 3 Members i.e. 1 Lead & 2 Others) (Applicable only for estimated project cost of 50 Crore and above)

4.6.1. Joint ventures must comply with the following

requirement: (a) Following are the minimum qualification

requirements:

(i) The lead partner shall meet not less than 50 percent of all criteria given in para 4.5.3 & 4.5.6 above. The joint venture must collectively satisfy the criteria of para 4.5.3 & 4.5.6 above. The experience of the other joint venture partners shall be considered if it is not less than 30 percent of the qualifying criteria in para 4.5.3 & 4.5.6 above.

(ii) Individually each member must satisfy the requirements of para 4.5.7 & 4.5.8 above.

(b) Bid shall be signed so as to legally bind all partners, jointly and severally, and shall be submitted with a copy of the joint venture agreement providing the joint and several liabilities with respect to the contract.

4.6.2. Qualification of a joint venture does not necessarily qualify any of its partners individually or as a partner in any other joint venture. In case dissolution of a joint venture, each one of the constituent firms may qualify if they meet all the qualification requirements, subject to the written approval of the Employer.

4.7. Bid Capacity.

Applicants who meet the minimum qualification criteria will be qualified only if their available bid capacity at the expected time of bidding is more than the total estimated cost of the works. The available bid capacity will be calculated as under:

Assessed Available Bid Capacity = (A*N*2-B), where

A = Maximum value of work executed in any one year during the last five years (updated to the price level of the year indicated in appendix) taking into account the completed as well as works in Progress.

B = Value at current price level of the existing commitments and ongoing works to be completed during time interval of "N" year from the Bid due date; and

N = Number of years prescribed for completion of the works for which the bids are invited.

Note :- Non disclosure of any related information will result in disqualification of the bidder.

4.8 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

-Made misleading or false representation in the forms, statements and Attachments the submitted in proof the qualification requirements; and / or

-Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delay in completion, litigation history, or financial failures etc.; and/ or

-Participated in the previous bidding for the same work and had quoted unreasonably high bid prices and could not furnish rational justification to the employer.

5. **One bid per bidder**

5.1. Each bidder shall submit only one bid for one package. A bidder who submits or participates in more than one bid (other than as a subcontractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the bidder's participation to be disqualified.

6. Cost of Bidding

6.1. The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

7. Site Visit

7.1. The Bidder, at the Bidder's own responsibility and risk is encouraged to visit and examine the Site of work and its surrounding and obtain 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.

B. BIDDING DOCUMENTS

8. Content of Bidding Documents

8.1 The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 10:

Section	Particulars	Volume No.
-	Invitation for Bids	I
1	Instructions to Bidders	
2	Qualification Information, and other forms	
3	Conditions of Contract	
4	Contract Data	
5	Technical Specifications	II
6	Form of Bid	III
7	Bill of Quantities	
8	Securities and other forms	
9	Drawings	IV
10	Documents to be furnished by bidder	V

8.2. Volumes I, II, III and IV are available online and documents to be furnished by the bidder in compliance to section 2 will be prepared by him and furnished as Volume-V in two parts (refer clause 12).

8.3. The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, technical specifications, bill of quantities, forms, Annexes and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk. **Pursuant to clause 26 hereof**, bids which are not substantially responsive to the requirements of the Bid Documents shall be rejected.

9. Clarification Bidding Documents

9.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or through E-mail at the Employer's address indicated in the invitation to bid. The Employer will respond to any request for clarification which he received earlier than 15 days prior to the deadline for submission of bids. Employer's response will be published on website including a description of the enquiry but without identifying its source.

9.2. Pre-bid meeting

9.2.1. The bidder or his official representative is invited to attend a pre-bid meeting which will take place at the address, venue, time and date as indicated in the appendix.

9.2.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

9.2.3. The bidder shall be required to submit any questions in writing or e-mail to reach the Employer not later than 03 days before the meeting.

9.2.4 Minutes of the meeting, including the question raised (Without identifying the source of enquiry) and the responses given will be published without delay on the tender website i.e. www.tender.nprocure.com. Any modification of the bidding documents listed in sub-Clause 8.1 which 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 Clause 10 and not through the minutes of the pre-bid meeting.

9.2.5. Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

10. Amendment of Bidding Documents

10.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.

10.2. Any addendum thus issued shall be part of the bidding documents. The Employer will assume no responsibility for the same.

10.3. To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may, at his discretion, extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.

C. PREPARATION OF BIDS

11. Language of the Bid

11.1 All documents relating to the bid shall be in the English language.

12. Documents Comprising the Bid

12.1. The bid be submitted by the bidder as Volume V of the bid document (refer Clause 8.1) shall be in two separate parts:

<u>Part I</u> shall be named "Technical Bid" and shall comprise

(i) Bid Security in the form specified in Section 8

(ii) Qualification Information and supporting documents as specified in Section 2

(iii) Certificates, undertakings, affidavits as specified in Section 2

(iv) Any other information pursuant to Clause 4.5 of these instructions

(v) Undertaking that the bid shall remain valid for the period specified in Clause 15.1

Part II shall be named "Financial Bid" and shall comprise

(i) Form of Bid as specified in Section 6

(ii) Priced Bill of Quantities for items specified in Section 7

12.2. The Bidder shall submit the details / information pertaining to each part i.e. technical as well as financial and must be submitted online only.

12.3. Following documents will be deemed to be part of the bid.

Section	Particulars	Volume No.
	Invitation for Bids (IFB)	
1	Instruction to Bidders	Volume I
3	Conditions of Contract	
4	Contract Data	
5	Specifications	Volume II
9	Drawings	Volume IV

13. Bid Prices

13.1 The Contract shall be for the whole works as described in Sub-Clause 1.1, based on the priced Bill of Quantities submitted by the Bidder.

13.2 The bidder shall fill in rates and prices and line item total (both in figures and words) for all items of the Works described in the Bill of Quantities along with total bid price

(Both in figures and words). Items for which no rate or price is entered by the bidder will not be paid for by the Bill of Quantities.

13.3 All duties, taxes, and other levies except GST payable by the contractor under the contract, or for any other cause shall be included in the rates, prices and total Bid Price submitted by the Bidder. (GST will be paid extra)

13.4 Deleted

13.5 The rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 47 of the Condition of Contract **(Irrespective of the time limit and Bid Amount)**

14. Currencies of Bid and Payment

14.1 The unit rates and the prices quoted by the bidder shall be entirely in Indian Rupees. All payments shall be made in Indian Rupees.

15. Bid Validity

15.1 Bids shall remain valid for a period of not less than 120 days after the deadline date forbid submission specified in Clause 20.

15.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified period. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his security for a period of the extension, and in compliance with Clause 16 in all respects.

#16. Bid Security

16.1. The Bidder shall furnish, as part of his Bid, a Bid security in the amount as shown in column 4 of the table of IFB for this particular work. This Bid security shall be in favor of Employer as named in Appendix and may be in one of the following forms;

a. Bank Guarantee from any scheduled Indian bank, in the format given in Volume III. **(Bank Guarantee is applicable only for Bid Estimated Amount of 01 Crore and above)** **and Bank** Guarantee of Schedule and Private Banks shall be considered as per GoG Finance Department's Circular No. FD/MSM/e-file /4/2023/4020/D.M.O. Date 11/03/2024 or as per their latest amendment.

b. Fixed Deposit Receipt issued by any Scheduled Indian Bank or a foreign Bank approved by the Reserve Bank of India.

OR

A Valid Bid Security / EMD Exemption Certificate issued by (1) Road & Building Department or (2) Narmada Water Resources, Water Supply and Kalpsar Department of Govt of Gujarat. **Exemption Certificate is applicable only when Registration Certificate of Appropriate Class and Category of Approved Contractors is required as eligible criteria of bidder.**

16.2. Bank guarantees (and other instruments having fixed validity) issued as surety for the bid shall be valid for 45 days beyond the validity of the bid i.e. total validity of 120+45 = 165 Days

16.3. Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 16.1 and 16.2 above shall be rejected by the Employer as non-responsive.

16.4. The Bid Security of unsuccessful bidders will be returned within 28 days of the end of the bid validity period specified in Sub-Clause 15.1

16.5 The Bid Security of the successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security.

16.6. The bid Security may be forfeited

(a) If the Bidder withdraws the bid after Bid opening during the period of Bid validity.

(b) If the Bidder does not accept the correction of the Bid Price, if any or

(c) In the case of a successful Bidders, if the Bidder fails the specified time limit to
   (i) Sign the Agreement; or
   (ii) Furnish the requirement Performance Security.

(d) #If found necessary, the bidder will be intimated for negotiation, He will be intimated maximum three times within the validity period for negotiation, If contractor does not respond in time, his Bid Security (EMD) will be forfeited and his tender will be rejected. Punitive action will be taken on such contractors. (As per GoG R&B Dept's Gr. No. S/22/2017/639/D, Dt.08/06/2018)

17. Alternative Proposals by Bidders.

17.1. Bidders shall submit offers that fully comply with the requirements of the bidding documents, including the conditions of contract (including mobilization advance or time for completion), basic technical design as indicated in the drawing and specifications. Conditional offers or alternative offers will not be considered further in the process of tender evaluation.

18. Format and Signing of Bid

18.1. The Bidder shall prepare documents comprising the bid as described in Clause 12 of these Instructions to bidder as the "Technical Bid "and "Financial Bid" in separate parts to be uploaded.

D. SUBMISSION OF BIDS

19. Deleted

20. Deadline for Submission of the Bids

20.1. Complete Bids must be received online by the Employer at the tender website specified above not later than the date indicated in appendix.

20.2. The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all right and obligation of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

21. Deleted

22. <u>Modification and Withdrawal of Bids</u>

22.1. Bidders may modify or withdraw their bids online before the deadline prescribed in Clause 20 or pursuant to Clause 23.

22.2 Deleted

22.3. No bid shall be modified or withdrawn after the deadline for submission of Bid.

22.4. Withdrawal or modification of a bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15.1 above or as extended pursuant to Clause 15.2 may result in the forfeiture of the Bid security pursuant to Clause 16.

E. BID OPENING AND EVALUATION

23. Bid Opening

23.1 The Employer will open all the Bids received including modifications made pursuant to Clause 22, in the presence of the Bidders or their representatives who choose to attend at time, date and the place specified in Appendix in the manner specified in Clauses 20 and 23.3, 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.

23.2. Deleted.

23.3. The "Technical Bid" shall be opened. The amount, form and validity of the bid security furnished with each bid will be announced. If the bid security furnished does not conform to the amount and validity period as specified in the invitation for bid (ref. Column 4 and paragraph 3), and has not been furnished in the form specified in Clause 16, the technical bid will not be opened.

23.4. (i) Subject to confirmation of the bid security by the issuing Bank, the bids accompanied with valid bid security will be taken up for evaluation with respect to the Qualification information and other information furnished in part I of the bid pursuant to Clause 12.1.

(ii) If required, the bidder will be asked in writing to clarify his Qualification Documents with respect to any required clarification.

(iii) The bidders will respond in not more than 7 days of issue of the clarification letter.

(iv) Immediately (usually within 3 or 4 days), on receipt of these clarification the Evaluation Committee will finalize the list of responsive bidders whose financial bids are eligible for consideration.

23.5. Deleted

23.6 At the time of opening of "Financial Bid", the names of the bidders were found responsive in accordance with Clause 23.4(iv) will be announced. The bids of only these bidders will be opened. The responsive Bidders' names, the Bid prices, the total amount of each bid, any discount and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening.

23.7 the time of opening of "Financial Bid", the names of the bidders were found responsive in accordance with Clause 23.4(iv) will be announced. The bids of only these bidders will be opened. The responsive Bidders' names, the Bid prices, the total amount of each bid, any discount, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening.

23.8 In case bids are invited for more than one package, the order for opening of the "Financial Bid" shall be in order of Estimated amount of Bids from highest to lowest.

23.9 The Employer shall prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Sub-Clause 23.6.

24 Process to be Confidential

24.1 Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by Bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his Bid.

25. Clarification of Financial Bids

25.1. To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by e-mail, but no change in the price or substances of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids.

25.2 Subject to sub-clause 25.1, no Bidder shall contact the Employer on any matter relating to his Bid opening to the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.

25.3. Any effort by the Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decision may result in the rejection of the Bidders' bid.

26. Examinations of Bids and Determination of Responsiveness

26.1 During the detail evaluation of "Technical Bid", the Employer will determine whether each Bid (a) meets the eligibility criteria defined in Clause 3 and 4; (b) has been properly signed; (c) is accompanied by the required securities and; (d) is substantially responsive to the requirements of the Bidding document. During the detailed evaluation of the "Financial Bid", the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications, and drawings.

26.2 A substantially responsive "Financial Bid" is one which confirms all the terms, conditions and specifications of bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

26.3 If a "Financial Bid" is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

27. Deleted

28. Deleted

29. Evaluation and Comparison of Financial Bids

29.1. The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Sub-Clause 26.2.

29.2. Deleted.

29.3. The Employer reserves the right to accept or reject any variation or deviation. Variation and deviations and other factors, which are in excess of the requirements of the Bidding documents or otherwise result in unsolicited benefits for the Employer, shall not be taken in to account in Bid evaluation.

29.4. The estimated effect of the price adjustment conditions under Clause 47 of the Conditions of Contact, during the period of implementation of the Contract, will not be taken in to account in Bid evaluation.

29.5. If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract the Employer may require the Bidder to produce detailed consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in Clause 34 be increased at the expense of the successful /bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

29.6. A bid which contains several items in the bill of Quantities which are unrealistically priced low and which cannot be substantiated satisfactorily by the bidder may be rejected as non-responsive.

30. Deleted

F. AWARD OF CONTRACT

31. Award Criteria

31.1. Subject to Clause 32, the Employer will award the contract to the Bidder whose Bid has been determined.

(i) to be substantially responsive to the Bidding documents and who has offered the lowest evaluated Bid Price; and

(ii) to be within the available bid capacity adjusted to account for his bid price which is the lowest evaluation in any of the packages opened earlier than the one consideration.

In no case, the contract shall be awarded to any bidder whose available bid capacity is less than the evaluated bid price, even if the said bid is the lowest evaluated bid. The contract will in such cases be awarded to the next lowest bidder at his evaluation bid price.

32. Employer's Right to Accept any Bid and to Reject any or all Bids

32.1. Notwithstanding Clause 31, the Employer reserves the right to accept or reject any Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the award of contract, without thereby incurring any liability to the affected bidder or Bidder or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

33. Notification of Award and Signing of Agreement

33.1. The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the condition of contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

33.2 The notification of award will constitute the formation of the contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause.

33.3. The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and to the successful Bidder, within 28 days following the notification of award along with the Letter of Acceptance. Within 21 days of receipt, the successful Bidder will sign the Agreement and deliver it to the Employer.

33.4. Upon the furnishing by the successful Bidder of the Performance Security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

34. Performance Security

34.1. (A) Within 10 (Ten) days of receipt of Letter of Acceptance, the successful Bidder shall furnish to the Employer an irrevocable and unconditional guarantee from a Bank in the form set forth in Section 8 (the "Performance Security") for an amount equal to 5% (five percent) of its Contract Price. In case of bids mentioned below, the successful Bidder, along with the Performance Security,

shall also furnish to the Authority an irrevocable and unconditional guarantee from a Bank in the same form given at Section 8 towards an Additional Performance Security (The "Additional Performance Security") for an amount calculated as under:

(a) If the Contract Price offered by the Selected Bidder is lower than 10% but upto 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @ 20% of the difference in the (i) Estimated Project Cost (as mentioned in Bid Document) - Minus 10% of the Estimated Project Cost and (ii) Contract Price offered by the selected Bidder.

(b) If the Contract Price offered by the Selected Bidder is lower than 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @ 30% of the difference in the (i) Estimated Project Cost (as mentioned in Bid Document) - Minus 10% of the Estimated Project Cost and (ii) Contract Price offered by the selected Bidder.

(c) This Additional Performance Security shall be treated as part of the Performance Security.

(B) The Performance Security shall be valid beyond 60 (Sixty) days **from the stipulated date of completion of the project** and the Additional Performance Security shall be valid beyond 28 (twenty-eight) days of Project Completion Date.

Performance Security shall become refundable/releasable within 15 days after certified project completion date subject to Fulfillment of contractual obligation and settlement of all dues and claims.

34.2. If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued either (a) at the Bidder's option, by a Nationalized/Scheduled Indian bank or (b) by a foreign bank located in India and acceptable to the Employer. As per GoG Finance Department's Circular No. FD/MSM/e-file /4/2023/4020/D.M.O. Date 11/03/2024 or as per their latest amendment.

34.3. Failure of the successful Bidder to comply with the requirement of Sub-Clause 34.1 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security.

~~**35 Advance Payment and Security**~~

~~35.1 The Employer will provide an Advance payment on the Contract Price as stipulated in the Conditions of Contract, subject to maximum amount, as stated in the Contract Data.~~

36. Deleted

37. Corrupt of Fraudulent Practices

37.1 The Employer will reject a proposal if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in completing for the contract in question and will declare the firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract with National Highways Authority of India/ State PWD and any other agencies, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in completing for the contractor, or in execution.

37.2 Furthermore, Bidders shall be aware of the provision stated in Sub- Clause 59.2 of the Conditions of Contract.

APPENDIX TO ITB

Clause Reference With respect to Section –I

Item marked "N/A" do not apply to this Contract.

1.	The Name of the Employer is **Executive Engineer, Ambica Division, Navsari**.	[Cl.1.1]
2.	The last five financial years. 2019 – 2020 2020 – 2021 2021 – 2022 2022 – 2023 2023 – 2024	
3.	This Annual Financial Turnover Amount is Rs.: N/A	[Cl.4.5.3 (a)]
4.	Value of Work is Rs. **Rs 776482.47**	
5.	Deleted	
6.	The cost of electric work is Rs.: N/A	
7.	The cost of water supply / sanitary works is Rs.: N/A	
8.	Liquid assets and / or availability of credit facilities is for Rupees @25% of Value of Work i.e **:N/A**	[Cl.4.5.6]
9.	Price level of the financial year **2025 – 2026**	[Cl. 4.5.2]
10.	The pre-bid meeting will take place at:N/A	[Cl. 9.2.1]
11.	The technical Bid will be opened at the office of the Executive Engineer, Ambica Division, Navsari On ..... As stated in online NIT	
12.	Address of the Employer: Executive Engineer, Ambica Division, Navsari-396445	
13.	Deleted	
14.	The bid should be submitted latest by….As stated in online NIT	[Cl. 20.1 & 20.2]
15.	The bid will be opened at …..As stated in online NIT	[Cl. 23.1]
16.	The Bank Draft in favor of **Executive Engineer,Ambica Division, Navsari**	
17.	Deleted	
18.	Escalation factors (for the cost of works executed and financial figure to a common base value) for works completed : **N/A**	[Cl.4.5.2]

Year	**Financial Year**	**Multiplying factor**
Base year of inviting tender	2024 – 2025	1.00
-1	2023 – 2024	1.10
-2	2022 – 2023	1.21
-3	2021 – 2022	1.33
-4	2020 – 2021	1.46
-5	2019 – 2020	1.61

#LIST OF KEY PLANT & EQUIPMENT TO BE DEPLOYED ON CONTRACT WORK

[Reference CL. 4.5.5]

~~**The contractors shall also give a list of machineries in his possession and which they propose to use on the work.**~~

Sr. No.	Plant or Machinery	Location	Age of Machinery (maximum 15 years)	Make	Capacity	Approximate Value	Remark
1	2(a)	2(b)	3	DELETED E.E.	5	6	7

List of Key Personnel to be deployed on Contract Work

(Reference Cl. 4.5.4)

 # Employment of a qualified site Engineer by the Contractor.

The Contractor shall employ full-time technically qualified staff during the execution of this work as under: -

1. Two graduate Civil Engineers and three diploma Civil Engineers when cost of the work to be executed is more than Rs.50 lakhs.
2. One graduate & two Diploma, Civil Engineers when the cost of the work to be executed is more than Rs.15 lakhs but less than Rs.50 lakhs.
3. Minimum Two Diploma Civil Engineer when the cost of work is less than Rs.15 lakhs but more than Rs.5 lakhs.
4. Minimum One Diploma Civil Engineers for the work when the cost of work to be executed is less than Rs. 5 lakhs. The Engineer so employed for the Government work must have sufficient experience to handle the work independently. Such an Engineer shall have to stay at the site of work and he shall not be entrusted with other duty except this work.

   In case the contractor or partner of the contractor firm is a Civil Graduate Engineer, Employment of a separate Engineer will not be necessary provided that the Engineer partner himself attends the execution of the work on the site.

   Within 15 days of issue of work-order the Contractor will have to furnish to the Deputy Executive Engineer-in-charge of the work the Name, Qualifications, copy of marksheet, Color Photograph and the appointment order issued such engineers engaged for this contract work. If 15 days after issue of work order such designated Site Engineers do not resume or do not remain present on site of work, the recovery at the rate of Rs.15,000-00 per month per Engineer will be made from the bills/deposit/dues of the contractor. Such recovery shall be non-refundable.

SECTION - 2

QUALIFICATION INFORMATION

QUALIFICATION INFORMATION

The information to be filled in by the Bidder in the following pages will be used for the purpose of post qualification as provided for in Clause 4 of the Instruction to Bidders. This information will not be incorporated in the Contract.

1. For Individual Bidders

1.1 Constitution or legal status of Bidder _____
(Attach Copy)
Place of registration _____
Principal place of business _____
Power of attorney of signatory of Bid
(Attach)

1.2 Total value of Civil engineering construction works performed in the last five years (in Rs. lakhs)

Sr. No	Financial Year	Annual Turnover of Civil Engineering Construction Works (in Rs. lakhs)	Remarks
1	2019-20		CA Certificate for Annual Turnover of Civil Engineering Construction Works is to be attached.
2	2020-21		
3	2021-22		
4	2022-23		
5	2023-24		
6	2024-25		

DELETED
E.E.

1.2.1 Work performed as prime contractor, work performed in the past as a nominated sub-contractor will also be considered the sub-contract involved execution of all main items of work described in the bid documents, provided further that all other qualification criteria are satisfied (in the same name) on works of a similar nature over the last five years** and in current year before the submission of the bid.

(All Figures in Rs. lakhs)

Financial Year (FY)	Description of work	Name of the Employer	Contract No.	Value of contract	Cost of Completed Portion of Works in that particular FY	Date of issue of work order	Actual Date of Starting	Stipulated /Actual date of completion*	Remark explaining reasons for delay & work Completed
1									
2019-20									
2020-21									
2021-22									
2022-23									
2023-24									
2024-25									

Note:- Necessary Certificates i.e. Form 3A (for Govt. Works) or Self attested copy of workorder/competition certificate/final bill/TDS certificate etc (for Non- Govt. Works), showing year wise breakup of work done amount, issued by concerned Engineer-In-Charge, are required to be attached.

*Attach certificate(s) from the Engineer(s)in-charge
**Immediately preceding the financial year in which bids are received.

#1.3.2 Quantities of work executed as prime contractor, work performed, in the past as a ominated sub-contractor, will also be considered provided the sub-contract involved execution of all main items of work described in the bid document, provided, further that all other qualification criteria are called (in the same name and style) in the last five years** and in current year before the submission of the bid.

*To be modified as per the nature and scope of work

Year	Name of the work	Name of the Employer	Quantity of work performed (Cum/MT)				Remarks* (indicate contract Ref)
			Cement Concrete (Including RCC & PCC) ITEM 1	Masonry ITEM 2	Earth Works ITEM 3	Bituminous Work ITEM 4	
20__-20__							
20__-20__							
20__-20__							
20__-20__							
20__-20__							

DELETED E.E.

1.4 Information on Bid Capacity (works for which bids have been submitted and works which are yet to be completed) as on the date of this bid.

(A) Existing commitments and on-going works:

(All Figures in Rs. lakhs)

Description of works	Place & State	Contract No.	Name & Address of Employer	Value Contract (Rs. Cr)	Stipulated/ Actual Date of Starting	Value of Works* to be completed in next (time limit of proposed work) Year	Anticipated Date of completion
1	2	3	4	5	6	7	8

DELETED E.E.

Note:- Furnish information about all the projects which are in progress including all such works for which letter of intent/acceptance of tenders have been received by bidders till the date, on which bidders has submitted his bid for the proposed work.

*Attach certificate (s) from the Engineer(s) in-charge

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

1.5 Availability of key items of Contractors Equipment for carrying out the works (Ref. Clause 4.5.5). The Bidder should list all the information requested below.

Item of Equipment	Requirement		Availability Proposals			Remarks (from whom to be purchased
	NO	Capacity	Owned/ Leased to be procured	Nos/. Capacity	Age/ Conditions	

DELETED E.E.

1.6 Qualifications and experience of key personnel required for administration and execution of the contract. Attach biographical data. Refer also to Sub Clause 9.1 of the Conditions of Contract.

Position	Name	Qualification	Year of Experience (General)	Year of experience in the proposed position
Project Manager				
Etc.				

DELETED

E.E.

1.7 Proposed sub-contract and firms involved

Sections of the works	Value of Sub-Contractor	Sub-Contractor (Name & Address)	Experience in similar work

Attach copies of certificates on possession of valid license for executing water supply/ sanitary work/ building electrification works.

~~1.8 Financial reports for the last five years: balance sheets, profit and loss statements, auditors' reports (in case of companies/corporations), etc. List them below and attach copies.~~

~~1.9 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc. List them below and attach copied documents.~~

1.10 Name, address, and telephone, telex, and fax numbers of the Bidders bankers who may provide references if contacted by the Employer.

1.11 Information on Litigation history in which the Bidder is involved.

Other Party (ies)	Employer	Cause of Dispute	Amount Involved	Remarks showing Present Status
		DELETED E.E.		

1.12. Statement of compliance under the requirements of Sub Clause 3.2 of the instruction to Bidders. (Name of Consultant engaged for project preparations is * .....N/A.....)

1.13 Proposed work method and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. (Refer ITB Clause 4.1)

1.14 Programme

2. Deleted

3. Additional Requirements

3.1 Bidders should provide any additional information required to fulfill the requirements of Clause 4 of the Instructions to the Bidders, if applicable.

(i) Affidavit
(ii) Undertaking

* Fill the name of Consultant

SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR AVAILABILITY OF CREDIT FACILITIES

(CLAUSE 4.5.6 OF ITB)

BANK CERTIFICATE

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

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

DELETED

E.E.

_____

(Signature)

Name of Bank

Senior Bank Manager

Address of the Bank

AFFIDAVIT

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.

2. The undersigned also hereby certifies that neither our firm M/s. _____ _____ have not abandoned any work of Government of Gujarat/Government of India/any Board or Corporation under Government of Gujarat/Government of India nor any contract awarded to us for such works have been rescinded, during last five years prior to the date of this bid.

3. The undersigned hereby authorize(s) and request (s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding any (our) competence and general reputation.

4. The Undersigned understands and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of the Department/ Project implementing agency.

_____

(Signed by an Authorized Officer of the Firm)

_____

Title of Officer

_____

Name of Firm

_____

Date

UNDERTAKING

I, the undersigned do hereby undertake ..... that our firm M/s.....would invest a minimum cash up to 25% of the value of the work during implementation of the contract.

_____

(Signed by an Authorized officer of the firm)

_____

Title of officer

_____

Name of firm

_____

DATE

SECTION - 3

CONDITIONS OF CONTRACT

Conditions of Contract

Table of Contents

CONDITIONS OF CONTRACT

A. GENERAL.

1. Definitions

1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meaning.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid

Compensation Events are those defined in Clause 44 here under

The **Completion Date** is the date of completion of the Works as certified by the Engineer in accordance with Sub Clause 55.1

The Contract is the contract between the Employer and Contractor to execute, complete and maintain the Works **till the completion of Defects Liability Period.** It consists of the documents listed in Clause 2.3 below.

The **Contract data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Bid to carry out the Work has been accepted by the Employer.

The **Contractor's Bid** is the completed Bidding document submitted by the Contractor to the Employer and includes Technical and Financial Bids.

The **Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days: **months** are calendar months.

The **Defects Liability Period** is the period named in the Contract Data and calculated from the Completion Date.

The **Employer** is the party who will employ the Contractor to carry out the Works.

The Engineer is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer) who is responsible for supervising the Contractor, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, awarding extensions of time, and valuing the Compensations Events.

Equipment is Contractor's machinery and vehicles brought temporarily to the site to construct the Works.

The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

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 Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an extension of time.

Materials are all supplies, including consumables, used by the contractor for incorporation in the works.

Plant is any integral part of the work which is to have mechanical, electrical, electronic or chemical or biological functions.

The **Site** is the area defined as such in the Contract Data.

Site Investigation Reports are those which were included in the Bidding documents and are factual interpretive reports about the surface and subsurface conditions at the site.

Specifications means the Specifications of the works included in the Contract and any modification or addition made or approved by the Engineer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

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.

Temporary Works are works designed, constructed, installed, and removed by the Contractor which are needed for construction or installation of the Works.

A **Variation** is an instruction given by the Engineer, which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.

2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter and the other way around. Heading have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about Conditions of Contract.

2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion date, and Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion date for the whole works)

2.3 The documents forming the Contract shall be interpreted in the following order of priority

(1) Agreement
(2) Letter of Acceptance, notice to proceed with works
(3) Contractor's Bid

(4) Contract Data
(5) Conditions of Contract including Conditions of Contract
(6) Specifications
(7) Drawings
(8) Bills of quantities and
(9) Any other document listed in the Contract Data 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 Contract Data.

4. Engineers Decisions

4.1 Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

5.1 The Engineer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

7. Sub-Contracting

7.1 The Contractor may subcontract any portion of work, up to a limit specified in contract data, with the approval of the engineer but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations. **Sub-contracting of supply or specific items of work is not allowed.**

7.2 The sub-contractor must be registered in appropriate class and category for the part of work to be subcontracted.

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities and the Employer between the dates given in the Schedule of other Contractor. The Contractors shall as refer to in the Contract Data, 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 modifications.

9. Personnel

9.1 The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

9.2 If the engineer asks the Contractor to remove a person who is a member of the Contractor Staff or his work force stating the reasons the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Contractors Risks

10.1 The Employer carries the risk which these Contract states are Employer's risks, and the Contractor carries the risks which these Contracts states are Contractors risk.

11. Employer's Risks

11.1 The employer is responsible for the excepted risks which are (a) in so far as they directly affect the execution of the Works, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive.

12. Contractor's Risks

12.1 All risks of loss of or damages to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

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 Contract data 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 damages of property (expect 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 Engineer for the Engineer'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 affect 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 Engineer.

13.5 Both parties shall comply with any conditions of the insurance policies.

14. Site Investigation Report

14.1 The Contractor in preparing the Bid shall rely on any site Investigation reports referred to in the Contract Data, supplemented by any information available to the Bidder.

15. Queries about the Contract data

15.1 The engineer will clarify queries on the Contract Data

16. Contractor to Construct the Works

16.1 The Contractor shall construct and install the works in accordance with the specification and Drawings.

17. The Works to be completed by the Intended Completion Date

17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the programme submitted by the Contractor, as updated with the approval of the Engineer, and complete them by the Intended Completion date

18. Approval by the Engineer

18.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary works to the Engineer, who is to approve them if they comply with the Specifications and drawings.

18.2 The Contractor shall be responsible for design of temporary works.

18.3 The Engineer's approval shall not alter the contractor responsibility for design of the Temporary works.

18.4 The Contractor shall obtain approval of third parties to the design of the Temporary works where required.

18.5 All Drawings prepared by the Contractors for the execution of the temporary or permanent work are subject to prior approval by the Engineer before their use.

19. Safety

19.1 The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the site is the property of the Employer. The contractor is to notify the engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

21. Possession of the Site

21.1 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 Contract Data the Employer is deemed to have delayed the start of the relevant activities and this will be a Compensation Event.

21.2 If within 25% of the time limit of the project, 80% of possession of the site is not handed over to the Contractor, then contractor/ Employer may fore-close the contract. Contractor/Employer has to foreclose the work within 30 days after lapse of 25%-time limit and after 30 days foreclosure option will be closed.

22. Access to the Site

22.1 The Contractor shall allow the Engineer and any person authorized by the Engineer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plants are being manufactured/ fabricated/ assembled for the works.

23. Instructions

23.1 The Contractor shall carry out all instructions of the Engineer pertaining to works which comply with the applicable laws where the site is located.

23.2 The Contractor shall permit the Employer to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Employer, if so required by the Employer.

24. Disputes

24.1 If the Contractor is of the view that a decision taken by the Engineer was either outside the authority given to the Engineer by the Contract or that the decision was wrongly taken, the decision shall be referred to #**Superintending Engineer , Surat Irrigation Circle, Surat** within 14 days of the notification of the Engineer's decision. If the issue is not resolved, any party can refer the
matter for conciliation within 15 days from the decision given by the **#Superintending Engineer, Surat Irrigation Circle, Surat .**

24.2

(a) For the work up to Rs.100 Cr., if any of the parties is not satisfied with the decision of the **#Superintending Engineer Surat Irrigation Circle, Surat** both the parties have to refer to the Chief Engineer concern for the conciliation process.

(b) For the work more than Rs.100 Cr., if any of the parties is not satisfied with the decision of the # **Superintending Engineer Surat Irrigation Circle, Surat**, both the parties have to refer to the #Secretary, Water Resources Department, Government of Gujarat for the conciliation process.

If the dispute is not resolved through the conciliation process, he may refer the dispute to Gujarat Public Works Contract Dispute Arbitration Tribunal. If the Contractor fails to refer a claim / dispute to the Higher Authority within 14 days of the notification of the Engineer's decision, the Contractor shall not be entitled to any additional payment/claim if he doesn't follow the above sequence in stipulated time and he should not stop the work.

25. Procedure for Disputers

25.1 The arbitration shall be conducted in accordance with the arbitration procedure stated in the Special Conditions of Contract.

26. Deleted

B. TIME CONTROL

27. Programme

27.1 Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Programme showing the general methods, arrangements orders, and timing for all the activities in the works along with monthly cash flow forecast.

27.2 An update of the Programme shall be a programme 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.

27.3 The Contractor shall submit to the Engineer, for approval an updated programme at intervals no longer than the period stated in the Contract data. If the Contractor does not submit an updated programme within this period, the Engineer may withhold the amount stated in the Contract data from the next payment after the date on which the overdue programme has been submitted.

27.4 The Engineer's approval of the programme shall not alter the Contractor's obligations. The Contractor may revise the programme and submit it to the Engineer again at any time. A revised programme is to show the effect of Variations and Compensations events.

28. Extension of the Intended Completion Date

28.1 The Engineer 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 and which would cause the Contractor to incur additional cost.

28.2 The Engineer shall decide whether and by how much to extend the Intended Completion Date within 35 days of the Contractor asking the Engineer 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.

28.3 The Engineer shall within 14 days of receiving full justification from the contractor for extension of Intended Completion Date refer to the Employer his decision. The employer shall in not more than 21 days communicate to the engineer the acceptance or otherwise of the Engineer's decision. If the employer fails to give his acceptance, the Engineer shall not grant the extension and the contractor may refer the matter under Clause 24.1

29. Deleted

30. Delays Ordered by the Engineer

30.1 The Engineer may instruct the Contractor to delay the start or progress of any activity within the works.

31. Management Meetings

31.1 Either the Engineer 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.

31.2 The Engineer shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

32. Early Warning

32.1 The Contractor is to warn the Engineer 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 works. The Engineer 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 is to be provided by the Contractor as soon as reasonably possible.

32.2 The Contractor shall cooperate with the Engineer 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 Engineer.

C. QUALITY CONTROL

33. Identifying Defects/ Defect liability period

33.1 : Defect liability period: The contractor shall be responsible to make good and remedy at his own expense any defect which may develop or may be noticed before the period mentioned hereunder from the certified date of completion. The Engineer in charge shall give the contractor a notice in writing about the defects and the contractor shall make good the same within 15 days of receipt of the notice. In the case of failure on the part of the contractor, the Engineer-in-charge may rectify or remove or re-execute the work at the risk & cost of the contractor. The Engineer-in-charge shall be entitled to appropriate the whole or any part of the amount of security deposit towards the expenses, if any, Incurred by him in rectification, removal or re-execution. The Defects Liability period shall be as under….

A. For works of WRD Except Building

(a) (1) For all works costing up to Rs. 50,000 (amount put to tender), the period shall be 3 Months from the certified date of completion.

(b) (1) For WRD works likes Check Dam/ Canal / Drainage / Road Structure tender amount from RS. 50,000 to 10,00,000, the defect liability period shall be 12 months from the certified date of completion.

(2) For WRD work except likes Check Dam/ Canal / Drainage / Road Structure tender amount from RS. 50,000 to 10,00,000, the defect liability period shall be 3 Months from the certified date of completion.

(c) (1) For WRD works likes Check Dam/ Canal / Drainage / Road Structure tender amount more than RS. 10,00,000, the defect liability period shall be 3 Years from the certified date of completion.

(2) For WRD work except likes Check Dam/ Canal / Drainage / Road Structure tender amount from RS. 10,00,000 to 1 Crore, the defect liability period shall be 12 months from the certified date of completion.

(d) (1) For all WRD works of tender amount more than RS. 1 Crore, the defect liability period shall be 3 Years from the certified date of completion

B. For Building works of WRD:-

For Building works of WRD, Follow the R&B Circular dated.03/12/2009

For original building works the defect liability period will be 4 years or elapse of 4 monsoon period following date of possession of building taken over by user agency following the certified date of completion, whichever is later.

For the purpose of deciding the monsoon period, the 30th September shall be treated as the last date.

WRD Circular No. Matas/102013/MICELL(K-1) Dated 13/12/2013

33.2 For Road works :

Free maintenance guarantee period for works of **Road/Bridge construction**

(a) For resurfacing work of road free maintenance guarantee period one year from the date of completion.

(b) In case of widening of the road/strengthening of the road/bridge, the contractor shall have to give four years free maintenance guarantee from the certified date of completion. During this period the contractor shall visit the site every six months along with the concerned Section Officer / Deputy Executive Engineer and will examine the work already carried out in this contract like road work, jungle cutting, side shoulders, side gutter, road furniture, patta etc. and will prepare Km. wise inspection report duly signed by all concerned and any defect observed shall be done within 15 days by the contractor at his risk and cost as per the direction of Engineer in charge. The contractor needs to do videography of these visits and require to submit at the time of release of FMG. If B.T. the surface during

the maintenance period of 4 years is worn out then agency shall have to provide renewal coating as per tender item as directed by the Engineer-in-charge. The amount equivalent to 5% of each running bill shall be withheld and will be released after the free maintenance guarantee period (i.e. 4 years) is over.

However, this amount shall be released against fixed deposit or bank guarantee pledged in the name of Executive Engineer after completion certificate of work is issued.

(1) The flakiness and elongation index (combined) for coarse aggregates under no circumstances shall exceed the allowable limit set forth in the relevant clause for the material in question.

(2) 2% of the amount eligible for the payment of bituminous items shall be withheld till the miscellaneous items like earthwork in embankment / cutting for side shoulders, side gutters, kilometer / indicator / guard stones, sign boards etc. are completed in all respect by the contractor. After completion of the miscellaneous items, the above said 2% withheld amount shall be released.

(Govt. of Gujarat's G.R. No.: TNC-10-2013-3(Part-3)/C, Dtd. 13/12/2013).

(3) Videography for the surface under Maintenance Guarantee is to be done as per Govt. letter No.: SSR/10/2015-16/26/C, Dtd. 26/11/15 for the work costing more than Rs. 5.00 Crore.

(4) Setting up of adequate laboratory & deployment of quality engineers.

The contractor shall have to set up the laboratory with adequate equipment. Till the setting up of adequate laboratory is completed & reported of this to the engineer (subject to due verification by engineer's representative) by contractor in writing, Rs.2,00,000/- shall be withheld. The qualified quality Engineer shall be deployed exclusively for this contract by the contractors. If quality Engineer is not deployed by contractor within one month after the date of work order, the amount equivalent to Rs.20,000 per month shall be recovered till the actual deployment of quality engineer. The amount so recovered towards the deployment of quality engineers shall not be refunded.

(5) Asphalt work will have to be cross checked as per G.R. No.: RGN/60/2006/35/C, dtd.31/05/07 before final bill is paid.

(6) Maintenance during Construction Period

During the Construction Period, the Contractor shall maintain, at his own risk and cost, the existing lane(s) of the road so that the traffic worthiness and safety thereof are at no time materially inferior as compared to their condition 10 (ten) days prior to the date of the Agreement, and shall undertake the necessary repair and maintenance works for this purpose; provided that the Contractor may, at his cost, interrupt and divert the flow

of traffic if such interruption and diversion is necessary for the efficient progress of works and conforms to Good Industry Practice; provided further that such interruption and diversion shall be undertaken by the Contractor only with the prior written approval of the Executive Engineer which approval shall not be unreasonably withheld. For the avoidance of doubt, it is agreed that the Contractor shall at all times be responsible for ensuring safe operation of the road.

33.3 The Engineer shall check the Contractor's work and notify the Contractor of any defects that are found. Such checking shall not affect the Contractor's responsibilities the Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.

34. Tests

34.1 If the engineer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no defect the test shall be a Compensation Event.

34.2 #1% of the amount of work done for works upto Rs. 10 crore of estimate cost should be deducted from R.A. Bill of the contractor for testing the quality of material workmanship. Whereas for estimated cost of works more than 10 crore, the charges for testing of quality of material workmanship shall be deducted from R.A. bill of contractor as per actual charges. ~~As Per GoG NWRWS & K Department's Circular No. PARCH/132023/401/MICELL Dated: 05/10/2023~~

(* As Per GoG NWRWS & K Department Letter No: NWRWSKD/GCA/e-file/13 /2023/13648/Section K7, Date:-16-03-2024)

34.3 Agency has to establish testing laboratory on site for the various test to be carried out in the work for this purpose agency shall construct a pukka laboratory building with all facility on site at location specified by the engineer in charge.

35. Correction of defects

35.1 The engineer 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 contract data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

35.2 Every time notice of a Defect is given, the Contractor shall correct the notified defect within the length of time specified by the Engineer's notice.

36. Uncorrected Defects

36.1 If the Contractor has not corrected a defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. COST CONTROL

37. Bill of Quantities

37.1 The bill of Quantities shall contain items for the constructions, installation, testing and commissioning work to be done by the Contractor.

37.2 The bill of Quantities is used to calculate the Contract price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

38. Change in the Quantities

38.1 The Engineer shall have power to make any alterations in or addition to the original specifications , drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instruction in this connection which may be given to him in writing signed by the Engineer and such alteration shall not invalidate the contract and any additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work and at the same rate as are specified in the tender for the main work.

Except that when the quantity of any item exceeds the quantity as in the tender by more than 130%, the contractor will be paid for the quantity in excess of 130%, at the rate entered in the SOR of the year during which the excess in quantity is first executed.

39. Variations

39.1 All Variations shall be included in updated programmes produced by the Contractor.

40. Payments for Variations

40.1 If the additional or altered work includes any class of work for which no rate is specified in this contract, then such class of work shall be carried out as under.

(i) At the rate derived from the item within the contract which is comparable to the one involving additional or altered class of work; where there are more than one comparable items, the item of the contract which is nearest in comparison with regard to class or classes of the work involved shall be selected and the decision of the Superintending Engineer as to the nearest comparable item shall be final and binding on the contractor.

(ii) If the rate cannot be derived in accordance with (i) above, such class of works shall be carried out at the rate entered in the Schedule of Rates of the division

for the year in which the tender was received, increased or decreased by the percentage by which the tender amount is more or less as compared to the amount arrived at the rates in the "Schedule of Rates" of the Division in the year in which the tender was received. If the Schedule of rates of the Division does not contain all the items, the percentage increase or decrease of the tender shall be calculated considering such items which were included in the "Scheduled Rates" of the division for the year and for materials consumed on such item the rate to be charged would be the basic rate taken into account for fixing the rate in S.O.R. referred to above.

(iii) If it is not possible to arrive at the rate from (i) and (ii) above, such class of work shall be carried out at the rate decided by the competent authorities on the basis of detailed rate analysis after hearing the contractor before a Committee of two Superintending Engineers stationed at the same place or the nearest place.

40.2 If the additional or altered work, for which no rate is entered in the "Schedule of Rates" of the Division is ordered to be carried out before the rate is agreed upon, then the contractor shall within seven days of the date of receipt by him of the order to carry out the work, inform the Engineer-in-charge of the rate, which it is his intention to charge for such class of work and if the Engineer in charge does not agree to this rates, he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider it advisable, provided always that if the contractor shall commence work or incur any expenditure in regard thereof before the rates shall have been determined as lastly herein before mentioned, then in such cases he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer-in-charge. In the event of the dispute, the decision of the Superintending Engineer of the Circle shall be final.

Where, however, the work is to be executed according to the designs, drawings and specifications recommended by the contractor and accepted by the competent authority, the alternation above referred to shall be within the scope of such designs, drawings and specifications appended to the tenders.

The time limit for the completion of the work shall be extended in the proportion that the increase in the cost occasioned by alterations bears to the cost of the original work and the certificate of the Engineer-in-charge as to such proportion shall be final and conclusive.

41. Cash Flow Forecasts

41.1 When the programme is updated, the contractor is to provide the engineer with an updated cash flow forecast.

42. Payment certificates.

42.1 The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

42.2 The Engineer shall check the Contractor's monthly statement within 14 days and certify the amount to be paid to the Contractor after taking in to account any credit or debit for the month in question in respect of materials for the works in the relevant amounts and under conditions set forth in sub-clause 32.3 of the Contract Data (secured Advance).

42.3 The value of work executed shall be determined by the Engineer.

42.4 The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed.

42.5 The value of work executed shall include the valuation of variations and compensation events.

42.6 The Engineer 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

43. Payments

43.1 Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of the contract and taxes at source, as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer within 28 days of the date of each certificate.

43.2 Payment of GST (prevailing rates) on the amount payable under the contract to the Contractor will be made by the Employer. Hence, it is the responsibility of the contractor to pay the GST to the concerned Authority.

43.3 Items of the works for which no rate or price has been entered in will not be paid by the Employer and shall be deemed covered by other rates and prices in the Contract.

44. Compensation events

44.1 The following are compensation Events unless they are caused by the Contractor:

(a) The Employer does not give access to a part of the Site by the site Possession date stated in Contract data to the Contractor

44.2 In case of compensation event occurs and it prevents the work being completed beyond the Intended Completion Date then Authority will approve EOT with eligible contractual price escalation.

45. Tax

45.1 The rates quoted by the Contractor must be inclusive of all taxes prevailing on due date of bid submission except GST. However, any subsequent changes in the tax structure by Government after due date of bid submission will be compensated (+/-) on availability or submission of actual documentation. Contractor will have to intimate Engineer regarding changes occurred in the tax structure after bid submission. If the contractor fails to provide such information and if any financial obligation may arise due to change in tax structure, same will be recovered from the contractor.

45.2 GST will be paid separately on the bills. Hence, it is the responsibility of the contractor to pay the GST to the concerned Authority.

46. Currencies.

46.1 All payment shall be made in Indian Rupees.

47. Price Adjustment

47.1 Contract price shall be adjusted for increase or decrease in rates and price of labour, materials, fuels and lubricants in accordance with the following principles and procedures and as per formula given in the contract data:

(a) The price adjustment shall apply for the work done from the start date given in the contract data up to end of the initial intended completion date or extensions granted by the Engineer and shall not apply to the work carried out beyond the stipulated time for reasons attributable to the contractor.
(b) The price adjustment shall be determined during each month from the formula given in the contract data.
(c) Following expressions and meanings during to the work done during each month
R = Total value of work done during the month. It would include the amount of secured advance granted, if any, during the month less the amount of secured advance recovered, if any during the month. It will exclude value for works executed under variations for which price adjustment will be worked separately based on the terms mutually agreed.

47.2 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 clause 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.

48. Retention

48.1 The Employer shall retain from each payment due to Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

48.2 On Completion of the whole of the Works half the total amount retained is repaid to the Contractor and half when the Defects Liability Period has passed and the Engineer has certified that all Defects notified by the Engineer to the Contractor before the end of this period have been corrected.

48.3 On completion of the whole works, the contractor may substitute retention money with an "on demand" Bank guarantee.

In case, Contractor requests for refund of the Retention Money deducted by the Employer under the provision of this clause, Employer shall consider the said request of the Contractor provided that the refund hereunder shall be made in tranches of not less than 1% (One Percent) of the Contract Price and Contractor furnishes an irrevocable and unconditional Bank guarantee for an equal amount substantially in the format of Bank Guarantee for Performance Guarantee enclosed with SBD and valid up to 60 day beyond the scheduled / extended Defects Liability Period. On completion of the whole works, the contractor has however an option to submit a fresh irrevocable and unconditional Bank Guarantee for an amount equal to 5% of the total value of work executed substantially in the format of Bank Guarantee for Performance Guarantee enclosed with SBD and valid up to 60 days beyond the Defect Liability Period and yet refund the Retention Money Bank Guarantee submitted for refund of Retention Money.

49. Liquidated Damages

49.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole works or the milestone as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payment due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.

49.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall not be entitled for any interest on the over payment calculated from the date of payment to the date of repayment.

49.3 If the contractor fails to comply with the time for completion as stipulated in the tender, then the contractor shall pay to the employer the relevant sum stated in the Contract Data as Liquidated damages for such default and not as penalty for everyday or part of day which shall elapse between relevant time for completion and the date stated in the taking over certificate of the whole of the works on the relevant section, subject to the limit stated in the contract data.

The employer may, without prejudice to any other method of recovery deduct the amount of such damages from any monies due or to become due to the contractor. The payment or deduction of such damages shall not relieve

the contractor from his obligation to complete the works on from any other of his obligations and liabilities under the contract.

49.4 If, before the Time for Completion of the whole of the Works or, if applicable any Section, a Taking Over Certificate has been issued for any part of the Works or of a Section, the liquidated damages for delay in completion of the remainder of the Works or of that Section shall, for any period of delay after the date stated in such Taking-Over-Certificate, and in the absence of alternative provisions in the Contract, be reduced in the proportion which the value of the part so certified bears to the value of the whole of the Works or Section, as applicable. The provisions of this Sub-clause shall only apply to the rate of liquidated damages and shall not affect the limit thereof.

50 Bonus

50.1 If the contractor achieves completion of the whole of the works prior to the intended Completion Date prescribed in Contract Data the Employer shall pay to the contractor a sum stated in Contract Data as bonus for every completed month **but subjected to maximum amount as stated in Contract Data**; which shall elapse between the date of completion of all items of works as stipulated in the contract, including variations ordered by the Engineer and the time prescribed in Clause 17.

50.2 Bonus shall be paid only to works amounting to above INR 5 crore with time limit of the works is equal or more than 3 Months. The bonus would be paid as under

% of Time Saved	% of Initial Contract Price entitled for Bonus
50 %	5%
40 %	4%
30 %	3%
20 %	2%
10 %	1%
Less than 10%	0%

51. Advance Payment.

51.1 The Employer shall make advance payment (not to be paid less than two installments except in special circumstances for which the reason to be Recorded in writing) to the Contractor of the amounts stated in the Contract Date by the date stated in the Contract Date, against provision by the Contactor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to be at least 110% of 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. The Mobilization advance would be deemed as interest bearing advance at an interest rate of 10 % to be compounded, quarterly.

51.2 The Contractor is to use the advance payment only to pay for Equipment, plant and Mobilization expenses required specifically for execution of the Works. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the engineer.

51.3 The advance payment shall be repaid by deduction proportionate amount 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, or Liquidated damages.

51.4 Deleted

52. Securities

52.1 52.1 The performance Security (including additional security for unbalanced bids) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Employer, and denominated in Indian Rupees. **The performance Security shall be valid until a date 60 days from the certified date of completion of the project** and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion of the work.

Performance and Additional Performance Security shall become refundable/releasable within 15 days after project certified completion date subject to fulfillment of contractual obligation and settlement of all dues and claims.

53. Deleted

54. Cost of Repairs.

54.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start date and the end of Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damages arises from the Contractor's acts or omissions.

E. FINISHING THE CONTRACT

55. Completion

55.1 The Contractor shall request the Engineer to issue a Certificate of Completion of the works and the Engineer will do so upon deciding that the work is completed.

56. Taking Over

56.1 The Employer shall take over the Site and the Works within seven days of the Engineer issuing a certificate of Completion.

57. Final Account

57.1 The Contractor shall supply to the Engineer a detailed final account of the total amount that the Contractor considers payable as full and final settlement of all claims under the Contract for items before the end of the Defects Liability Period. The Engineer shall issue a Defect 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 Engineer 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 Engineer shall decide on the amount payable to the Contractor and issue a payment certificate, within 56 days of receiving the Contractor's revised account.

57.2 If reversal in characteristic of tender (L1 becoming L2) on account of excesses and savings in final account is observed, the Engineer/Employer shall be at liberty to restrict the final payment of BOQ items to the lowest amount evaluated of the bids considering the final quantities and the rates quoted including the rebates if any. Payment of variation items shall however be made at the rates approved by the Employer, within 90 days from the physical completion of work.

58. Operating and Maintenance Manuals

58.1 If "as built" drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract data.

58.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

59. Termination

59.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

59.2 Fundamental breaches of Contract include, but shall not be limited to the following:

1. The contractor stops work for 28 days when no stoppage of work is shown on the current programme and the stoppage has not been authorized by the Engineer

2. The Engineer instructs the Contractor to delay the progress of the Works and the instructions is not withdrawn within 28 days;

3. The Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstructions or amalgamation

4. A payment certified by the Engineer is not paid by the Employer to the Contractor within 56 days of the date of the Engineer's certificate

5. The Engineer 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 Engineer;

6. The Contractor does not maintain a security which is required;

7. The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and

8. If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.

59.3 When either party to the Contract gives notice of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 59.2 above, the Engineer shall decide whether the breach is fundamental or not.

59.4 Notwithstanding the above, the employer may terminate the Contract for convenience.

60. Payment upon Termination

60.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a Certificate for the value of the work done less advance payments received up to the date of the issue of the

certificate, less other recoveries due in terms of the contract, less taxes due to deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract data. 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.

60.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Engineer shall issue a certificate for the value of the work done, the cost of balance material brought by the contractor and available at site, the reasonable cost of removal of equipment, repatriation of the Contractor's personnel employed solely on the works, and the Contractor's cost of protecting and securing the Works and less advance payment received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to deducted at source as per applicable law.

61. Property

61.1 All materials on the Site, Plant Equipment's, Temporary Works and Works are deemed to be property of the Employer, if the Contract is terminated because of a Contractor's default.

62. Release from Performance

62.1 If the Contract is frustrated by the outbreak of war of by any other event entirely outside the control of either the Employer or the Contractor the Engineer 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 commitment was made.

F. SPECIAL C O N D I T I O N S OF CONTRACT

63. LABOUR

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment of housing, feeding and transport.

The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the site and such other information as the Engineer may require.

64. COMPLIANCE WITH LABOUR REGULATIONS

During continuance of the contact, the Contractor and his sub-contractor shall abide at all times by all existing labour enactments and rules made thereunder, regulations, notification and bye laws of the State or central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notifications that may be issued under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major labour laws that are applicable to the construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer/Engineer shall also have the right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point to time.

SALIENT FEATURES OF SOME MAJOR LABOUR AND OTHER LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTIONS WORK

A) **Workmen Compensation Act 1923** :- The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

B) **Payment of Gratuity Act. 1972** :- Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more on death, the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

C) **Employees P.F. and Miscellaneous Provision Act 1952:-** The Act Provides for monthly contributions by the employer plus workers @ 10% or 8.33% The benefits payable under the Act are :

1. Pension or family pension on retirement or death, as the case may be.
2. Deposit linked insurance on the death in harness of the worker.
3. Payment of P.F. accumulation on retirement/death etc.

D) **Maternity Benefit Act 1951** :- The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

E) **Contract Labour (Regulation & Abolition) Act 1970** : The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer, if they employ 20 or more contract labour.

F) **Minimum Wages Act 1948 :-** The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act, if the employment is a scheduled employment. Construction of Building, Roads, Runways are scheduled employment.

G) **Payments of wages Act 1936:-** It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

H) **Equal remunerations Act 1979 :-** 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 matter of transfer, training and promotions etc.

I) **Payments of Bonus Act 1965** :- The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20 % of wages to employees drawing Rs. 3500/- per month or less. The bonus to be paid to employees getting Rs, 2500/- per month or above Rs. 3500/- per month shall be worked out by taking wages as Rs. 2500/- per month only. The Act does not

apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

J) **Industrial Disputes Act 1947** :- The Act lays down the machinery and procedure for resolutions 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.

K) **Industrial employment (standing Orders) Act 1946 :-** It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the State 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.

L) **Trade Unions Act 1926:-** The Act lays the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have 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 process and provides for regulation of employment of children in all other occupations and processes. Employment of Child labour is prohibited in 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, is 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 Cess Act of 1996:-** All the establishments who carry on any building or other constructions work and employ 10 or more workers are covered under this Act.

All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified 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 workplace etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officers appointed by the Government.

P) **Factories Act 1948 :-** The Act lays down the procedure for approval of plans before setting up a factory, 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 engaged in the manufacturing process.

Q) **Royalty charges-**The contractor shall pay the royalty to the competent authority as per rule. The **royalty** charges paid shall be borne by the contractor and shall not be reimbursed by the Employer.

R) **Following Pollution control Acts and amendments made thereof from time to time shall be applicable**.

1. Water (Preservation and control of Pollution) Act, 1974
2. Air (Prevention and Control of Pollution Act 1981
3. Environmental (Protection) Act 1986

The contractor must commit to adopting Environmental management plan for best energy use, waste management, the reduction of pollution as in EMS (Environmental Management system)ISO-14001-2015

65. ARBITRATION (GCC Clause 24)

The procedure for arbitration will be as follows: -

24.1 If the Contractor is of the view that a decision taken by the Engineer was either outside the authority given to the Engineer by the Contract or that the decision was wrongly taken, the decision shall be referred to #**Superintending Engineer** (Higher Authority) (Surat Irrigation Circle, Surat) within 14 days of the notification of the Engineer's decision. If the issue is not resolved, any party can refer the matter for conciliation within 15 days from the decision given by the
#Superintending Engineer.

24.2

(a) For the work up to Rs.100 Cr., if any of the parties is not satisfied with the decision of the #Superintending Engineer (Surat Irrigation Circle, Surat), both the parties have to refer to the #Chief Engineer concerned for the conciliation process.

(b) For the work more than Rs.100 Cr., if any of the parties is not satisfied with the decision of the Superintending Engineer, both parties have to refer to the #Secretary, Water Resources Department, Government of Gujarat for the conciliation process.

If the dispute is not resolved through the conciliation process, contractor may refer the dispute to Gujarat Public Works Contract Dispute Arbitration Tribunal. If the Contractor fails to refer a claim / dispute to the Higher Authority within 14 days of the notification of the Engineer's decision, the Contractor shall not be entitled to any additional payment/claim if he doesn't follow the above sequence in stipulated time. However, during such period, he would not stop the work in any case.

SECTION - 4

CONTRACT DATA

#CONTRACT DATA

Clause Reference With respect To section 3

Item marked "N/A" do not apply to this Contract.

1. The Employers is [CL.1.1]
   Name: **Executive Engineer, Ambica Division, Navsari**.
   Address: **Sinchai Bhavan, 2nd Floor,Near Parsi Hospital**.
   Name of authorized Representative (will be intimated later)
2. The Engineer is **Executive Engineer, Ambica Division, Navsari.**
   Name of Authorized Representative: ……
3. The Defects Liability Period is **…3 Year…** years from the date of completion. [CL.1.1&33]
4. The Start Date shall be **1st** days from the date of issue of the Notice to proceed with the work. [CL.1.1]
5. The Intended Completion Date for the whole of the works is **4 (Four) Months** after start of work with the following milestones: [CL.1.1,17&2]

   Milestone dates: [CL.2.2& 49.1]

   Physical works to be completed Period from the start date

1.Milestone 1:	**30 %**	**30 Days.**
2.Milestone:2	**70 %**	**90 Days.**
3.Milestone:3	**100 %**	**120 Days.**

6. The Site is located at Village **Parnera-Pardi** village of Valsad Sub Division Jurisdiction. [CL.1.1]
7. The name and identification number of the Contract is: [CL.1.1]
8. The works consist of **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.** items as per B.O.Q. The [CL.1.1]

(A) WRD Works

Site clearance; setting – out and layout; Construction and Maintenance of all types of dams and its component, earthen dam; spillway; installation of gate; excavation and earth work, approach road, Inspection Bunglows, checkdams, bandhara, T.R., weir, barrages, Flood Protection & Anti Sea Erosion work, canal lining and structures, , CD Works, structure repairing, Jungale cutting, Desilting, etc. other WRD works.

(B) Road Works :

Site clearance; setting out and layout widening of **existing** carriageway and strengthening including camber corrections; construction of new road/ Parallel service road; bituminous pavements remodeling/construction of Junctions, intersections, bus bays, lay-bays; supplying and placing of drainage Channels, flumes, guard posts and guard other related items; construction/extension of cross drainage works, bridge, approaches and other related stones; protective works for roads/bridge; all aspects of quality assurance of various components of the works; rectification of The defects in the completed works during the Defects Liability Period; submission of "As- built" drawings and any other related documents; and other item of work as may be required to be carried out for completing the work in accordance with the drawings and the provisions of the contract and to ensure safety.

(C) Bridge Works

provision of foundations, piers abutments and bearing; prestressed/reinforced cement concrete superstructure; wearing coat, hand railings, expansion joints, approach slabs, drainages spouts/ downtake pipes, arrangements for fixing light posts, water mains, utilities etc; provision of suitably designed protective works; providing wing/return walls; provision of road markings, road signs etc.; all aspects of quality assurance; clearing the site and handing over the works on completion; rectification of the defects during the Defects Liability Period and submission of "As-built" drawings and other related documents; and other items of work as may be required to be carried out for completing the works in accordance with the drawings and the provisions of the contract and to Insure safety

(D) Other Items [CL.1.1]

Any Other Items as required to fulfill all contractual obligations as per the Bid documents.

10. The following documents also form part of the Contract: [CL.2.3(9)]
_____As per clause 2-3_____

11. The law which applies to the Contract is the law of Union of India [CL.3.1]

12. The language of the Contract documents is English [CL.3.1]

13. Limit of subcontracting 25% of the Initial Contract Price [CL.7.1]

14. The Schedule of Other Contractors [CL.8]

15. The Schedule of Key Personnel As per Annex – II to Section I [CL.9]

16. The minimum insurance cover for physical property, injury and death is Rs. 5 lakhs per occurrence with the number of occurrences limited to four. After each occurrence, the contractor will pay an additional premium necessary to make insurance valid for four occurrences always. [CL13]

17. Site Investigation report [CL.14]

18. The Site Possession dates shall be …….. [CL.21]

19. The period for submission of programme for approval of the engineer shall be 21 days from the issue of Letter of Acceptance. [CL. 27.1]

20. The period between program updates will be **30** days. [CL.27.3]

21. The amount to be withheld for late submission of an updated programme shall be **Rs 10,000/-** [CL. 27.3]

22. The following events shall also be Compensation Events [CL. 44]
Substantially adverse ground conditions encountered during the course of execution of work not provided for in the bidding document.
    (i) Removal of underground utilities detected subsequently
    (ii) Significant changes in classification of soil requiring additional mobilization by the contractor, e.g. ordinary soil to rock excavation,
    (iii) Removal of unsuitable material like marsh, debris dumps, etc. not caused by the contractor.

(iv) Artesian conditions

(v) Seepage, erosion landslide

(vi) River training requiring protection of permanent work

(vii) Presence of historical, archeological or religious structures, monuments interfering with the works

(viii) Restriction of access to ground imposed by civil, judicial, or military authority

23. The currency of the Contract is Indian Rupees [CL. 46]

24. **The formula (e) for adjustment of prices are as under:** [CL.47]

If any of the commodities like Cement, Steel or Bitumen are not found applicable in a work, the weight component of that commodities {i.e. 'Cement' (Pc), 'Steel' (Ps) or 'Bitumen' (Pb) as indicated in SBD for the purpose of Price Adjustment} shall be clubbed with the weight component of 'Other Material' (Pm), such that the gross % weight of the components shall remain as 100% .

R = value of work as defined in Clause 47.1 of Conditions of Contract

Adjustment for labour component

(i) Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the following formula:

$V_L = 0.85 \times (P_l/100) \times R \times (L_i - L_0)/L_0$

V_L = Increase or decrease in the cost of work during the month under consideration due to changes in rates for local labour

L_0 = The consumer price index for industrial workers for the State on 28 days preceding the scheduled date of opening of technical Bids as published by Labour Bureau, Ministry of Labour, Government of India

L_i = The consumer price index for industrial workers for the State for the month under consideration as published by the Labour Bureau, Ministry of Labour, Government of India.

P_l = Percentage of labor component of the work.

Adjustment for cement component.

(ii) Prices adjustment for increase or decrease in the cost of cement procured by the contractor

$V_c = 0.85 \times (P_c/100) \times R \times (C_i - C_0)/C_0$

V_c = Increase or decrease in the cost of work during the month under consideration due to changes in rates for cement.

C_0 = The all India wholesale price index for Ordinary Portland Cement on 28 days preceding the scheduled date of opening of technical bid as published by the **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

C_i = The all India average wholesale price index for Ordinary Portland Cement for the month under consideration as published by **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

P_c = Percentage of cement component of the work

Adjustment for steel component

(iii) Price adjustment for increase or decrease in the cost of steel procured by the contractor shall be paid in accordance with the following formula

$V_s = 0.85 \times (P_s/100) \times R \times (S_i - S_0)/S_0$

V_s= Increase or decrease in the cost of work during the month under consideration due to changes in the rates for steel

So= The all India wholesale price index for steel **(Mild Steel - Long Products Rebars)** on 28 days preceding the date of opening of Bids as published by the **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

S_i= The all India average wholesale price index for steel **(Mild Steel - Long Products Rebars)** for the month under consideration as published by **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

P_s = Percentage of steel component of the work

Note : For the application of this clause, the index of **Mild Steel- Long products Rebars** has been chosen to represent the steel group.

Adjustments of bitumen component

(iv) Price adjustment for increase in the cost of bitumen shall be paid in accordance with the following formula

$V_b = 0.85 \times (P_b/100) \times R \times (B_i - B_0)/B_0$

V_b = Increase or decrease in the cost of work during the month under consideration due to changes in rates for bitumen.

B_o = The official retail price of bitumen at the IOC depot at the nearest centre on the day 28 days prior to the scheduled date of opening of technical bid.

B_i = The official price of bitumen of IOC depot at the nearest center:

- **For the first 15 days of the month under consideration, the price declared on the 1st day of that month.**
- **For the remaining days of the month under consideration, the rate declared on the 16th day of that month.**

P_b = Percentage of bitumen component of the work

Adjustment of POL (fuel and lubricant) component

(v) Price adjustment for increase or decrease in cost of POL (fuel and lubricant) shall be paid in accordance with the following formula

$V_f = 0.85 \times (P_f/100) \times R \times (F_i - F_0)/F_0$

V_f = Increase or decrease in the cost of work during the month under consideration due to changes in rates for fuel and lubricants.

F_o = The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC at the nearest centre on the day 28 prior to the date of opening of Bids.

F_i = The official retail price of HSD at the existing consumer pumps of IOC at the nearest centre for the 15^{th} day of the month of the under consideration.

P_f = Percentage of fuel and lubricants component of the work

Note: For the application of this clause, the price of High-Speed diesel Oil has been chosen to represent the fuel and lubricants group.

Adjustment for Construction Machinery

(vi) Price adjustment for increase or decrease in the cost of plant and Machinery spare procured by the Contractor shall be paid in accordance with the following formula

$V_p = 0.85 \times (P_p/100) \times R \times (P_i - P_0)/P_0$

V_p= Increase or decrease in the cost of work during the month under consideration due to changes in rates for plant and machinery spares

P_0 = The all India wholesale price index for **manufacturer of machinery for mining, quarrying and Construction** for the month under consideration as published **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

P_i = The all India average wholesale price index for **manufacturer of machinery for mining, quarrying and Construction** for the month under consideration as published **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

P_p = Percentage of plant and machinery spares component of the work.

Note: For the application of this clause, index of Heavy Machinery and parts has been chosen to represent the Plant and Machinery Spares group

Adjustment of other materials Component

(vii) Price adjustment for increase or decrease in cost of local materials other than cement, steel, bitumen and POL procured by the contractor shall be paid in accordance with the following formula

$V_m = 0.85x (P_m/100) \times R \times (M_i - M_0)/M_0$

V_m = Increase or decrease in the cost of work during the month under consideration due to change in rates for local materials other than cement, steel, bitumen and POL.

M_0 = The All Indian wholesale price index (all commodities) on 28 days preceding the scheduled date of opening of technical Bids, as published by the **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

M_i= The All India wholesale price index (all commodities) for the month under consideration as published by the **Office of the Economic Adviser, Department for Promotion of Industry and Internal Trade, Ministry of Commerce & Industry.**

P_m = Percentage of local material components (other than cement, steel, bitumen and POL) of the work.

The following percentage will govern the price adjustment for the entire contract:

Components	Percentage (%)
1. Labour-P_l	19.85 %
2. Cement – P_c	24.34 %
3. Steel - P_s	32.96 %
4. Bitumen - P_b	0.00 %
5. POL - P_f	2.42 %
6. Plant & Machinery Spares P_p	10.36 %
7. Other Materials - P_m	10.07 %
Toal=	100.00 %

25. The proportion of payments retained (retention money) shall be 6% {CL. 48} from each bill subject to a maximum of 5% of final contract price.

26. Amount of Liquidated damages for delay in completion of works — For Whole of work {CL.49} $(1/2000)^{th}$ of the Initial contract price, rounded off to the nearest Thousand, per day. For sectional Completion (wherever specified In item 6 of Contract data) $(1/2000)^{th}$ of initial contract price for #5 km Section, rounded off to the nearest thousand per day.

27. Maximum limit of liquidated damages For delay in completion work	10 percent of the Initial Contract Price rounded off to the nearest thousand	{CL. 49}
28. Amount of Bonus for early completion	Amount of bonus for early completion of work shall be given as per CL.50 of Section-3	
29. Maximum limit of bonus for early Completion of work	**5 percent** of the Contract Price	{CL. 50}

30. The amount of the advance payment are : **N/A** {CL. 51 & 52}

#**Nature of Advances**		**Amount (Rs.) Conditions to Be fulfilled**
i Mobilization	10% of the contract Price	On submission of unconditional Bank Guarantee. (to be drawn before the end of 20% of the contract period). The contractor may furnish four bank guarantees of 2.5 % of each valid for the full period.
ii Equipment	90% for new and 50% of depreciated value for old equipment Total amount will be subject to a maximum of 5% of the Contract Price	After equipment is brought to site (provided the Engineer is satisfied That the equipment is required for performance of the contract) and on submission of unconditional Bank Guarantee for amount of advance
iii Secured Advance for Non-persishable material Brought to site	**Deleted**	

DELETED
E.E.

(The advance payment will be paid to the Contractor no later than 28 days after fulfillment of the above conditions).

31. **Repayment of advance payment for mobilization and equipment** {CL. 51.3}

The advance loan shall be repaid with percentage deduction from the interim payments certified by the Engineer under the Contract. Deduction 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 20 percent of the Contract Price or 6 (six) months from the date of payment of first installment of advance, whichever period concludes earlier, and shall be made at the rate of 20 percent **(collectively for both Mobilization Advance and Equipment Advance)** of the amounts of all Interim Payment Certificate until such time as the loan has been repaid, always provided that the loan shall be completely repaid prior to the expiry of the original time for completion pursuant to Clause 17 and 28.

DELETED
E.E.

32. Deleted
33. The securities shall be for the following minimum amounts equivalent {CL. 52}
    As a percentage of the Contract Price:
    Performance Security for 5 percent of contract price plus Rs. …….. (to be decided after evaluation of the bid) as additional security in terms of ITB Clause 29.5

    The standard form of Performance security acceptable to the Employer shall be an unconditional Bank Guarantee of the type as presented in Section 8 of the Bidding Documents.
34. The Schedule of Operating and maintenance Manuals…..N/A. {CL. 58}
35. The date by which "as– built" drawings (in scale as directed) in 2 sets {CL. 58} are required within 28 days of the issue of certificate of completion of the whole or section of the work, as the case may be.
36. The amount to be withheld for failing to supply "as built" drawings {CL. 58} by the Date required is Rs 10,000/-.
37. The following events shall also be fundamentals breach of contract: {CL.59.2}
    "The Contractor has contravened Sub- clause 7.1 and Clause 9 of GCC"
38. The percentage to apply the value of the work not completed representing {Cl 60} the Employer's additional cost for completing the Works shall be 20 per cent.

SECTION - 5

TECHNICAL SPECIFICATION

PART – 1

General Technical Specification

2. General Technical Specification

1. General

1.0 The work consists mainly cement concrete work is to be carried out under jurisdiction of Ambica Division, Navsari. The works contains mainly cement concrete, lining work.

1.1 **Time limit of the work required to be completed within 4 Months. Hence, the contractor shall have to deploy sufficient staff technical as well as managerial, labor, machineries, tools, plants etc. to the site of work. Moreover, the contractor shall have to stack sufficient quantity of material required for the work before beginning of the work. It is planned to close canal Closure Period only.**

1.2 The Contractor shall make his own survey, arrangement for construction materials such like Cement, Fine aggregate, Coarse aggregate, Water, Steel, soil availability, Murrum etc. as per tender Specification.

1.3 A motorable inspection road shall be maintained by contractor for inspection of the work during construction period. In working period, necessary temporary inspection facilities on site of work shall be also provide for the detailed inspection of the work. Proper diversion roads, for highway road traffic shall be maintained by the contractor with proper signboards and red lights on entry and exist of the division etc. as directed by the Engineer - in - charge in during currency of the contract without any type extra payment.

1.4 The work in general shall be carried out in workmen like manner as well as to the correct section, better (side slope) and gradient as per drawing and to the entire satisfaction of the Engineer-in-charge or his authorized any representative. The various works shall be done true to line, level and grade. The periodical checking of these works by Government's staff shall not absolve the contractor of his responsibility regarding the accuracy. In case of any deviation or discrepancy in line, level or grade at the meeting faces, the contractor shall make good the discrepancy at his own cost and without any extra compensation for the additional work involved. Whenever such a discrepancy is found to arise at the junction of works of different contractors, the responsibility to set right such discrepancy lies with the contractors concerned. The Engineer- in -charge shall further have the unquestioned right, if need be, to rectify the discrepancies and recover the costs from the contractor or contractors according to proportion as he may consider reasonable.

1.5 All work shall be carried out as per specification given in P.W.D. volume I & II and / or as per relevant latest I.S.I. standard and technical specification of contract document. The list of I.S. code & other publications for earthwork, concrete work, steel work & other misc. work etc. are laid down in this Volume.

1.6 The site shall be cleared of all rubbish material and heaps etc. and shall be handed over in neat and good condition after completion of the work.

1.7 The proposed methodology and program of construction including Environmental Management plan, backed with equipment planning and deployment, duly supported with broad calculations and quality control 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.

1.8 The Provisions detailed below are applicable to all items of work and are deemed to be integral part of the detailed specifications of items of work and are to be followed strictly.

It shall be distinctly understood that the contract rate of the items is for the work completed in all respects.

1.8.1 All labor, materials, use of equipment, tools, plants, appliances, etc. and scaffolding, from work, shuttering, centering etc. as may be required for satisfactory execution and completion of the item of work.

1.8.2 Fabricating, erecting, handling, conveying, placing and keeping in position of materials.

1.8.3 Consolidation, vibrating, curing, finishing, etc. wherever the nature of the items is obviously indicative of the same.

1.8.4 Racking as directed to the entire concrete surface to provide proper bond to the abutting masonry & finishing.

1.8.5 All work tests of materials required to be carried out as per specifications or as are required to be carried out in the opinion of the engineer-in-charge.

1.8.6 Definite particulars covered in the items of work, though not mentioned or elucidated in its specification shall be deemed to be included therein.

1.8.7 General reference of Indian standard given for the mode of measurement and payment will not be considered to override any definite provision made therefore in specifications of item.

1.8.8 For the purpose of payment, the quantity in respect of cement concrete work shall be computed as per the size as cast (which shall be in conformity with the structural drawings only and not finished.)

1.8.9 In case of substandard results of test cubes, as per specification on account of any reasons whatsoever, the defective work shall be reconstructed or strengthened as necessary, as required by the government, by the contractor at his risk and cost without any extra expenditure to the Government, of replacement of such defective work. Contractor shall take all precaution and care, during dismantling and re-doing the work to ensure that any other work, so far executed is not damaged or affected.

1.8.10 The work shall be carried out in true line and level and in conformity with the detailed drawings and specified patterns.

1.8.11 All works shall be carried out in a workman like manner and as per the best techniques for the particular item.

1.8.12 All tools, templates, equipment's etc. for correct execution of the work, as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers on the site of work.

1.8.13Scaffolding shall be provided by the contractor at his own cost for the execution of items in which it is essential.

TESTING OF MATERIALS:

1.9 All materials before being incorporated in the work shall be inspected and if necessary, tested before being approved by the Engineer-in-charge. Any work on which such materials are used without prior inspection (and when necessary prior testing) and without approval or written permission of the Engineer- in -charge may be considered as unauthorized, defective and not acceptable.

1.10 The day-to-day / periodical tests to be carried out on materials, mixes and placed concrete, mortar etc. shall be specified by the Engineer- in- charge or as per relevant IS from time to time for ensuring quality and workmanship. The contractor shall allow all facilities and co-operation towards collection of samples & testing procedure etc. The contractor shall supply necessary materials for testing at his own cost. Also, required labor for collecting samples of materials & transport facilities with loading, unloading to samples of materials from work site to field laboratory / Govt. laboratory for tests, shall be supplied by contractor free of cost to department. Necessary arrangement for proper curing of cast specimen on work site & transport it from work site to laboratory shall be arranged by the contractor at his own cost.

1.11 The methods of sampling and testing, the procedure and standards shall be as laid down by the Engineer-in-charge for the respective item as per relevant latest I.S.I. standard.

1.12 The materials, mixes and placed concrete, mortar, cores etc. shall be tested day to day or periodically at the Government Laboratory / set up at the site of work by Q. C. wing of department and the results given thereof shall be considered correct and authentic by the contractor. The contractor shall be given access to all operations / tests that may be carried out as aforesaid so that he may satisfy himself regarding the procedure and methods adopted. Maintaining quality of work shall be the fully responsibility of the contractor under supervision of Q.C. staff & execution staff of the work.

1.13 The contractor shall be established a laboratory with necessary required equipment with required facilities of light, water etc. at site of work at his own cost / expenses to carry out field test. The contractor shall be providing a set of sieves, weight batcher, stove, pan, cube moulds, cube testing machine, slump cone with compacting rod, flakiness & elongation gauge etc. at field lab., for field test.

1.14 Contractor shall provide all testing equipment including compressive strength testing machine at site and 10% shall be carried out in Govt. laboratory. All types testing charges will be born by the contractor.

1.15 For each material, 10% testing out of total testing and/ or at least one test shall be carried out at GERI's laboratory.

1.16 ~~The concrete mix design shall be carried out in~~ **GERI's / Govt Engineering college** ~~and the department staff shall witness the final mix.~~

1.17 The contractor shall submit the monthly schedule in advance for the work to be taken up during that month and which shall be approved by the Engineer –in –charge. The work shall be carried out in accordance with approved work schedule.

2. Dismantling

The dismantling shall consist of dismantling the existing Concrete / masonry as specified or shown in the drawing. Dismantling implies taking up or down or breaking. This shall consist of dismantling whole or part of work including all relevant items as specified or shown in the drawing.

The dismantling shall always be planned before hand and shall be done in reverse order of the one in which the structures was constructed. This scheme shall be got approved from the Executive Engineer-in-charge before starting the work. This however will not absolve the contractor from the responsibility of proper and safe dismantling. Necessary propping, shoring and under pinning shall be provided for

the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining property.

Wherever required temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or dismantling masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

All materials obtained from dismantling shall be the property of the government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in- charge.

Any serviceable materials, obtained during dismantling shall be separated out and stacked properly as directed with all leads and lifts. All unserviceable materials, rubbish etc. Shall be stacked as directed by the Engineer-in-charge.

On completion of work the site shall be cleared of all debris rubbish and cleaned as directed.

3. EXCAVATION:

The excavation will generally refer to the open excavation for foundation.

3.1 CLEARING THE SITE:

The site on which the structure is to be built shall be cleared and all obstruction loose stones, materials and rubbish of all kind, bush, Wood and trees shall be removed as directed. The materials so obtained shall be the property of the Government and shall be conveyed and stacked as directed by Engineer-in-charge.

3.2 SETTING OUT:

After clearing the site, the center lines will be given by the Engineer-in-charge. The contractor shall assume full responsibility for alignments, elevations and dimension of each and all parts of the work. Contractor shall supply labor, materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required.

3.3 EXCAVATION FOR FOUNDATION:

3.3.1 The excavation for foundation shall be carried out true line and level and shall have width and depth as shown in the drawing or as directed. The contractor shall do the necessary shoring and strutting or providing necessary slope to a safe angle at his own cost. The bottom of the excavated area shall be both longitudinally and transversely as directed for removing and dewatering as required by the Engineer-in-charge.

3.3.2 No earth filling will be allowed for bringing to level if by mistake or any other excavation is made deeper or wider than that shown on the plan or directed. The extra depth or width shall be made with concrete of same proportion as specified for the foundation concrete at the cost of the contractor.

3.3.3 The item shall include all labor and materials cost involved in excavation in wet, dry or slushy condition and removal of excavated materials and stacking and disposal etc. as per the instruction of the Engineer-in-charge in accordance with drawing.

3.3.4 The item shall clear up all jungle i.e. shrubs, hedges, bushes vegetation etc. as per the directive of the Executive Engineer.

3.3.5 The item shall include excavation in all sort of soil including sand, hard clay, soft murrum in dry or slushy condition and stacking and disposing the excavated stuff in manner as per the instruction of Engineer-in-charge, refilling the foundation trenches, as directed.

3.3.6 The contractor shall provide necessary materials and labors and make necessary arrangement to get line out from the Executive Engineer or his authorized representative. It shall be the responsibility of the contractor to install sufficient reference points, bench marks etc. at his own cost and maintain during the construction period.

3.3.7 The contractor shall perform all excavation for foundation in accordance with line, levels, width and depth as shown on plans. If the executive engineer or competent authority decides to take the foundation lower than the foundation level shown on the plan, the same will have to be done by the contractor at the same rate quoted by him for the item unless there is change in strata, for which rates as per corresponding item shall be paid. He shall have to preserve a clean, even and dry surface for the foundation to the satisfaction of the engineer-in-charge for passing.

3.3.8 The excavation beyond the lines and level specified on the plan shall not be measured and paid for unless it is passed by the engineer-in-charge in writing. If excess excavation is done than required, it shall be filled up with concrete or masonry of the same type as used for foundation at his own const and risk.

3.3.9 The sides of the excavated trenches shall be left plumb where nature of soil admits of it the sides shall be strutted and shored carefully and adequately, where they are liable to fall. The contractor shall clear the foundation trenches of loose materials at his cost. The govt. shall not be responsible for any accident occurring due to slip or any other cause whatsoever may be. The contractor shall be held responsible and liable to pay all claims under workman compensation act.

3.3.10 The excavated materials from foundation trenches shall be dumped (not nearer than 50 mt) sufficiently away from the edge of foundation so as not to endanger stability of the slopes or excavation.

3.3.11 The rate of excavation includes refilling of foundation trenches with selected earth materials from excavation including watering etc. as directed. The lead and lift shall be as shown in the description of the item.

3.3.12 The bottom of foundation shall be dressed perfectly in level as directed and all loose and soft materials shall be removed before laying of concrete, masonry. Before laying of masonry, it shall be got approved from the executive engineer or competent authority before any work of excavation of foundation is taken.

PAY LINE:

3.3.13 The basis for the width of excavation shall be foundation levels as marked into drawing (herein after termed as proposed foundation level)

3.3.14 When the actual depth of foundation considered in same with the proposed foundation level, the pay line shall be the line starting from the limiting lines of structure of foundation level and slopping at the rates specified above.

3.3.15 When the actual depth of foundation is taken lower than proposed foundation level, the pay line shall be the line starting from the limiting lines of structure at actual foundation level and sloping at the rates specified above.

3.3.16 When the actual depth of foundation is taken above the proposed foundation level, the pay line shall be the line confirmed to appropriate slopes excavated on the basis of width required for proposed foundation levels, but ending at the level of actual foundation.

3.3.17 No payment shall be made for any work done beyond the specified pay line. Notwithstanding the standards given above the contractor shall however be permitted to excavated at flatter slopes in interest of stability and safety of work without extra cost. The contractor shall take care to see that the slopes excavated are stable and accident or slip does not occur.

UNDER CUTS AND OVER CUTS:

3.3.18 In the event of actual line of excavation being steeper than that specified under pay line above, payment shall be made for the actual line of excavation only. Over cut beyond specified pay line of excavation carried out by the contractor for any purpose or reasons unless at the specified direction of Engineer-in-charge shall be at expenses of contractor. Refilling required of such unauthorized excavation with concrete, masonry or other suitable materials, as may be directed by the Engineer in charge shall also be done by the contractor at his own expenses.

SHORING AND STRUTTING:

3.3.19 MAINTENANCE OF EXCAVATION SLOPES

Any shoring and structing that may be required during excavation and progress of work shall be deemed to be covered by the rates quoted for the respective item of excavation.

3.3.20 SLIPS GOVERNMENT NOT RESPONSIBLE:

Slips shall be avoided. But if any slip occurs in account of any reasons, the excavation shall be properly restored to stability. No extra claims shall be entertained for such slip and their consequences.

The excavated trenches filled up due to monsoons or any other reasons shall be cleared as directed by the Engineer-in-charge by the contractor without any extra cost to Government.

DISPOSAL OF EXCAVATED MATERIALS:

3.3.21 The contractor shall not sell or otherwise use or remove except for the purpose of this contract, the sand, clay, ballast, earth work or other sub-stances or materials which may be obtained from any excavation made for the purpose of this contract produce upon the site at time of delivery of the possession of the land, but all such substances, materials and produce shall be property of the Government and shall be disposed of in the manner and place shown in the drawings or as and where the Engineer may direct with all lead & lifts. The contractor shall however, use such of the excavated useful materials or stones, obtained from excavations, in masonry as well as in banking which the Engineer may direct and approve. The selection, sorting and stacking shall be done according to the directions of the Engineer-in charge free of charge by the contractor. The sorting of useful excavated materials as above must be inclusive in quoted rates.

3.3.22 After sorting of useful materials is done, the rest of the materials which is declared not useful shall be disposed of in areas as directed with all leads and lifts.

3.3.23 No materials shall be disposed where it will detract from the appearance or interfere with the accessibility of the complete structures. Waste shall be leveled and trimmed to reasonable regular lines and all the work shall be done with reasonable neatness, excavated materials shall not be carelessly thrown over the entire premises of work, but shall be deposited directly in permanent position, consistent with proper execution of work. The directives of Engineer-in-charge shall be binding in respect of location of disposing the waste materials.

3.3.24 If for the convenience of the contractor and at the express permission of the Engineer part of whole of useful materials stack supplied at site is washed away to floods or any other reasons, the contractor shall make good for the credit which the Government could have driven, from the use of this material had the material been not washed away.

3.3.25 The canal section is to be excavated with grades and side slopes as indicated on drawings. Pay line for excavation in soil and murrum above shall be determined as per detail. Payment for excavation will be strictly as per design section or for the section as directed by the Engineer-in-Charge. No payment shall be made for excavation done beyond the pay lines shown on drawings and defined as above.

Mode of Measurement and payment

i. The payment will be made on volumetric basis for the quantities excavated to the required extent. Any fresh water above the ground surface/ excavated canal bed level shall be dewatered first at the start of the work. The cross sections shall be taken in presence of Q.C. Wing not below grade of AAE initially before commencement of excavation. Lines, levels and grades of excavation shall be marked for excavation. On completion of excavation final cross sections shall be taken. These sections will be marked on the initial cross sections taken prior to commencement of work. The quantities between initial and final cross sections within the pay lines shall be worked out and paid for. It shall be clearly understood that no excavation beyond pay line as mentioned herein above shall be measured and paid. The rate of excavation of canal is inclusive of dewatering or desilting due to any reason including rains the canal section during excavation and till the final profile is excavated and accepted by Engineer-in-charge. The conveyance and disposal of excavated material in all leads maximum up to as indicated in para 1.1 (b) is to be paid as per rate quoted or approved unit rate, whichever is applicable for this item.

3.3.27 The quantity shall be derived by the difference of initial & final level taken at different stages during execution of work & completion of work. The payment shall be made for actual quantity executed in cubic meter.

Dewatering Trenches & Wet Excavation

3.3.28 Surface or subsoil water met with during canal excavation shall be diverted to nearby drain/ nalla by cutting an open Canal within the canal section to be excavated. When the drain/nalla bed is higher than the subsoil water level met with, the bailing out by suitable means of pumping shall be resorted to for dewatering in sub soil water below the drain/nalla bed level. In case where

topography of the areas is such that surface water including accumulation of rain water during monsoon period is not possible to drain off by excavating the Canal, the bailing out by suitable means of pumping shall be resorted to and no distinction shall be made as to whether the material being excavated is dry moist, wet or slushy.

3.3.29 The ground water table is subject to variation during the construction period and may vary for full depth of cutting. The Contractor shall have to carry out the excavation work in such conditions during the construction period.

Tolerance

3.3.30 Finished section shall have a neat and smooth profile as per designed section over cuts and under cuts shall not exceed 2.5 cm. except soft and hard rock. For soft rock and hard rock over cut beyond specified pay line of excavation carried out by the contractor for any purpose or reasons unless at the specified direction of Engineer-in-charge shall be at expenses of contractor. Refilling if require of such unauthorized excavation with concrete masonry or other suitable materials as may be directed by the Engineer-in-charge shall also be done by the contractor at his own expenses.

Desilting of Foundation

3.3.31 Any silting in the Foundation excavation partly or fully completed occurs due to any reason including rains, the silt so accumulated shall be removed till the work is completed and accepted by Departments directed by Engineer-in-Charge. No extra payment shall be made to contractor for desilting or slush clearance.

2.3.32 Monsoon Damages.

3.3.33 Damages due to rain or flood either in cutting or in banks or in foundation of structure shall have to be made good by the Contractor till the work is accepted by the Department. The responsibility of desilting, dewatering and making good the damages due to rain or flood rests with the contractor, throughout the construction period of structures and not only limited to earthwork. No extra cost is payable for such operations and the contractor shall, therefore, has to take all necessary precautions to protect the work done during the entire construction period. The provision made in this para shall be applicable to all the components of the work under this contract till completion of the entire work. The contractor shall take all precautionary measures well prior to onset of the monsoon to prevent entry of flood waters of drains, nallas and other area. However, any damage done to the work or silting or slush caused shall have to be attended by the Contractor without any extra cost to Department.

3.3.34 During monsoon the contractor shall make available the machinery such as pumps, excavators, dozers, rollers etc. and skilled and unskilled manpower to attend the emergency conditions of flood inundation caused due to construction of canal in surrounding fields, roads etc. so that the public traffic can be maintained with least possible in convenience and damage to public/Govt.'s property.

3.3.35 The cost for such operations shall not be paid separately and deemed to be included in the rates quoted in respective item of schedule-B.

4. EARTHWORK IN EMBANKMENT

4.0 EARTH WORK OF CANALS:

Earth work of canal shall consist of carrying out excavation of canal, conveyance and

deposition if the excavated stuff for preparing embankments or in spoil banks repairing embankment by obtaining materials from borrow pits and compacting the embankment it also includes formation of catch water drains and gutters, drains, gutters excavating diversion of drains formation of excavating making embankments for road bridges on canal.

4.1 SITE CLEARANCE:

All areas required for construction including seats of embankment and the surface of borrow pits shall be cleared of all trees with girth up to

60 cm i.e. hedges stumps, roots, bushes, weeds, grass and other objectionable materials.

The hedges shall be cleared in the complete boundary of the canal land width. The roots shall be thoroughly garbled up loose stones and rubbish shall be removed from the surface to be covered by new earth and deposited outside the toe from a near bund or deposited as directed by the Engineer-in-charge. After the bank area is cleared, it shall be ploughed or harvested to loosen the existing top so as to have sufficient bond, with the new earthwork. All the holes and hollow in the seat of embankment shall carefully filled in with earth well rammed and leveled off.

4.1.1 All the materials obtained from site clearance shall be removed from site so as not to interfere in the construction operation and maintenance of the project. These materials shall be the property of Government and shall be disposed of in a manner specified by the Engineer-in-charge.

4.1.2 Unless otherwise explicitly, provided for the work of clearing site as given above shall be considered as included in the items of excavation and of making banks. Department or other agency fixed by department shall do however where trees greater than 60 cm in girth are required to be removed or stripping of borrow area or of the seat of embankment is considered necessary department or another agency fixed by department.

4.2 EXCAVATION CLASSIFICATION:

In soil excavation of canal is classified soil, soft, sand, gravel, sit murrum, clay, kankar and other soft material which can be easily excavated by means of pick and shovel loose stones less than 0.03 mt cube which do not require breaking up shall be treated as soil. The Classification of excavated strata shall be carried out on the basis of Geological Mapping & opinion as per IS Code.

4.3 DEFINITIONOF LEADS AND LIFTS, DEPTH SLABS AND HEIGHT SLABS:

4.3.1 Leads specified in any items of canal excavation shall mean the longitudinal distance along the canal bank line parallel to the centerline of the canal and across canal lead for canal earthwork in embankment by obtaining earth from borrow pits shall mean the distance as the crow files between as the weighted center of gravity of the place of embankment chainages of a particular section of the canal for computation of lead shall be fixed by the Engineer-in-charge.

4.3.2 Depth slab in the item of excavation indicates the range of depth measured from mean ground level of the cross section. Height measured from ground level of the cross section. Heights slab in the item of embankment indicates the range of height measured, from mean ground level at the cross section.

4.4 LINE OUT:

4.4.1 The work shall allow to commence unless line out is given and the profiles are created by the contractor and got approved by the Engineer-in-charge. The profiles shall be fixed at every 30 m. or closure interval along the length of canal and maintained undisturbed till the work is completed and final measurements are taken.

4.4.2 For the length in full banking or partial banking, the top edges of the banked shall from straight lines parallel to and equal distance from the center line the distance being as per designs or as directed by the Engineer-in-charge. For the lengths in spoils banks, the inner top edges of the spoil banks shall be in straight line for reasonable lengths as directed by the Engineer. Tops of the spoils will have fairly uniform level and they shall be smoothened at top with a slope away the canal center line.

4.4.3 Suitable gaps at an interval of 300 mt. or less shall be left in the spoil banks to allow for efficient drainage of the rain water from the canal limits to the outside as directed by the Engineer. At all the crossing of the canal, at cart track, roads, drains bridge the length as directed or ordered by the Engineer shall be left unexcavated which shall however excavate before completion of work.

4.5 METHOD OF ERECTION OF PROFILES:

The peg shall be fixed at every 30 M or closure interval along the length of canal as under. Reference peg 5 Cm. dia and 15 Cm. long shall be fixed on either side equal distance from the center line of canal. The distance shall be consult for a reasonable length 150 M. or so. In portions of partial cutting and partial embankments, the position of these pegs shall be selected so that they will not get buried in embankment or obstruct in the way for consolidation.

One peg 5 cm dia and 30 cm. long shall be fixed to mark each of the toes (inner and outer) of spoil banks and embankment on either side.

4.5.1 Bamboos shall be erected below the top edges of embankment and spoil banks and profiles to mark shape of the embankment or spoils, Marking shall be done by coir strings tied to the peg and in proper elevation on bamboos. Nails shall be fixed to bamboos or any other arrangement shall be made to ensure the string shall not slide down and shall remain in their correct position.

4.5.2 The peg and profiles shall have to be fixed and maintained undisturbed till the work is completed and final measurement are taken.

4.5.3 The contractor shall provide necessary materials and labor and mark all necessary arrangement to install substantial reference points, bench marks etc. as his own cost and maintain them during the construction period.

4.5.4 For lengths in full banking or partial banking the inner top edges of the banks shall from a straight line parallel to get line out from the

4.5.5 Engineer-in-charge it is tail be the responsibility and at equidistance from the center line, the distance being as per design or as directed by the Engineer-in-charge. For the lengths in spoil banks the inner top edges of spoil banks shall be in straight line for reasonable lengths as directed by the Executive Engineer. Top of spoil banks will have fairly uniform level and they shall be smoothened at top with slope away from the canal center line.

4.5.6 All arrangement for supply of materials & labor etc. for giving lining out, setting up profiles & taking levels during courses of work shall be made by contractor as his cost.

4.6 EXCAVATION AND DEPOSITING EXCAVATED MATERIALS:

4.6.1 The excavation shall be carried out to the exact lines and levels as specified in the drawing or as directed by the Engineer. Any extra excavation beyond such line and levels shall not be measured and paid for. Also, the shallow has to be filled back by the contractor at his cost, in a manner as directed by the Engineer.

4.6.2 The section of canals including inner slopes from etc. as shown in tendered drawings are tentative & are subject to modification as & when required during currency of contract. The work shall have to be executed accordingly without any extra cost/ claims on the ground of modified drawings except for any excess or saving in tendered Qty. Which can be considered under provision of clause-14 of the "Terms & condition of the contract." The rate for Excess / Saving shall be governed as per clause-14.

4.6.3 No extra payment shall be made for slips etc. and the same shall have to be restored by the contractor at his cost.

4.6.7 The excavated materials shall be deposited either in canal embankment or in spoil banks as directed by the Engineer-in-charge in uniform layers.

4.6.8 From deep cutting the excavated stuff will be deposited in spoil banks up to lead specified in item, but the contractor will be allowed to deposit such stuff inner by motor, nala depressions Waste Govt. Indian land, if it is possible without any additional cost and there is no hindrance of will cause any damage to the concerned.

4.6.9 The excavated stuff in spoil banks shall be so deposited as not obstruct to any roads, tracks or natural drainage and not to interfere with the construction and operation maintenance of the work.

4.6.10 The material obtained from excavation i.e. soft rock & hard rock shall be sorted cut to separate the materials which can be used in embankment rubber. The useful material as approved by the Engineer shall be utilized in embankment rubble & spauls obtained from excavation shall be properly stacked in measurable about as directed without any extra cost. The rate shall be wasted in spoil bank.

4.6.11 The excavated material if formed to contain material suitable for service road surface or for manufacture of soil cement bricks shall be avoided in using in canal bank and shall be stacked separately.

4.7 MATERIALS FOR BANK WORK:

4.7.1 Only after all the useful and acceptable materials from excavation of canal is used up in bank work provided in specification the contractor shall obtain remaining material if any required for bank from borrow pits with lead as directed.

4.7.2 When the Engineer decides to use the excavated materials in particular section, if surplus beyond the specified distances, he shall direct to do so by a written order and the contractor shall use the same for bank work with an extra lead.

4.7.3 Earth to be deposited in embankment, weather obtained from excavation of canal or from borrow pits with lead as directed to do so by a written order and the contractor shall use the same for bank work with an extra lead.

4.7.4 Earth to be deposited in embankment, whether obtained from excavation of canal or from borrow pits, shall be free from roots, stamps, pieces of wood rubbish vegetation, lump or any other organic, materials and such other materials as will affect the stability of the embankment. Stone large than 10 cm diameter shall be executed from earth and all clods and lumps shall be broken down to5 cm before the material is deposited in embankment. Only such material as found suitable by the Engineer for bank work shall not be used in bank work unsuitable materials from canal excavation shall not be used in canal bank similarly unsuitable materials shall be removed by contractor without extra cost. No payment for such canal bank built by unsuitable materials such unsuitable Qty. not allowed for bank shall be measured & kept on authorized record

4.8 BORROW AREA:

4.8.1 The contractor shall obtain materials only from the borrow area approved by engineer-in-charge. It is the responsibilities of the contractor to find out borrow area. Department will not be responsible for arability of borrow area as per lead specified in the tender. Before quoting rates for earthwork, the contractor required to ascertain land and availability of borrow area and accordingly the contractor shall quote the rate for items. **If borrow area for Qty. specified in 'Bill Of quantity' is not available within specific lead, then contractor shall make their own arrangement for borrow area and no extra payment shall be made for any extra lead.**

4.8.2 The borrow area shall be identified within the specified lead. The borrow area shall be regular in shape and shall not as rule be deeper than 2.5m. They shall be excavated with suitable steps or side slopes to avoid slips. If the borrow Area are excavated to depth greater than those specified on plan or as directed by the Engineer the same shall be refilling by the contractor and no extra payment shall be made for such refilling that may have to be carried out.

4.8.3 Ridges not less than 3 m vide shall be left at intervals not exceeding30 m drains shall not be made. However, the excavation required if any from the last borrow Pits to the natural drainage channels as may be directed by the Engineer shall be paid under relevant items of excavation to prevent stagnation of water the borrow pits shall above progressively towards the natural drainage channel. All borrow area shall be joined so as to drain away water accumulated in its suitable link channel as allow shall be made to drain away water in natural drain. The payment shall be made as per actual lead determined.

4.9 EMBANKMENT:

4.9.1 Earth in canal embankment shall be spread in successive horizontal layers not exceeding 23 cm. in depth in full width of embankment at respective level. To ensure proper compaction of edges of embankment the fill shall be kept 15 cm wider than the true section on either side where sufficient width to ply roller as to be done in lisper width the type of roller shall be so used to have required compaction or bank work shall be so done to have space for rolling on required width. No extra payment will be made on this account. The Qty. & compaction

shall be paid as per designed section only as shown in the drawing. The extra section so provided will not be paid for and the section trimmed off after completion of the bank work without any extra cost. So as to have corrected shall also be rolled with section as above O.K. inner slope be trimmed as per designed section of the canal proud section will be out with any extra cost.

4.9.2 No new layer shall be laid until the previous layer is properly compacted to the required dry density. The earthen embankment shall be raised uniformly as far as possible and cross falls etc. shall be so provided as to shed off water to prevent ponding.

4.9.3 The heights of embankment shall include a suitable allowance for settlement. The base width, however shall not be increased by a steeper slope to this extent shall be allowed. Allowance for settlement in various bank material shall be decided by the Engineer-in-charge.

4.10 PROTECTIONS TO EARTH WORK:

4.10.1 Care shall be taken to ensure that the method of operation and raising of earth work does not cause any damage or under strain on any adjoining structure. Earthwork over and around structure shall be carried out with special care with specially selected and approved materials. The contractor shall take all precautions necessary for the protection of bank work by diversion of streams, local surface drainage, rain water etc. likely to damage the work. Any damage caused to earthwork, due to any reasons whatsoever, shall be made good by the contractor at his own cost, till the work is certified as completed.

4.11 FINISHING:

4.11.1 This includes removal of palsies. Deanne, step etc. that may have left or provided during construction. The finished section shall be as smooth as possible and shall be dressed neatly to conformation the alignment, line, dimensions and slopes as shown on the drawings or as directed by the Engineer unevenness shall not exceed the limits specified.

4.11.2 LIMITS OF TOLERNACE:

1. Width of canal at bed +1% subject to a max at F.S.L. of ± 3cm
2. Canal bed level ± 3 cm
3. Embankment top level ± 6 cm

In case of undercut or less in embankment work, the payment will be made on the actual section executed. In case of over cut or larger embankment work, payment will be made as per design section of the section as directed by the Engineer to be executed. In no case under cut or lesser embankment will permitted and agency shall bear all expenditure required to be incurred by the department for bring under out or lesser embankment to the designed section.

4.12 COMPACTION OF CANAL EMBANKMENT:

4.12.1 All the materials placed in the embankments shall be properly compacted by vibratory roller of Suitable capacity. The actual nos. of Passes should be required for a layer to obtain the required compaction as suggested by Engineer-in-charge.

4.12.2 Compaction and watering shall be carried out by 8.0 to 10 M.T. vibratory roller or suitable type roller equipment as approved by the Engineer – in – charge considering the site condition.

4.12.3 In those parts of the embankment which are accessible by the specified rolling equipment such as around and in contract with the structures and periphery of structures where the rolling equipment is not permitted to operate, compaction

shall be accomplished either with manual or mechanical tempers of approved type. Rollers shall not be tempted shall be spread in layers having thickness not more than 15 cm. special care shall be exercise to obtain a good contact and bond with the surface of concrete or masonry structures.

4.12.3 When new embankment is to be joined with the old embankment the surface of the old embankment shall be borrowed so loose the compacted materials before laying any, fresh materials. The surface of old bank shall be properly scrapped well-watered and keyed to the new banks as directed by the Engineer-in-charge.

4.13 MODE OF MEASUREMENT AND PAYMENT:

4.13.1 The line out shall be given by the Engineer-in-charge or his authorized representative.

4.13.2 The initial levels shall be taken by the Engineer-in-charge or his Dy. Ex. Engineer in presence of the contractor. This initial level both on field book & cross section as drawn shall be signed by the contractor in token of acceptance of the initial levels.

4.13.3 The quantity shall be derived by the difference of initial & final level taken at different stages during execution of work & completion of work. The payment shall be made for actual quantity executed in cubic meter.

DEDUCTION:

Sr. No.	Name of Bank work	Percentage to be deducted when Measurement of compacted bank are taken		
		Before monsoon	After one monsoon	After two monsoons
	1	2	3	4
1.	Compacted an optimum moisture content to specified dry density	0	0	0
2.	Compacted with light rolling without artificial watering	10	5	0
3.	Not compacted and no watering	15	10	5

4.13.5 The final measurement shall be taken at an interval of every 120 meter along the canal with levels. Based on those levels cross section of canal shall be plotted & the Qty. shall be worked out on cross section bases. The levels for C.S. shall be taken in presence of contractor or his authorized representative. The contractor shall sign the levels and C.S. plotted in acceptance of the measurements. The qty. shall be worked out on C.S. area & distance between C.S. by simple rule of average.

4.13.6 When surplus excavated material is ordered to be placed within the specified extra lead. No separate measurement shall be taken for the item or extra lead. Those shall derive from the measurement of embankment and of canal excavated and the surplus excavated shall be considered as utilized within the extra lead up to 150 meter till surplus quantity is accorded for.

5. Ordinary Cement Concrete: Plain or Reinforced

5.1 Scope of work:

The work covered by this section of furnishing all materials, equipment and labour for manufacture, transport, placing, finishing and curing of concrete in the structure

included in these specifications and performing all the functions necessary and ancillary thereto. Specifications described here in after shall however, in relevance, apply to all concrete items.

I.S.456-1978 or as revised from time to time shall be followed in general. Cement, sand and black trap Metal (Coarse aggregate) shall be measured by weight.

5.2 Composition

a) Concrete shall be composed of cement, fine aggregates (natural sand only), coarse aggregates (manufactured), admixtures and water, well mixed in proportion and brought to the proper consistency. The design mix proportions shall be adjusted to produce a durable and workable and cohesive concrete, suitable for specified conditions of placement & design strength.

b) For all items of concrete in any portion of the structure or its associated works, concrete manufactured by batching and mixing plant which shall be termed by controlled concrete shall be used where specified.

5.3 Materials

5.3.1 Cement

Cement shall be procured in bags by the contractor from market at his own risk and cost. It shall confirm the qualitative provisions made in I.S 269-1989 and the specification shall be as specified in Technical Specification of material at Para M1 for cement shall be apply.

5.3.2 Sand

The sand to be used in concrete shall be of well graded, hard, durable and as an inert material. It shall confirm to specification specified in the Para M2 of Technical Specification of material. The specification specified in I.S 383-1999 shall also apply to sand.

5.3.4 Water

The mixing water shall be potable confirming to specification prescribed in Para M3 of General Technical Specification.

5.3.5 Coarse Aggregates

The coarse aggregate shall conform to the specification specified in Para M4 of Technical Specification of material. Specification specified I.S. 383-1999 shall also apply to coarse aggregate.

The course crushed metal, aggregate for concrete shall consist of clean, hard dense, durable, crushed metal predominately. Flaky crushed aggregate shall not be used.

The percentage of deleterious substance in any size of coarse aggregates as delivered to the mixer shall not exceed the following values.:

Materials passing No. 100 screen	1 % by wt.
Shale	1 % by wt.
Coal	1 % by wt.
Soft fragments	1 % by wt.
Other deleterious substances	1 % by wt.

Clay lumps 1 % by wt.

The sum of the percentages of all the deleterious substances shall however not 5 percent exceed by weight. The coarse aggregate shall satisfy the abrasion, soundness and water absorption test as laid down in I.S. 515/1959 or relevant IS Code.

Grading:

(i) Coarse aggregate of such a size shall be retained on mesh 3/16" square.

(ii) The gradation shall give a dense concrete of the specified strength and consistency that will work readily into position without segregation and without the use of excessive water content.

(iii) The gradation shall be as indicated by the project laboratory studies.
Following shall be maximum size of coarse aggregate for the different items of work.

Sr. No.	Item of Work	Maximum Nominal Size of Coarse Aggregates (MSA)
1.	Foundation floor and gravity retaining walls (Mass Concrete)	40 mm
2.	R.C.C. rafts, piers, abutments, cutoff walls, brest walls, staunching rings, pile and pile cap etc.	40 mm
3.	RCC work in Main and Cross girders, Deck Slabs, Wearing Coat, Kerb, Parapet walls, Approach Slab, Pier Cap, RCC Trough, Barrel and other thin member and zones of congestion caused by closely spaced reinforcement bars.	20 mm
4.	For any other items not covered by item 1 to 3	As specified in drawings or in case not specified in drawing, as directed by Engineer-in-Charge

For heavily reinforced concrete members, as in the case of ribs of main beams, maximum size of aggregate shall usually be restricted to 5 mm less than the minimum lateral clear distance between the main bars or 5 mm less than the minimum cover to the reinforcement, whichever is smaller, However, if required under special circumstances, the Engineer-in-Charge may permit an aggregate of maximum size 25 % more than this critical spacing/ cover provided that proper vibration is ensured.

Testing:

The following testing frequencies shall be maintained for the same source of coarse aggregate.

Sr. No.	Name of Test	Minimum number of tests specified
1.	Gradation	Daily one test for each nominal size of aggregates
2.	Water Content	Daily one test for each nominal size of aggregates
3.	Silt Content	Daily one test for each nominal size of aggregates
4.	Sp. Gravity and Water Absorption, Impact or Abrasion, Density, Soundness, Alkali-Acid reactivity, Petrographic examination	Once in concrete working season

5.3.6 REINFORCEMENT STEEL

The reinforcement (TMT Bar) shall confirming to specification prescribed in Para M5 of General Technical Specification.

5.3.7 Admixtures:

(a) Accelerators: Admixtures for increasing the strength of concrete at early ages may be permitted to be used at the cost of contractors upon written approval covering the type, amount and location of use. The amount of accelerator used shall be not more than that necessary to reduce the desired result. Calcium chloride shall not be used in excess of 2% by weight of cement. Accelerator shall be measured accurately and shall be introduced into the mixer in solution of the mixing water. Use of accelerator in the concrete shall in no way affect the compliance with the requirements of these specifications governing protection and curing of concrete. Accelerator shall be used by contractor and the contractor shall not charge anything extra for cost and use of admixture.

(b) Air entraining agents and additives: If necessary suitable air entraining agents shall be used to improve the quality and workability of the concrete. The same shall be used by contractor and the contractor shall not charge anything extra for cost and use of admixture.

5.3.8 Epoxy

Use of epoxy for bonding fresh concrete for repairs shall be permitted on written approval of the Engineer-in-Charge. Epoxy shall be applied in accordance with the instructions of the manufacturer. The cost of such repair shall be borne by the Contractor.

5.4 Concrete for Structures

Controlled concrete shall be used for the structures in grades designated as M-15 and M-20 Grade Concrete.

5.4.1 Mix Design

a) The contractor shall prepare mix design of concrete in accordance with IS 456-2000 and relevant codes to achieve desired strength durability and workability and using approved ingredients viz. cement, fine aggregates and water. The ingredients of concrete shall be got tested and approved by the Engineer-in-charge. The contractor shall get approval the mix design thus prepared by him from Engineer-in-charge and only after approval of Engineer-in-charge, the same shall be used for construction.

b) (i) The Engineer in charge shall check and carry out necessary tests on mix design given by the contractor in accordance with Para (a) above to determine its strength, workability durability as well as economy. For this purpose, the contractor shall submit mix design and its details prepared by him to the Engineer in charge well in advance of commencement of work as directed by the Engineer in charge.

ii) Department reserves right to accept or reject the mix design given by the contractor and also to direct him to use mix design given by Engineer in charge Decision in this regard shall be final and binding to the contractor.

iii) Over and above specified in (a) above, if required Engineer in charge shall make a test to determine the mix proportions required to produce the strength specified with the material to be used in the work. (The necessary ingredients shall be provided to department free of cost by contractor.)

c) The mix shall be designed using representative samples of approved coarse and fine aggregates as well as cement and water to be made available by the Contractor to the Engineer in charge, to achieve the required workability, cohesion, strength and durability at minimum level of cement. Mix design studies and test will be carried out by the Dep't.

d) The proportion of mix design ingredients shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with the means available.

e) During the execution of the work if the source of any ingredient of the concrete changes or in new working season, the Contractor shall inform the Engineer-in-Charge sufficiently in advance so as to allow him to proportion a new mix design to attain the specified strength of concrete. At that time the representative samples of approved ingredient shall be supplied by the Contractor to the Engineer-in-Charge without any extra cost.

f) The details of mix design including the proportion of each separate size and grading of aggregates and actual cement level required shall be declared to the Contractor in writing by the Engineer-in-Charge.

g) As a result of para (d) if there is any subsequent change in mix design, similarly the same shall be declared.

5.5 Strength Requirement of Concrete

Ordinary Portland cement grade 53 conforming to IS: 12269 shall be used. The permission of Engineer-in-charge shall be obtained for other grade of concrete. The

compressive strength requirements for the various grades of controlled concrete shall be as given in Table.

Grade of Concrete	Compressive test strength in N/mm2 on 150 mm cube in accordance with IS:456-2000 Minimum at 28 Days
M10	10
M15	15
M20	20
M25	25
M30	30

In all cases the 28 days compressive strength specified in Table shall along be the criterion for acceptance or rejection of the concrete.

Where the strength of a concrete mix as indicated by tests lies in between the strength for the two grades specified in Table, such concrete shall be classified for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

The compressive strength test of concrete shall be conducted on 150 mm x 150mm x 150 mm molded cube. The design Mix for different classes of concrete to be used will be furnished by the department. Based on these mix proportion and by using the same materials as approved for use in the Structure of works, concrete mixes will be prepared in the Laboratory at frequent intervals and cubes 150 mm x 150 mm x 150 mm will be cast and tested for strength at 7 Days and 28 Days. These strengths shall be deemed as the standard strengths. The strengths shall be deemed

as the standard strength. The strength of test specimens cast from the concrete used on the permanent work shall be determined and these should be not less than 80 per cent of respective Standard strength mentioned above. The testing of cubes Will be carried out as per relevant Indian standard Specifications. 80 per cent of the test specimens shall fulfill the above stipulation. Also, coefficient of Variation shall not be more than 20 per cent. The set of test cubes shall consist of 3 cubes for testing for crushing strength, at 28 days Crushing strength.

5.6 Proportioning Concrete

Except when it can be shown to the satisfaction of the Engineer-in-Charge that supply of properly graded aggregates of uniform quality can be maintained till the completion of the work, grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions as required. Different sizes, however, shall be stacked in separate stockpiles. Required quantity of material shall be stockpiled several hours, preferably a day, before use. Grading of course and fine aggregates shall be checked as frequently as possible, frequency for a given job shall be determined by the Engineer-in-Charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tank or weight. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked. b). To keep

the specified water cement ratio constant as determined by mix design, moisture content in both fine and coarse aggregates shall be pre-determined by the Engineer-in-Charge. The amount of mixing water shall be adjusted to compensate for any variations noted in the aggregate IS: 2386-1977 (Part-III) shall be referred to make suitable arrangement in weight of water. Suitable adjustments shall also be made in the weight of aggregates to allow for variations in weight of aggregates due to variations in their moisture content.

5.6.1 Mix Design and Testing:

For Design Mix Concrete the mix design shall be designed according to IS 10262 and SP:23 to provide the grade of concrete having the required workability and characteristics strength less than appropriate values given in IS – 456. The design mix shall be such that it is cohesive and does not segregate and should result in dense and durable concrete and also capable of giving the finish as specified. For water retaining structures, the mix shall be also result in watertight concrete. The contractor shall be exercise great care while designing the concrete mix and executing the works to achieve the desired result.

The cement level for the controlled concrete shall be as under for the purpose of working out the rates to be quoted in Schedule – B

TABLE NO. 1

Sr. No.	Grade of Concrete	Tentative Cement Level required in Kg for one Cubic Meter of Concrete Resolution No. MIS102010/17/K-1 Dated; 30.07.18
1	2	3
1	1:2:4	300 (Not Applicable for Mix Design)
2	1:3:6 (MSA 40 mm)	205 (Not Applicable for Mix Design)
3	1:3:6 (MSA 20 mm)	220 (Not Applicable for Mix Design)
4	M-15 (MSA 40 mm)	280
5	M-15 (MSA 20 mm)	300
6	M-20 (MSA 40 mm)	330
7	M-20 (MSA 20 mm)	360
8	M-25 (MSA- 40 mm)	360
9	M-25 (MSA- 20 mm)	380
10	M-30 (MSA-20 mm)	410
11	M-35 (MSA-20 mm)	425

12	M-40 (MSA-20 mm)	440
13	M-45 (MSA-20 mm)	450

However, depending on the technical requirement various size of aggregate may be required to be used in various components of the structure. In that case, the minimum cement level for various grade of concrete with various size of aggregate shall be as per IS 456-2000.

Actual cement level required for the aggregate to be used shall be determined by tests. The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing so that after compaction it surrounds all reinforcement and completely fills the formwork. When concrete is hardened, it shall have the required strength, durability and surface finish.

A concrete mix shall be designed to produce the particular grade of concrete having the required workability and characteristic strength not less than that stipulated in tender specification. However, due to change in cement level of design mix, if it becomes obligatory to use more quantity cement per cubic meter of concrete w.r.t. cement level mentioned in above table No.1, the contractor shall do the same without claiming the extra cost for use of more quantity of cement w.r.t. approved mix design, If due to change in cement level of design mix, it is obligatory to use less quantity cement per cubic meter of concrete w.r.t. cement level mentioned in the above table, the amount (Cost) of quantity of cement used less w.r.t. cement level mentioned in the above table shall be recovered at the **Input Rate** per metric ton of cement from the bill/amount to be paid to the contractor.

The quantity of water shall be just sufficient to produce a dense concrete of required workability cohesiveness, durability and strength for the job. An accurate and strict control shall be kept on the quantity of water.

In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slump tests. Following slumps shall be adopted for different types of works.

Sr. No.	Type of Work	Slump allowed without any admixture
1	Mass concrete for RCC Raft Foundation, Footing and Retaining wall	45 mm to 55 mm
2	Pier, Pier Cap, Pedestal, Transition wall	25 mm to 45 mm
3	Thin RCC Section with congested steel	60 mm to 70 mm
4	Baffle walls, Chute Blocks and Sills	25 mm to 40 mm
5	CC Lining works	60 mm to 70 mm

5.7 Production of Concrete

5.7.1 Production of Aggregates

Production of aggregate may include quarrying of the raw material and processing

viz. transporting, crushing, screening and washing. Water used for washing aggregates shall be clean and free from alkali, salts and other impurities. After washing, fine aggregates must be stored in stockpiles with a free draining base for at least 3 days to ensure that aggregates delivered to the batching plant will have reasonably uniform moisture content. The storage and handling shall be in such a manner as to prevent inter-mixing of various sizes of aggregates required separately for grading purposes. No foreign matter shall be allowed to mixed up with the aggregates.

Batching & Mixing plant.

a) The Batching and mixing shall be done with Fiori machine (on wheel batching plant) or Digital weighing system conventional mixer of required capacity. .The prescribed amount of the various materials of concrete including water, cement, admixtures the groupings of fine aggregates and each individual size of coarse aggregate shall be measured and controlled within the specified limits of accuracy. The amount of water, cement and aggregate shall be determined by weighing. In the case of fine aggregates, the surface moisture shall be determined in accordance with the method prescribed in Appendix–D of IS: 456-2000 and its subsequent amendments or publications. In the case of coarse aggregates, percentage of free water shall be determined by weighing a representative sample, then surface drying each particle individually with a clean piece of cloth and reweighing.

b) The proportion of various materials shall be changed as directed in order to maintain the desired quality of the concrete. The batching equipment shall be so constructed and operated that the combined inaccuracies in feeding and measuring the materials shall not exceed 1 ½ percent for water and cement and 2 percent for each size of aggregate.

c) The operating performance of each scale or other measuring device shall be checked by standard test weight to be supplied by the Contractor and test weight shall be got calibrated by the Contractor and the test shall cover the ranges of measurements involved in the batching operations. Tests of equipment in operation shall be made at least once every fortnight and adjustments, repairs or replacement, be made as necessary to meet the specified requirement for accuracy of measurement.

d) Aggregate shall not be batched for concrete or mortar when free water is dripping from the aggregate.

e) Before the concreting operation start the Contractor shall provide communication facility in the form of wireless, walkie-talkie or telephone between the batching and mixing plant and sites of various concrete placements and got approved by the Engineer-in-Charge. It will be the Contractor's responsibility to keep this system in good and working condition throughout the construction period.

5.7.3 Mixing

(a) The Concrete ingredients shall be mixed thoroughly in mixers of satisfactory type and size which are so designed as to ensure uniform distribution of all the constituent materials throughout the mass at the end of the mixing period.

The plant shall be so designed and operated that all materials entering the mixer can be accurately proportioned and readily controlled. The entire batch within the mixer shall be discharged before recharging. The volume of mixed materials per batch shall not exceed the rated capacity. A mixer will be considered unsatisfactory, if from three test of any one batch, a change in slump exceeding 25mm or a change in air content exceeding one percent is noticed between representative samples taken at different portions of the mixer discharges.

(b) For any one batch, uniformity of fresh concrete weight of air free mortar of two samples, one taken at the front and one at the end of the mixer discharges, when determined in accordance with the provision of the mixer performance test, the provision test, designation 26 in the Appendix, Concrete Manual-Eight Edition, Revised-1981, United States Bureau of Reclamation, shall not exceed 1.6 percent of the mean value. The adequacy of mixing shall also be determined in accordance with "Method of sampling and analysis of concrete as per IS: 1199-1959 and its subsequent amendment. Excessive variation on the unit weight of air free mortar indicates that mixing time should be increased. Mixer efficiency tests shall be made at the start of a job or at such intervals as may be necessary to ensure compliance with the requirements for effective mixing. The minimum mixing time specified herein may be reduced if mixer efficiency tests confirm that the reduced time permits satisfactory mixing.

(c) The first concrete batch at the start of continuous mixing operation or after a lapse of 30 minutes in continuous mixing operation shall be made richer by the addition of extra cement as directed.

(d) For any one batch, the difference between the unit weights of coarse aggregate from concrete samples from the front and end of the mixer or mixer discharge, when determined in accordance with the above-mentioned mixer performance test shall not exceed 10 percent of the mean value.

(e) The mixing of each batch shall continue, for not less than the period stated in Table-I of IS: 457 – 1957 unless tests of mixer performance show that variation in the prescribed time is necessary or acceptable. Each mixer shall have a timing device for indicating the completion of the required mixing period

(f) The actual time of mixing shall be checked at least twice during each shift and the timing device shall be adjusted if there is error. The timing device shall be so interlocked with the discharge gate of the batch hopper that the timing does not start until the discharge gate is fully closed and all ingredients are in the drum. A suitable record shall be kept of the average time consumed in charging, mixing and discharging a batch during each run.

(g) The full contents of the drum shall be discharged quickly to avoid segregation.

(h) The minimum mixing periods specified are considered on the materials being fed into the mixer in a manner which will facilitate efficient mixing and an operation of the mixer at its designed speed. The following sequence of charging the mixer be adopted.

i. Five to ten percent of the total quantity of water required for mixing, adequate to wet the drum thoroughly, shall be introduced before the other ingredients in order to prevent any caulking of the cement on the blades or sides of the mixer.

ii All dry ingredients (Cement, fine and coarse aggregate) shall be simultaneously fed into the mixer in such a manner that the period of flow for each ingredient is about the same. Eighty to ninety percent of the total quantity of water required for mixing shall be added uniformly along with the dry ingredients.

iii the remaining quantity of water shall be added after all the other ingredients are in the mixer.

iv Portion of the coarse aggregate, however, may be added last. This facilitates clearance of the chutes and removes any fine aggregate or cement adhering to the sides.

(i) Excessive mixing requiring additions of water to preserve the required concrete consistency shall not be permitted. Concrete which has been kept unused for more than 30 minutes after the addition of water shall be rejected

(j) When the mixer is stopped before placing again any ingredients in the mixer, all hardened concrete or mortar shall be removed from the inner surface of the mixer.

(k) The re-tempering of partially hardened concrete or mortar requiring renewed mixing with or without the addition of cement, aggregate or water shall not be permitted.

5.7.4 Temperature of Concrete and Weather Conditions

The temperature of concrete at the time of placement shall not exceed 32^0 C. Concreting operations shall be temporarily suspended during excessively hot weather when the air temperature exceeds 45^0 C or when conditions are such that the concrete cannot be placed at the required temperature. Wherever necessary, exposed surfaces of fresh concrete shall be adequately shaded to the direct rays of the sun and protected against premature setting or drying by curing under continuous fine spray of water.

5.7.5 Transporting Concrete

a) Concrete shall be transported from the mixing plant or batch mixer to the placing position by means of transit mixers as rapidly as practicable by methods that will prevent segregation or loss of ingredients or slump loss in excess of 25mm and/or a loss in air content of more than one percent before the concrete is placed in the works. The concrete shall be placed in in position within a period of 30 minutes. Irrespective of haul distance, suitable agitators or transit mixer shall be used for conveying concrete. Conveying concrete by head load shall not be permitted in any

case.

(b) If buckets are used for conveying low slump concrete, they shall be capable of promoting discharge in controlled quantities without splashing or segregating and shall be of such capacity that there is no splitting of batches in loading buckets. Buckets shall be of the bottom dump type permitting an even and controlled flow into the forms or hopper without undue splashing or segregation. Conveying vehicles shall be designed to facilitate uniform delivery rather than quick dumping. For major pour use of crane and bucket for placement of concrete particularly in syphon structure will not be allowed where only concrete pumps or belt creates to achieve a minimum rate of placement of 15 to 20 cubic meter/ hour shall be used.

(c) Chutes used for conveying concrete shall be of such size and shapes as to ensure a steady uniform flow of concrete in a compact mass without separation or loss of ingredients and shall be protected from wind and sun where necessary to prevent loss of slump by evaporation and shall be furnished with a discharge hopper. Free fall or drop of concrete shall be limited to 150 cm. Chute section shall be made of or lined with metal and all runs shall have approximately the same slopes not flatter than 1 vertical to 2.5 horizontal. The required consistency of concrete shall not be changed in order to facilitate chuting. Where it becomes necessary to change the consistency, the mix shall be completely redesigned. Wherever there is a free fall within the conveying system, suitable baffle plates, splash boards or down spouts shall be provided to prevent segregation, splashing or loss of ingredients. Wherever it is necessary to hold the discharge end of a chute more than 3 meters above the level of the fresh concrete, a flexible down spout shall be used to break the fall and confine the flow. The lower end of the spout shall be held closed to the place of deposit. Wherever depositing is intermittent, a discharge hopper shall be provided. All chutes shall be thoroughly cleaned before and after each run. All wash water and debris shall be disposed of outside the forms. Use of chutes shall be allowed in exceptional circumstances and adverse placement condition only.

(d) Placement of concrete by pump crates has made a rapid technological advancement. It is an acceptable method if properly planned and backed with appropriate state of art equipment and accessories. The principal requirement is to achieve requisite workability and strength at the prescribed cement level. Slump is the critical factor in concrete placement by pump crates. In the context of attaining designed strength at the prescribed cement level and at the same time without raising water cement ratio for making the concrete mix workable enough for smooth pumping use of super plasticizers may become essential. If the Contractor chooses to deploy pump crates for concrete placement and uses super plasticizers for attaining the required workability within the requisite parameters evolved through mix design studies to the full satisfaction of Engineer-in-Charge, he shall be allowed to do so. Before using super plasticizers necessary approval from the

Engineer-in-Charge shall be taken. No extra payment shall be made for such arrangements.

(e) Alternatively, properly designed Belt-crates capable to cover of one monolith shall be allowed to be used for conveying concrete for placement in the structures. Belt-crates shall ensure an adequate and steady uniform flow of concrete in a compact mass without any segregation and shall have a discharge hopper with a flexible down spout as to ensure concrete placement as close to the place of deposit as possible and in no case more than about a meter.

(f) Equipment used for transporting concrete from the mixer to the forms shall be maintained free from deposits of stiff concrete and leakage of mortar. Batch containers, transit mixers, agitators, chutes, concrete pumps, pipelines, belts and discharge hoppers shall be thoroughly cleaned after each run. All wash water and debris shall be disposed of outside the forms

5.8 Preparation for Placing Concrete

5.8.1 General Requirement

(a) Concrete shall not be placed until all form work required is completed, embedded parts, reinforcement if any, installed and checked and surfaces prepared for placing. No concrete shall be deposited until the foundation has been inspected and approved by Engineer-in-Charge/ competent authority.

(b) All surfaces of forms and embedded materials that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned of all such mortar or grout before fresh concrete is placed.

5.8.2 Foundation surfaces

a) In the case of earth or shale foundations, all soft or loose mud and surface debris shall be scraped and removed. The surface shall be moistened to a depth of about 15 cm to prevent the Sub grade from absorbing water from the fresh concrete. Just before placing the concrete, the surface of the earth shall be tamped or otherwise consolidated sufficiently to prevent contamination of concrete during placing. If subsoil water is met with the foundation it shall be dewatered as directed till placing and setting of concrete. All concrete shall be placed upon clean damp surface, free from standing or running water and never upon soft mud, dried porous earth or upon fills that have not been subjected to approved rolling and desired compaction has been obtained

b) Immediately before placing concrete, all surfaces of foundations upon or against which the concrete is to be placed shall be made free from standing water, mud and debris. The surface of absorptive foundation upon or against which concrete is to be placed shall be moistened thoroughly and kept sufficiently wet for at least 24 hours prior to placing concrete so that moisture will not be drawn from the freshly placed concrete. The cleaning and roughening of the surfaces of rock shall be performed by the use of high velocity air water jets, wet sand blasting, stiff brooms, picks or by other effective means. The washing and scrubbing process shall be continued until the wash water collected in puddles is clean and free from dirt. In the final cleaning process the wash water may have to be removed by sponges. If any drilled holes are left in the foundation surface which is no longer needed, the same shall be cleaned

with air water jetting and filled up completely with cement slurry.

c) Foundation of porous or free draining material shall be thoroughly compacted by flushing and by subsequent tamping or rolling if necessary. The finished foundation surface shall then be blanketed with a layer of tar paper or closely woven burlap, carefully lapped and fastened down along the seams so as to prevent the loss of mortar from the concrete.

d) Before placing the concrete safe bearing capacity of the soil shall be checked.

5.8.3 Surface of Construction / Contraction joints

a) The surface of construction joints shall be clean, rough and damp but free from standing pools of water when receiving the next lift Clean up shall comprise removal of all laitance loose or defective concrete, coating, sand, sealing compounds, if used and other foreign materials, if necessary by scraping, chipping or other suitable means. The contraction joints shall be provided at equal distance of not greater than 20 m in canal bed portion or as shown in the drawing.

b) The surface of construction joints shall be cleaned by green cutting to remove laitance, if the next lift is planned to be placed within 3 to 4 days of the completion of the previous lift. Green cutting shall be done within 8 to 16 hours of laying concrete depending upon temperature, slump etc. If there is delay in placing the next lift, the surface shall be cleaned by wet sand blasting / high pressure water jetting just prior to placing next lift. Utilization of green cutting should be maximized. For effective green cutting, the compressed air pressure should not be allowed to fall below 6.33 kg/cm^2. The water pressure should be sufficient to bring the water into effective influence of the air pressure. As an approximate estimate, the quantity of compressed air required by the green cutting gun is 2m^3 /second and the quantity of water 273 liters /minute. Without availability of sand blasting equipment in working condition concrete pouring shall not be allowed.

c) The method used in disposing off waste water employed in cutting, washing and rinsing of concrete surface shall be such that the waste water does not stain, discolor or affect exposed surfaces of the structures. Method of disposal of waste water shall be subject to approval and at the cost of contractor.

5.9 Placing and Compacting Concrete

5.9.1 The contractor shall keep the Engineer advised as to when placing of concrete will be performed. Unless inspection is waived in each specified case by direction from the Engineer, placing of concrete shall be performed only in the presence of an authorized representative of the Engineer. The surface of all rock and concrete against which concrete is to be placed shall be thoroughly cleaned and damped. After the surfaces are prepared satisfactorily, all approximately horizontal surfaces of rock and construction joints shall be covered with a layer of mortar approximately tree eighth of an inch (10mm) thick. The mortar shall have the same proportions of water, cement, and sand as the regular concrete of mixture, unless otherwise directed. The water cement ratio of the mortar in place shall not exceed that of the concrete to be placed upon it, and consistency of the mortar shall be suitable for placing and working in the manner hereinafter specified. The mortar shall be spreaded and shall be worked thoroughly into all irregularities of the surface. Concrete shall be placed immediately upon the fresh mortar.

5.9.2 In placing concrete against formed construction, joints, the surface of the joints where accessible, shall be coated thoroughly with brooms dipped in the fresh mortar. Where it is impracticable to apply such mortar coating, special precautions shall be taken to ensure that the new concrete is brought into intimate contact with the surface of the joint by careful puddling and spading with the end of suitable tools.

5.9.3 Retempering of concrete will not be permitted. Any concrete which has become so stiff that proper placing cannot be assured shall be wasted. Concrete shall be deposited in all cases as nearly as practicable, directly in its final position and shall not be caused to flow such that the lateral movement will permit or cause segregation of the coarse aggregate from the concrete mass. Methods and equipment employed in depositing concrete in forms shall be such as will not result in clusters or groups of coarse aggregate particles being separated from the concrete mass, but if clusters do occur, they shall be scattered before the concrete is vibrated. A few scattered individual pieces of coarse aggregate that can be restored into the mass by vibration will not be objectionable.

5.9.4 Except as intercepted by joints, all formed concrete shall be placed in continuous approximately horizontal layers, the depths of which generally shall not exceed 50cms (20 inches). the engineer reserves the right to require lesser depths of layers, where concrete in 50cms (20 inches) layers cannot be placed in accordance with the requirements of these specifications. All intersections of construction joints with concrete surfaces which will be exposed to view shall be made straight and level or plumb. Construction joints shall be allowed only at places as directed by the engineer.

5.9.5 In reinforced concrete work, the thickness of the layer shall be reduced to 150 mm to 300 mm (6" to 12") or as directed. In congested parts, care shall be taken to see that all the bars are properly embedded and that no voids are left. On flat horizontal surfaces, whether the congestion of steel near the forms makes placing difficult, a mortar of the same cement, sand ratio as is used in the concrete shall be first deposited to cover the forms.

5.9.6 In placing uniformed concrete on slopes so steep as to make internal vibrating of the concrete impracticable without form work, the concrete shall be placed ahead of non-vibrated slip-form screed extending approximately 2 and ½ feet (75cm) back from its loading edge. Concrete ahead of the slip-form screed shall be compacted by internal vibrators so as to assure complete filling under the slip form.

5.9.7 If concrete is placed monolithically around openings having vertical dimensions greater than 2 feet (0.6m), or if concrete is for decks, floor slabs, beams, girders, or other similar parts of structure is placed monolithically with supporting concrete, the following instructions shall be strictly observed:

(i) placing of concrete may be delayed from 1 to 3 hours at the top of openings and at the bottoms of bevels under docks, floor slabs, beams, girders, or other similar parts of structures when bevels are specified and at the bottom of such structural members when bevels are not specified but in no case shall the placing be delayed so long that the vibrating unit will not readily penetrate of its own weight, the concrete placed before the delay. When compacting,

concrete placed after the delay, the vibrating unit shall penetrate and revibrated the concrete placed before the delay.

(ii) The last 2 ft (0.6 mt) or more of concrete placed immediately before the delay shall be placed with as low as slump as practicable and special care shall be exercised to affect thorough compaction of the concrete.

(iii) The surface of concrete where delays are made shall be clean and free from loose and foreign material when concrete placing is started after the delay.

(iv) Concrete placed over openings and in decks, floors, beams girders, and other similar parts of structures shall be placed with as low a slump as practicable and compaction of the concrete. The contractor shall not be entitled to additional payment over the unit price bid in the schedule for concrete by reason of any limitations in the placing of concrete required under the provisions of this paragraph.

Compaction:

5.9.8 Concrete shall be compacted to the maximum practicable density so that it is free from pockets of coarse aggregate and entrapped air, and closes smugly against all surface of form embedded materials. Compaction of concrete in structure shall be by petrol /diesel driven or electric or pneumatic drive, immersion type vibrators. Concrete vibrators shall be operated at least 7,000 rpm when immersed in the concrete. Forms vibrators where used shall be rigidly attached to the forms and shall operate at speeds of at least 8000 rpm when vibrating concrete.

5.9.9 In Compacting each layer of concrete, the vibrator shall be operated in a nearly vertical position and vibrating head shall be allowed to penetrate and revibrate the concrete in the upper portion of the underlying layer. Layers of concrete shall not place until the layers previously placed have been worked thoroughly as specified. Care shall be exercised to avoid contract of the vibrating head with surface of the forms or displacing reinforcement or embedded metal. Large void or air pockets which may be left in the permanently exposed faces of the structure by vibration shall be eliminated by systematically speeding the face with an appropriate flat tool.

5.9.10 Excessive vibration causing segregation or tending to bring an excessive amount of water to the surface shall be avoided. Cobbles and coarse aggregate protruding from the surface of the life shall be embedded into the mass during the initial compacting and vibrating operations. Surface vibrators or peddlers shall not be used except for wearing coat for the roadway.

5.9.11 Disturbance of the surface concrete at a construction joint during the early stages of hardening shall be avoided. Necessary traffic on new concrete shall be on timber walkways constructed so as not to cause injury to the concrete.

5.9.12 For formed concrete surface which are to be exposed to high velocities of water, special precautions shall be taken to prevent or to minimize surface pitting without resorting to over-manipulation of the concrete next to the form.

5.9.13 Inadvertent or intended revibration of some concrete is beneficial provided the concrete become momentarily plastic again during revibration. Revibration shall be resorted to only after specific instructions are given by the Engineer.

5.10 Formwork:

5.10.1 General

a) The forms for concrete work shall have sufficient strength and rigidity to hold and withstand the pressure of fresh concrete during compaction including live load and shaped to the required line writhing the tolerance specified. The tolerances specified are for finished concrete and not for the forms. Where the character of the natural material cut into to receive a concrete structure, is such that it can be trimmed to the prescribed lines, the use of forms shall not be required. All exposed concrete surfaces having slopes of two horizontal to one vertical or steeper shall be formed.

b) Forms shall be used wherever necessary to confine the concrete and shape it to the required lines or to ensure against contamination of the concrete by material caving in or sloughing from adjacent surface left by excavation or other features of the work. All exposed concrete surface having slope steeper than two horizontals to one vertical shall be formed.

c) Formwork may be of plywood, timber, steel or precast concrete panels or of such other suitable materials or combination of such materials. Formwork shall be substantially and rigidly constructed to the shapes, lines and dimensions required, efficiently propped and braced to prevent deformation due to placing, vibrating and compacting, other incidental loads or the effect of weather. If settlement or deflection of forms under the load of fresh concrete is to be expected, allowance should be made in the original construction of the forms so that the finished lines and dimensions of the structures are in accordance with those specified on the drawings. The bamboos for formwork shall be straight and in one piece. The form work for concrete shall be designed, treating concrete as a fluid, weighing 150Ibs/cuft. (2400 kg/cu.mt) addition a live load of 50 Lbs/sq. ft (245 kg/cu.mt) on horizontal projection of the surface shall be used. The supports shall be so arranged as to keep the maximum deflection within 1/360 of the span. Forms shall be designed and constructed to permit early removal without injury to the concrete. Suitable devices shall be used to hold corners, adjacent ends of panels of other forms together in accurate alignment during compaction of concrete by vibration or other means. The forms and their joints shall be tight enough to prevent, while vibrating, the loss of mortar from concrete. The ties and bracings as may be necessary shall be attended to. Forms to be used more than once shall be maintained in serviceable condition and shall be clean, smooth and free from adhering grout before being reused. Curved and special forms shall be of a character that will result in smooth concrete surfaces. They shall be designed and constructed so that they will not warp or swell during erection or placing of concrete.

d) The surface of form work shall be made such as to produce surface finishes as specified and form work joints space be tight enough to prevent loss of liquid or bleeding from concrete. Joints between the form work and existing concrete structures shall also be grout tight. Formwork shall be arranged to facilitate easing

and removing of the various parts in correct sequence, without jarring or damaging the concrete. Fixing blocks, or bolts similar devices may be embedded in the concrete, provided they do not reduce the strength or effective cover of any part of the structure below the required standard. But the use of through bolt shall be avoided as far as possible. Temporary opening shall be provided at all points necessary in the forms to facilitate cleaning and inspection immediately before placing of the concrete.

e) Form shall overlap the hardened concrete in the lift previously placed by not less than 75 mm and shall be tightened snugly against the hardened concrete. Particular attention shall be paid in setting and tightening the forms for construction joints so as to get a smooth joint free from sharp deviations or projections.

f) Molding strips shall be placed in the corners of forms so as to produce chamfered edges as required on permanently exposed concrete surface.

g) The formwork for various types of vertical R.C.C. members i.e. retaining walls, counter forts, bridge piers side walls, abutment walls or any vertical wall shall be carried out as per drawing or any equivalent arrangement approved by Engineer-in-Charge shall be used. Formwork shall not allow any exposure of corrosive material after removal of formwork. The shuttering arrangement for that consisting of through bolts (either replaceable or non-replaceable) or reinforcing bolts, washer which shall be confirming to IS: 1786-1985. It will come in direct contact with water, soil or any aggressive atmosphere which will ingress on corrosion of reinforcement and ultimately lead to the deterioration of concrete which is not permitted. It shall be consisting of projecting cores H.D.P.E (High Density Polyethylene Extrusion) which shall be confirming to IS: 7328-1974 and P.V.C. IS: 10515-1982 or any latest published code. After concreting work is completed the bolt shall be removed and the hole left in concrete shall be filled in accordance with the provision of repair of concrete as per Para 5.15.

5.10.2 Material to be used

a) Material used for form sheathing and lining shall conform to the following requirements.

Required Finished	Timber Sheathing of lining	Steel Sheathing or lining
F1	Any type grade timber meeting the dimensional requirement of surface finish except that metal forms shall be used on surface of internal transverse and longitudinal joints in mass concrete gravity walls.	Steel sheathing permitted steel lining permitted exact on surface of internal transverse and longitudinal joints in the structure component where steel sheathing is required.
F2	Common grade timber of plywood or plywood sheathing or lining.	Steel sheathing permitted steel lining permitted if strongly

		supported.
F3	For plain surface common grade timber or better timber sheathing or plywood.	Steel sheathing permitted steel lining not permitted
F4	For warped surface timber which is free from knots and other imperfections and which can be cut and bent accurately to the required shape without splintering or splitting.	Steel sheathing permitted steel lining not permitted

Note: Steel sheathing denotes steel sheets not supported by a backing of timber boards; steel lining denotes steel sheets supported by a back of timber boards.

b) Timber sheathing or lining shall be of such kind and quality or shall be so treated or coated that there will be no chemical deterioration or discoloration of the formed concrete surfaces. The type and condition of form sheathing and lining and the ability of forms to withstand distortion caused by placement and vibration of the concrete, and the workmanship used in the form construction shall be such that the formed surface will conform to applicable requirements of this specification pertaining to finish off formed surfaces.

c) Forms for concrete surface required to receive F2 and F3 finishes shall be constructed so as to produce uniform and consistent texture and pattern on the concrete faces. Metal patches on forms for these faces shall not be permitted. The form sheathing or lining shall be so placed that all horizontal form marks are continuous across the entire surface. Where finish F2 is specified the sheathing or lining shall be placed so that the joint marks on the concrete surface shall be in general alignment both horizontally and vertically and the form sheathing material used for such surfaces shall be restricted to one type in any one major feature of the work.

d) Forms for surfaces required to receive F4 finish shall be constructed so as to confirm accurately to the required curvature of the section. Where necessary to meet requirements for curvature, the form sheathing shall be built up of laminated splices cut to make right, smooth form surface. The forms shall be so constructed that the joints marks on the concrete surface shall in general, follow the line of water flow. After the forms have been constructed, all surfaces imperfections shall be corrected, all the nails shall be hidden and any roughness and all angles on the surface of the forms caused by matching the forms materials shall be dressed to curvature.

e) If temperate hard wood is used as form lining, it shall be continuously supported with timber or plywood.

f) Embedded ties for holding forms shall remain embedded and except where F1 finish is permitted they shall terminate not less than two diameters or twice the

minimum dimension of the tie or ten millimeters whichever is greater, from the formed faces of the concrete. Where F1 finish is permitted, ties may be cut off flush with formed surface.

g) The ties shall be constructed so that removal of the ends or end of fasteners can be accomplished without causing appreciable spelling at the faces of the concrete. Recesses resulting from removal of the ends of the form ties shall be filled in accordance with the provision for repair of concrete as per relevant para.

5.10.3 Form, Centering and Temporary works.

(a) The basic requirements of good formwork are strength, rigidity and conformity to design and geometrical shapes. The formwork shall be properly designed to withstand the loads coming over it. The formwork shall also be firm and rigid. It shall be so strong that at the time of vibration of concrete it does not get out of alignment and does not allow any mortar or water to leak from the gaps. It should be so designed that it can be finely adjusted in lines and levels and can be removed gradually by wedging action. Form oil shall be applied to facilitate easy removal of formwork without damaging the concrete surface. In short, formwork shall be given due importance in the concrete work. As far as possible only steel formwork shall be used.

(b) Timber formwork can be used where special shapes are to be formed and where repetitive use is not feasible. Plywood of good quality should be used or wood should be lined with G.I sheeting. Green or wet timber shall not be used. If, the formwork has been in use for some time, its surfaces shall be checked for geometrical shape. Defect if any, shall be corrected before use.

(c) All centering, formwork and temporary works shall be constructed according to the approved drawings and specifications. The IS:883-1970"Code of practice for design of structural timber in building" shall be applicable for this work.

As soon as practicable, after the acceptance of his tender, the Contractor shall submit a scheme showing the order of precedence and method by which he proposes to carry out work, together with such details as are necessary to demonstrate the adequacy, stability and safety of the methods.

(d) The approval to the general scheme of centering as well as design criteria and loading shall be obtained in good time to facilitate all preparatory works. Any delay on this account shall be the responsibility of the Contractor.

(e) After approval of the general scheme, the Contractor shall prepare detailed design and drawings for execution of the formwork, centering and temporary work. These shall be forwarded to the Engineer-in-Charge for approval. No work shall be carried without prior approval of the Engineer-in-Charge.

(f) Notwithstanding to the approval given to the design criteria and loading and the general scheme for the centering, the entire responsibility for the satisfactory execution of centering and all temporary works shall rest with the Contractor and he shall be liable to pay all claims and compensation arising from any loss or damage to life and property due to deficiency, failure or malfunctioning of the centering or the temporary works.

(g) Forms required to be used more than once shall be maintained in serviceable condition and shall be thoroughly cleaned and repaired before reuse. Where metal

sheets are used for lining forms, the sheets shall be placed and maintained in the forms without lumps or other imperfections. All forms shall be checked for shape and strength before reuse.

(h) The Contractor shall procure minimum two sets of the formwork for walls and slabs.

(i) **Scaffolding: -**

The scaffolding, hoisting arrangements and ladders etc. required for the facility of concreting shall be provided and removed on completion of work by the contractor at his own expenses. The scaffolding hoisting arrangement and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders work and workman etc. and a certificate from the supervisory Engineer of the contractor for its safety shall be furnished by the contractor before approval of scaffolding by the Engineer-in-charge. The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work spot and offer easy inspection.

5.10.4 Cleaning and Treatment of Forms

At the time the concrete is placed in the forms, the surfaces of the forms shall be free from encrustations of mortar, grout or other foreign materials. Before concrete is placed, the surfaces of the forms designated to produce F1, F2, F3, and F4, finishes shall be oiled with commercial form oil that will effectively prevent sticking and will not stain the concrete surface. For timber forms, form oil shall consist of pure refined pale paraffin mineral oil or other approved form oil. For steel forms, form oil shall consist of refined mineral oil suitably compounded with one or more ingredients which are appropriate for the purpose. Care shall be taken to keep form oil out of contact with reinforcement.

5.10.5 Removal of Forms

(a) Except or otherwise, provided in this sub clause forms shall be removed as soon as the concrete has hardened sufficiently, thus facilitating satisfactory specified curing and earliest practicable repair of surface imperfections. Forms on upper sloping surface of concrete, such as forms on the water sides of warped transition, shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repair or treatment required on such sloping surface shall be performed at once and be followed immediately by the specified curing.

(b) In order to avoid excessive stresses in the concrete that might result from swelling of the forms, timber forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.

(c) Subject to approval, forms on concrete surface close to excavated rock surface may be left in place provided that the distance between the concrete surface and the rock is less than 400mm and that the forms are not exposed to view after completion of the works.

(d) Forms shall be removed with care so as to avoid damage to the concrete. Concrete damaged if any in form removal shall be repaired in accordance with the provisions for repair of concrete as per Para 5.15

(e) Minimum strength to be attained by concrete for safe removal of forms

(i) Concrete not subjected to appreciable bending or direct stress nor reliant on forms for vertical support nor liable to injury from removal or other construction activities, vertical or approximately vertical surface of thick section-500 psi (35 kg/sq.cm.)

(ii) Concrete subjected to appreciable bending and for direct stress and partially reliant on forms for vertical support.

(a) Subject to dead load only, surfaces of unloaded Columns, walls, beams, and other than sections (750 PSI at three day)

(b) Subject to dead and live loads, galleries, loaded columns and walls. (1500 PSI at three day)

(c) Roof or floor slabs, walkways, platforms etc., press and not on boards (2000 PSI at 20 days).

(d) Heavily reinforced beams, bridges, lock and girders and other heavily reinforced thick section wholly reliant on forms for vertical support (2500 PSI at 20 days).

(f) In normal circumstances and where ordinary cement is used, form may be struck off after expiry of following period.

i.	Side walls of Beams	28 to 48 hrs
ii.	Removal of beam soffits	
	(Props left under)	7 days
iii.	Removal of props slab	
	Spanning up to 4.5 mt	7 days
	Spanning over 4.5 mt	14 days
iv.	Removal of props of beams and arches	
	Spanning up to 6 mt	14 days
	Spanning over 6 mt	21 days.

The period given above in brackets are approximate and for rough guidance. The removal of forms should entirely be based on the minimum strength specified varies widely under different job conditions of temperature, materials and curing etc.

(g) Procedure when removing the form work:

All form work shall be removed without such hook or vibrations as would damage the reinforcement concrete surface. Before the soffits and struts are removed, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

(h) Re-Use:

Before use all form shall be inspected by the Engineer-in-charge and their suitability ascertained. The forms shall be scarred. Cleaned and joints, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

5.11 SPECIALIZED FORM WORK:

Specialized form work may be required in the case of slip form work under water concreting, segmental construction etc. Such specialized form work shall be designed and detailed by competent agencies and design shall be certified by qualified Structural Engineer under his Signature and Seal and a set of complete work drawing and installation instruction shall be supplied to the Engineer. The site personnel shall be trained in the erection and dismantling as well as operation of such specialized form work. In case proprietary equipment is used the supplier shall supply drawing details, installation instructions, etc. in the form of manuals along with the form work. Where specialized form work is used close co-ordination with the design of permanent structure is necessary.

For slip form the rate of slipping the form work shall be designed for each individual case considering various parameters including in the grade of concrete, concrete strength, concrete temperature, ambient temperature, concrete admixtures etc. In the case of segmental construction, the concrete mix shall be normally designed for developing high early strength so that the form work is released as early as possible.

In order to verify the time and sequence of striking/removal specialized form work, routine field tests for the consistency of concrete and strength development are mandatory and shall be carried out before adoption.

For specialized formwork, the form lining material may be either plywood or steel sheet of appropriate thickness. Plywood is preferably where superior quality of surface is desired, whereas steel sheeting normally used where large number of repetitions are involved.

5.12 Finishing:

(a) **General:** The concrete surface shall be termed as formed or unformed. Both types of surface shall be finished by skilled workmen. The concrete surface shall be tested as detailed below and compared with the tolerance fixed. The surface irregularities shall be classified as either 'abrupt' or 'gradual' Offsets and fins caused by displaced or misplaced form sheathing, lining or form section by loose knots in forms or by otherwise defective form number shall be classified as 'abrupt' and tested by direct measurement. Others shall be template as 'gradual' irregularities and measured with a template as 'gradual' irregularities and measured with a template consisting of a straight edge for plain surface or its equivalent for curved surface. The length of the template will be 5 ft. (1.5m) for formed surface and 10 ft. (3.0m) for unformed surface. All exposed surface shall be cleaned of all unsightly encrustations or stain.

(b) Formed Surfaces: Surface having slopes steeper than two horizontals to one vertical shall be formed. The classes of finish for formed concrete surface are designated by the use of symbols F1, F2, F3 and F4. Unless otherwise specified or indicated on the drawings, the classes of finish shall apply as follows:

F1 – Finish: F1 applies to formed surface upon or against which backfill or concrete is to be placed or which will otherwise be permanently concealed. The surface requires no treatment after form removal, except removal and repair of defective concrete and the specified curing. Correction of surface irregularities will be required only for depressor greater than 1 inch. Form sheathing may be anything that will not leak mortar when concrete is vibrated. Form may be built with minimum of refinement.

F2 – Finish: F2 applies to all formed surface not permanently concealed by backfill or concrete except surface for which finish F3 or F4 is specified. This would apply to all galleries, structures and to other permanently exposed surface for which other finish are not specified. Surface for which finish F2 is specified will need no filling of pits or sack rubbing and no grinding other than that needed for repair of surface imperfection. Surface irregularities, shall not exceed ¼ inch (6mm) for abrupt irregularities and ½ inch (12mm) for gradual irregularities.

F3 – Finish: F3 applies to all formed surface. This shall be applicable for surfaces or structures permanently exposed to public view when appearance is of special importance such as parapets, spillway piers, interior and exterior walls of hoist elevator towers and other decorative features. No general stoning or grinding will be required on surfaces for which Finish F3 is specified, although in some cases conspicuous air holes shall be filled by sack rubbing. Surface irregularities shall not exceed 1/8 inch (3 mm) for abrupt irregularities and ¼ inch (6 mm) for gradual irregularities. irregularities exceeding these limits shall be reduced by grinding with no.60 carborundum stone or sand grinder to a level of 1 to 20 ratio of height to length. Immediately after removal of form work from surfaces for which f3 as required, sack rubbed mortar finish, as described below, shall be given to fill up the air holes and to remove difference in colour, if any, due to use of excess oil on forms and rust stains after completing all patching, cleaning operations and correction of major imperfections.

F4– Finish: F4 applies to formed surfaces where accurate alignment and evenness of surfaces are essential for prevention of destructive effect of running water e.g. it applies to hydraulic surfaces. Such surfaces include spillway crest, spillway face, spray wall, part of divide wall exposed to running water, intake for canals, outlet for canals, energy dissipation for outlet works, in late structures, spillway face, except where special finish is required. in addition to any necessary repairs, surface treatment will consist of the grinding of offsets and bulges on a level of 1 to 20. gradual surface irregularities shall not exceed ¼ inch (6mm).

Special Finish: This finish shall be applied to star risers, and other important places where especially smooth and even surface is required. Forms from the vertical surfaces where the special finish is required, shall be removed between 12 to 24 hours after completion of concreting and all required patching and repair of major imperfections shall be done. Then the entire surface shall be wetted with a brush and rubbed with a hard-wood float, dipped in water containing two pounds of Portland cement per gallon of water (0.2 kg of cement per liter). Rubbing shall be continued, until all form marks and projections are removed. Wood float rubbing shall be timed in such a way, that the aggregate grains should not be dislodged nor so late, that the surface is too hard to be readily dressed. curing of the surface shall

be continued till the completion of the curing period of concrete. The grindings from the rubbing operations shall be uniformly spreaded over the entire surface with a brush in such a manner as to fill all pits and small holes. The brushed surface shall be allowed to harden and shall then be kept moist for at least 3 days. the final finish shall then be obtained by rubbing with a carborundum stone of no.50 grit until the entire surface has a smooth texture and is uniform in colour.

Unformed Surfaces: The classes of finish specified for unformed surfaces are designated as U1, U2 and U3. Unformed surfaces exposed to weather and those which would normally be horizontal shall be sloped for drainage. Unless otherwise indicated, on drawings or ordered, narrow surfaces such as the top of walls and curbs shall be sloped 3/8" per foot (30.0 mm per meter) of width and broader surface such as roadways, platforms and decks shall be sloped ¼" per foot, (20 mm per meter). Concrete having unformed, exposed surface shall contain just enough mortar to avoid the necessity for excessive floating. Collection of excess mortar at the surface after thorough compaction should be avoided and any fine materials or excess mortar worked up to the top should be removed. No dry cement nor a mixture of dry cement and sand shall be sprinkled directly on the surface to stiffen the mix. Use of finishing tools in areas where water has accumulated should be prohibited. Operations on such areas should be delayed for nearly 30 to 40 minutes until the water is absorbed, has nearly 30 to 40 minutes until the water is absorbed, has evaporated, or is removed by draining or other means. The finish shall be brought to a smooth surface free from defects and blemishes. Working of the surface of the various finishing operations should be the minimum necessary to obtain the desired finish.

Finish U1: Finish U1 shall apply to unformed surface finished by screening. This finish shall be done for all concealed surface such as floor which will be covered concrete floor topping and for surface requiring roughness such as road surface. This is also used as the first stage for finish U2 and U3. The finishing operations shall consist of leveling and screening the concrete to produce an even uniform surface and surface irregularities of more than 3/8" (10.0 mm) shall not be permitted.

Screed Finish: Wherever feasible, electrically operated vibrances shall be used. After the concrete is thoroughly vibrated, finishing pass of the vibrating screed should follow with the vibrator running at low frequency. The finishing pass shall be made with the screed sliding along the forms and shall be performed by skilled workmen.

Wherever wooden or metal screed is used, it should be removed back and forth across the concrete with a skewing motion and advanced forward a short distance with each movement with some excess concrete against the front face of the screed. This will facilitate filling of low portions of concrete to the desired surface as the template passes over. Metal edged screed should be used where minimum tearing of surface is desired.

Finish U2: This is a floated finish and shall be used for spillway bucket, exposed face of spillway bridge, floors of galleries, surface of gutters and similar another outdoor unformed surface. Floating shall be done either by vibrances or metal edged screed. The concrete surface shall be left undisturbed for 30 to 45 minutes

until all surface water has disappeared and there is no visible seen. Minimum floating necessary to produce surface uniform in texture and free from screed marks, should be done. Wherever finish U3 is to be applied the floating should leave, small amount of mortar without excess water at the surface to permit effective troweling. Any necessary cutting or filling should be done during the floating operations. Joints and edges shall be finished with steel edging tools. Surface irregularities shall not exceed ¼ inch (6 mm).

Finish U3: This is troweled finish and shall be applicable to unformed surface permanently exposed to view such as top of parapets, stair treads and gallery floors. When the floated surface has stiffened sufficiently to prevent excess of fine material or free water being drawn to the surface, steel troweling shall be started and too long a delay in troweling should be avoided as the surface will become too hard for finishing. Steel troweling shall be performed with a firm pressure that will flatten and smoothen the sandy texture left by floating and the troweling should produce, dense, uniform surface, free of blemishes, surface irregularities more than ¼" (6 mm) and trowel marks. For this regular U3 finish shall be troweled again after the surface is nearly hardened, using glossy appearance. When the concrete surface has hardened sufficiently, initial curing shall be done by gentle spraying of water, taking care to protect the finished surface.

5.13 Preventing hair cracks:

Hair cracks are usually the result of concentration of water and fines at the surface caused by over-manipulation during and by too rapid drying or cooling. When the humidity is so low as to cause cracking of the finished surface before it can be covered without damage, the surface should be moistened and kept moist temporarily with a very fine spray of water supplied so as not to wash the surface nor form pools on it. Since chilling of the green concrete increases its tendency to crack, it is desirable that the water used for preliminary moistening not be cooler than and should preferably be warmer than concrete.

5.14 Curing protection:

All concrete shall be protected against injury until final acceptance. Unhardened concrete shall be protected from heavy rains and flowing water. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time. Exposed finished surface of concrete shall be protected from the direct rays of the sun for at least the first three days after placement. Such protection shall be made effective as soon as practicable after placing of unformed concrete or after the removal of forms from formed concrete. Exposed finished surface of concrete shall be protected from the direct rays of sun for at least 72 hours after placement. Concrete shall be kept continuously moist for not less than 21 days. Construction joints shall be cured in the ways as other concrete and shall also be kept moist for at least 72 hours prior to the placing of additional concrete upon the joints. Approximately horizontal surface shall be cured by sprinkling or by covering by damp sand, or may cured by covering with mats. If damp sand is used for curing, it shall be removed completely later. Water curing shall be used on all concrete works. It shall be applied by means of sprays or sprinklers.

Forms shall be kept sprinkled until removal. The contractor shall protect all concrete against injury until final acceptance by the engineer.

5.15 Repairs of concrete:

5.15.1 Repair of concrete shall be performed by skilled workers. All imperfection of the concrete shall be corrected as necessary to produce smooth surface. Repairs of imperfections in formed concrete shall be completed as soon as practicable, within 24 hours after the removal of forms. Concrete that is damaged from any cause, concrete that is honey-combed, fractured or otherwise defective and concrete, which because of excessive surface depressions must be removed and replaced by dry pack mortar or as hereinafter specified.

5.15.2 Dry filling shall be used for holes that have surface dimensions smaller than the depth of hole, such as for holes left by the remover of fasteners from the ends of form, tie road for grout, insert holes and for narrow slots, out for repair of cracks. Filling of holes left by removal of fasteners from the ends of the tie roads in the surface, for which finish F1 is specified, will not be required. Dry pack shall not be used for filling behind reinforcement or for filling holes that external completely through a concrete section.

5.15.3 Mortar filling, placed under impact by use of mortar gun, shall be used for holes too wide dry pack filling and too shallow for concrete filling and no deeper than the far side of the reinforcement that is nearest concrete surface.

5.15.4 Concrete filling shall be used for holes extending through concrete sections, for holes which are greater in area than one square foot (0.1 Sqmt) and deeper than 4 inches (0.1 m), and for holes, in reinforced concrete, which are greater in area than one half square foot (0.05 Sq. mt) and which extend beyond reinforcement. All materials, procedures and operations used in the repair of concrete shall be subject to direct by the Engineer. All filling shall be bounded tightly to the surface of the hole and shall ne sound and free from shrinkage, cracks and drumly areas after the filling has been cured and dried. All filling in surface for which finish F3 specified shall contain sufficient white Portland cement to produce the same colour as that of the adjoining concrete.

5.15.5 All patching shall be with extreme care, co that patches will not be noticeable from a distance of 75 ft (25mt). Colored cement as an ingredient of the patching mortar may be used if necessary, to produce patch of same colour as the adjoining concrete.

5.16 Use of Dry Pack mortar:

5.16.1 Repair operations shall be preceded by a careful inspection to see that hole is thoroughly. Clean and slightly wet but with a small amount of free water on the interior surface. The surface shall then be dusted lightly and slowly with cement by means of a small dry brush until all surface are covered and darkened by the absorption of water by the cement. There shall be no dry cement in the hole when packing begins and such cement, if present, shall be removed. The holes shall not be painted with wet cement grout.

5.16.2 Dry pack mortar shall consist of a mixture of 1 part of cement of 2 ½ part of sand that will pass a no 120.I.S. Sieve. White cement will be used in sufficient quantity to produce uniform colour matching with that of surrounding concrete at points wherever desired by the Engineer.

5.16.3 For packing cone-bolt holes, a leaner mixture of 1 to 3 to 1 to 3 ½ will be used. Only enough water shall be used to produce a mortar which when used, will stick

together on being molded into a ball by slight pressures of hands, and will not exclude water but will leave the hands damp. (The proper amount of mixing water and proper consistency are those which will produce a filling which is at a point of becoming rubbery, when the material is solidly packed).

5.16.4 Dry pack mortar shall be place and packed in layers having a compacted thickness pf about 3/8 inch (10mm). The surface of each layer shall be scratched to facilitate bonding with next layers. One layer may follow unless appreciable rubberizes develops, in which case work on the repair shall be delayed 30 to 40 minutes. Under no circumstances shall alternate layers of wet and dry materials be used.

5.16.5 Each layer must be solidly compacted over the entire surface by use of a hard wood stick and a hammer. (These sticks are usually 8 to 12 inches (20 to 30cm) long and not over 1 inch (25 mm) in diameter and are used on fresh mortar like a caulking tool). Much of tamping will be directed at a slight angle and towards the sides of the holes to assure maximum compaction in these areas. The holes shall not be overfilled and finishing shall be completed at once by laying the flat side of a hard wood piece against the fill and striking used, and water must not be used to facilitate finishing.

5.17 Requirement of Concrete Construction.

5.17.1 General

All concrete construction shall conform to the permissible tolerance and technical provisions as described in this section and to the detailed requirements of the lines grades and dimension shown in the drawing or as prescribed by the Engineer-in-Charge. The location of all the construction joints shall be subject to the approval of the Engineer-in-Charge. The dimension of each structure shown on the drawings shall be subject to such changes as may be found necessary by the Engineer-in-Charge to adopt for the structure to the conditions disclosed by the excavation.

5.17.2 Concrete in various components of Canal Syphon, Drainage Syphon, Cross Regulators, Head Regulators, and other structures.

a) The item of the schedule for concrete in aforesaid structure includes all concrete in the various components of the structure and block outs.

b) Expansion joints shall be constructed as shown on the drawing or as directed. Remolded bituminous fiber type expansion joint material shall be placed in the expansion joints. Lighting recesses shall be constructed in the parapets as directed by the Engineer-in-Charge. Open joints or false joints shall be constructed as shown on the drawings or as directed by the Engineer-in-Charge. Preformed expansion joint filler shall be placed in the roadway and side walls where shown on the drawings or as directed by the Engineer-in-Charge.

5.17.3 Concrete in Block outs

a) All concrete required to be placed in block outs to permit the installation and adjustment of mechanical and other equipment shall be included in the respective concrete as described above. The concrete surface of the block outs shall be chipped and roughened as described hereinafter before the concrete is placed in block outs.

b) Exceptional care shall be taken in placing the concrete in block out in order to ensure satisfactory bond with the concrete previously placed and to secure complete contact with all metal work in the block outs.

c) The roughening of the concrete surface of the block outs shall be performed by

chipping or sand blasting as approved by the Engineer-in-Charge and in such a manner as not to loosen, crack or shatter any part of the concrete beyond the roughened surface. After being roughened the surface of the concrete shall be cleaned thoroughly of loose fragments, dirt and other objectionable substances and shall be sound and hard to ensure good mechanical bond between the existing and new concrete. All concrete which is not hard, dense and durable shall be removed to the depth required to the satisfaction of the Engineer-in-Charge. While placement of concrete, care shall be taken so as not to dislocate or disturb installation

5.17.4 Embedment in Concrete

In some of the locations of structures as shown on the relevant drawings a few conduits or openings shall have to be provided through RCC/ PCC/ Masonry work. Construction of the surface for either placement of concrete or for laying of masonry shall have to be suitably carried out so as to meet with the placement to such conduits or openings. No extra claim for such improvidence in construction shall been entertained.

5.18 Construction Joints

a) Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown on approved drawings or as directed by the Engineer-in-Charge.

b) For vertical construction joints stopping boards shall be fixed previously at a predetermined position and shall be properly stayed for sufficient lateral rigidity to prevent its displacement or bulging when concreting is completed against it. Concreting shall be continued right up to the board. The board shall not be removed before expiry of the specified period for removal of vertical forms.

c) Before resuming work at any construction joints when concrete has not yet fully hardened, all laitance shall be removed thoroughly, care shall be taken to avoid dislodgement of coarse aggregates.

d) When work has to be resumed on a surface which has hardened, it shall be thoroughly raked, swept cleaned, wetted and covered with a layer of neat cement grout. The neat cement grout shall be followed by a 15 mm thick layer of mortar mixed in the same proportion as in concrete and concreting resumed immediately thereafter. The batch of concrete shall be rammed against the old work to avoid formation of any stone pockets, particular attention being paid to corners and close spots.

e) In all cases, the position and detailed arrangement of all construction joints shall be predetermined and got approved from the Engineer-in-Charge.

f) The contractor shall construct the concrete steps near the structure. The steps shall be construct M-15 grade as shown in drawing or as directed by the Engineer in Charge for inspection

5.19 Tests and Standards of Acceptance

(a) For controlled concrete tests shall be carried out consist of casting concrete cubes of size 15cm x 15cm x 15cm, in three separate sets and in each set, tests shall be conducted on six specimens. Not more than one set of six specimens, shall be made on any particular day. Out of the six specimens in each set, three shall be tested at seven days and the remaining three at 28

days. The preliminary tests at 7 days are intended only to indicate the strength likely to be attained at 28 days. In all cases, the 28 days compressive strengths shall alone be the criterion for acceptance or rejection of the concrete.

(b) The provision under para 4.5.1(c) for sampling procedures and frequency of test specimen, test strength of samples and acceptance criteria shall apply.

5.20 Tolerances in Concrete Construction

5.20.1General

(a) Permissible surface irregularities for the various classes of concrete surface finishes specified in the relevant portion of the paragraph of "Finishes and Finishing of Concrete Surfaces" are defined as finishes and are to be distinguished from "Tolerance" as described in it this section. Deviation from the established lines, grades and dimensions shall be permitted to the extent set forth in this clause, provided that lesser tolerance than that set forth in this clause may be prescribed at site if such tolerances are considered to impair the structural action or operational action or operational function of the structure.

(b) Where tolerances are not stated in the specifications or drawings for any individual structure or feature there-of, permissible deviations shall be interpreted in conformity with the provision of this clause.

(c) Concrete work that exceeds the tolerance limits specified in this section shall be either remedied as directed by Engineer-in-Charge or removed.

5.20.2 Tolerances for Structures

Variation in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawings shall be within the tolerances specified in relevant IS code.

General: The intent of this paragraph is to establish tolerances that are consistent with modern construction practice, yet governed by the effect that permissible deviation will have upon the structural action or operational function of the structure. Where tolerances are not stated in the specifications or drawing for any individual structure or feature thereof, permissible deviation will be interpreted in conformity with the provision of this paragraph.

The contractor shall construct all concrete structures to the exact lines, grades, and dimensions established.

However, inadvertent variation from the established lines, grades and dimensions will be permitted to the extent set forth herein, provided, that the Engineer reserves the right to diminish the tolerance set forth herein if such tolerance impairs the structural action or operational function of the structure. The notation on the drawings of specific maximum or minimum tolerances in connection with any dimension shall be considered as supplemental to the tolerances specified herein. Rejected work shall be remedied or removed and replaces at the expense of and by the contractor.

5.21 Record of concreting operations:

A systematic joint record in the form approved by the Engineer shall be maintained to record the details regarding weighment and use of cement, number of mixes of concrete, and of mortar used on works, rejected mixes, locations in which concrete or mortar is used etc. This record shall be signed by the Engineer or his authorized representative on the site in token of having scrutinized and verified the

correctness of the entries made in the joint record. If the contractor fails to scrutinize and scrutinize and verify the entries and sign the joint record, the record, as scrutinized, verified and signed by the Engineer or his representative shall be taken as final and binding on the contractor.

5.22 Unacceptable works:

All defective concreting work including but not limited to defects arising out of honey-combing, under sizing, under strength etc. are liable to be demolished and rebuilt by the Contractor at his cost. In the event of such work being accepted by carrying out repairs etc. as specified by the Engineer-in-Charge, the cost of repairs shall be borne by the Contractor. Acceptance of such works will be in accordance with the provisions of IS: 456-2000. In the event of the work being accepted by giving a design concession arising out of but not limited to under sizing and strength by accepting higher design stresses in member and accepting materials not fully meeting the specifications etc. the Contractor shall be paid for the work actually carried out by him at a reduced rate derived from the tendered rate as approved by the Engineer-in-Charge.

5.23 MEASUREMENT &PAYMENT:

5.23.1 Measurement and payment of concrete shall be made on the basis of the actual volume of the concrete for the class as placed within the lines as specified or as otherwise directed by the Engineer, according to all the provisions mentioned above. No deductions shall be made for the space occupied by the reinforcement anchor bars and electric conduit lines etc. The quantities of all holes and passages greater than 10 cm (4") in dia. Shall, however, be deducted from the total quantity to arrive at the concrete work for payment. The reinforcement, steel and other embedded metal parts shall be separately paid at the rates accepted as per the schedule of prices.

5.23.2 No payment will however be made for embedding fixtures or providing grooves, block outs etc. for gates and other installations, electric conduits etc. All labour material, plant etc. involved in providing cement slurry and mortar on rock surface and construction joints etc. shall be deemed to be included in the unit rate to be paid for concrete.

5.24.3 Measurement for payment for the trimming and preparation of Sub-grade shall be made on square meter base.

5.25.4 Measurement for payment of plain cement concrete lining will be based on square meter of plain concrete lining.

~~**6. Cement Concrete Lining:**~~

~~**6.1 SCOPE OF WORK:**~~

~~**(a)** The section covers specification for item of cast in situ lining in **1:2:4 grade** for thickness of **10.00 cm**.~~

~~**(b)** Concrete lining shall be done manually by laying plain cement concrete of grade with maximum size of aggregate as 20 mm or as directed and minimum cement level as per mix design of for actual available material confirm to relevant Indian Standards for 1:2:4 Grade Concrete with 20 MSA Respectively Per cubic~~

meter of concrete. The thickness of lining shall be of 10 cm thick for canal .The canal sections shall be as shown in relevant drawing. If during construction it is found necessary to alter the canal sections and side slopes without altering the thickness of lining, the contractor shall be informed in writing of such changes. The rates quoted being on square meter basis for the specified thickness the contractor shall have to execute the work at the same rate as quoted without any extra claim for change in the section of canal. Lining shall be provided for the length specified on the drawing in either side of the structures with a thickness of 10 cm in slopes & canal bed as specified on the relevant drawings.

(c) During the preparation of sub-grade for canal lining the proud earthwork shall be excavated and trimmed by trimmer only. This excavation for trimming for preparing the base for lining shall be carried out immediately prior to lining to laying of lining but in no case the time interval should exceed 3 days in normal weather & 2 days in adverse weather condition. **No extra payment shall be made for trimming work.**

(d) This works also include providing and filling the bituminous sealing compound in canal joints in canal lining having thickness 10 cm or as directed by Engineer-in-Charge.

(e) All items of concrete work, its constituents, methods and procedures of manufacture shall conform to relevant Indian Standard Specifications and shall conform general technical specification of concrete.

6.2 PREPARAING OF SUB GRADE FOR CONCRETE LINING.

6.2.1 General.

(a) The provisions under this item applies to the preparation of sub grade upon which concrete lining is to be placed, back filling the over excavated section, watering and compacting canal bed and side slopes using compactors & dewatering where required.

(b) After excavating the canal section for proud, pad cutting, silt removal up to the line representing top of lining, the trimming activity shall start. The work of trimming shall include the canal section up to the underside of concrete lining and preparing sub grade for concrete lining. The thickness of canal section under trimming work shall be as per thickness of canal lining i.e. 10cm.

(c) During the preparation of Sub-Grade for canal lining the proud earth work shall be trimmed. This excavation for trimming for preparing the base for lining shall be carried out immediately prior to lining to laying of lining but in no case the time interval should exceed 3 days in normal weather & 2 days in adverse weather condition. **No extra payment shall be made for trimming work.**

(d) All along the canal alignment the rain cuts on the banks shall be filled up with approved excavated material and shall be compacted adequately to required line and level. The material required for filling the over excavation in rain cuts if not available during excavation in soil to be done under this item, shall be hauled from spoil bank or from available place as directed by

Engineer-In-Charge and placed in position. The canal bed and slopes shall be dressed, wetted to a depth of 15 cm or up to an impervious layer which ever is less and compacted by vibrator / compactor. In canal lining work before placement of concrete canal bed and slope shall be trimmed. **No extra payment shall be made for trimming work.**

(e) If at any point material has been excavated beyond the pay line required to receive the concrete lining, the excess excavation shall be refilled in horizontal layers with selected material moistened, if required, and compacted using rollers and slope compactors. Where placing and compacting bedding material is on a sloping foundation, the layers may be placed parallel to the surface of the foundation. If at any point the foundation material is disturbed or loosened during the excavation process or otherwise it shall be moistened, if required, and thoroughly compacted by tamping, rolling or other approved methods to form firm foundations for placing the concrete lining.

(f) Immediately prior to placing the first lift of bedding material, the surfaces of the excavation and embankment to receive the material shall be adequately wetted to a depth of 15 cm. or to impermeable material whichever in less as approved by the Engineer-In-Charge.

(g) After the canal prism has been shaped to a reasonably true and even surface as described above, bedding material shall be placed on adequately wet surfaces in layers of 15 maximum thickness to bring the bedding material to a height where it can be trimmed to form a true and even surface upon which the concrete for lining is to be placed. Each layer of bedding material shall be moistened and thoroughly compacted.

(h) At the end panels of existing lining against which lining is to be placed under these specifications, all loose material shall be removed and all voids beneath the existing lining shall be refilled and thoroughly compacted.

(i) At the end of panels of existing lining just before monsoon the contractor shall take all measures to adequately protect the underneath of lining in slope and bed so as to prevent the monsoon water entering below the lining and damage it.

(j) Suitable useful material trimmed from the canal shall be used if found suitable and approved by Engineer-in Charge to complete canal embankments or to construct road embankments or for backfill around structures or to deposit bedding material or preparing dowel etc. Where material suitable for bedding as determined by the Engineer-In-Charge is encountered during trimming operations and cannot be placed in one continuous operation, such material shall be stockpiled along the right of way where designated by the Engineer-In-Charge.

6.3 MATERIALS FORCONCRETELINING

The specification of materials for concrete lining shall be applicable as per technical specification of material, SECTION-III of this volume.

6.4.1 CONCRETE FORLINING WORKS.

Controlled concrete shall be used in grade 1:2:4 for lining of canal for 10 cm thickness in main canal, branch canal, distributaries, minors and sub minors as per mix design para 4.6.1 of concrete specification.

6.4.2 Preparation for placing concrete for lining

(a) Concrete shall be placed only in the presence of a duly authorized representative of the dep't. Concrete shall be placed and compacted before initial setting time and shall not be subsequently disturbed.

(b) Placing of concrete shall not be started until sub grade is ready and preparation of surface upon which concrete is to be laid, have been completely inspected and approved by Engineer-In-Charge. All absorptive surfaces against which concrete is to be laid shall be moistened adequately so that moisture shall not be withdrawn from freshly placed concrete. The surfaces, however, shall be free from any water and slush.

(c) Concrete shall be deposited in all cases as neatly as practicable directly in its final position and shall not be caused to flow in a manner to permit segregation. Excessive separation of the coarse aggregate caused by allowing the concrete to fall freely from too great a height or at too great an angle from the vertical shall not be permitted and where such separation would otherwise occur, the contractor shall provide suitable means i.e. belt conveyor to convey the concrete without allowing such separation.

6.4.3 Placing and Compacting Concrete:

(a) Concrete lining shall be with Carried out with digital Fiori machine with concrete from batching plant. As far as it is possible, concrete shall be placed directly in its final position and shall not be caused to flow in a manner to permit or cause segregation. Methods and equipment employed in placing concrete shall ensure that aggregate is not separated from the concrete mass.

(b) Direct manual concrete placing by head basket shall not be permitted. Concrete shall be placed with the help of proper metal chutes. The concrete shall be used within 30 minutes of mixing. Re-tempering of concrete shall not be permitted. Any concrete which has become so stiff that proper placing without remembering cannot be ensured shall be wasted.

(c) Concrete when deposited shall unless otherwise specified have a placement temperature of not less than 4.50 c and not more than 320 c unless otherwise specified.

(d) Concrete shall be deposited and spread on the bed and sides of the canal as indicated on the drawings for panel joints in between them. Concrete may be laid to facilitate placing, vibrating, finishing and curing operations. The side lining concrete on the sides of canals shall be screeded up the slope. Concrete required for keys as shown on the drawings shall be laid integrally along with the side slope lining. In manual lining, after placing the concrete grooves for longitudinal and

transverse joint shall be done at the location as shown on the drawing. The grooves shall be continuous & uniform of required size & shape.

(e) The joints shall be formed by lining equipment as per drawing.

(f) The spread concrete should then be compacted properly and thoroughly by means of mechanical or screed vibrators. An improvised plate vibrator operated by high horse power engine and a winch for moving the vibrator up the inclined slope should be made use of for proper compaction. When width of panel is less i.e. up to 2 m manual operation of vibrators is possible and may be permitted. In no case the concrete should be compacted by tamping. The compacted surface should be true to the required side slope. Care should be taken, while placing and vibrating the concrete that, the sub grade in the adjacent bays does not get spoiled.

6.5 FORMWORK.

As per general technical specification of concrete of this VOLUME.

6.6 FINISHES AND FINISHING OF CONCRETE SURFACES.

6.6.1 Formed surfaces.

As per general technical specification of concrete this volume.

(a) All exposed concrete surfaces shall be cleaned of impurities, lumps of mortar or grout and unsightly stains. The finished surface shall be even, smooth and free from pockets and equivalent to the obtainable by

effective use of a long handle steel trowel. Where the surface produced by lining machines meet the specified requirements, no further finishing operation will be required. Surface irregularities, when tested with a straight edge of 1.5 meter length shall not exceed 6 mm in canal bed for bottom slab and 12 mm in that laid on side slopes.

(b) The surface of concrete finished shall be smooth and free from projections honeycombing and other objectionable defects.

(c) Repairs to concrete surface and additions where required shall be made by cutting regular opening into the concrete and placing fresh concrete to the required lines. Chipped openings shall be sharp and shall not be less than 70 mm in depth.

6.7 Curing

6.7.1 The concrete after its initial set shall be protected from excessive heat or sun, rain etc. by covering with wet gunny bags or similar heat absorbent materials or where possible by shallow pools of water on top. Curing with membrane shall be done for slope lining. After final set, the concrete shall be kept continuously wet for 28 days.

6.7.2 In case the contractor fails to make satisfactory arrangements for curing on any day within the curing period, the same shall be done by the department at the risk and cost of the contractor.

6.8 Finishing

6.8.1 The concrete surfaces shall be finished by skilled, workmen, all exposed surface shall be cleaned of all unsightly incrustation or stains. The surface permanently exposed to

public view shall be given cement wash if ordered by Engineer-in-charge.

6.8.2 General Technical Specification of Concrete of this volume shall apply.

6.9 Joints

Transverse joints and longitudinal joint shall be placed in bed as directed by Engineer-in-charge. The joints shall be cut up to 1/3 thickness of lining i.e. 25 mm to 27 mm . The dimensions of the joints shall be as per the provision of IS -3873. The width of grove shall be 11 mm joints shall be filled with sealing compound as directed by engineer in charge. It shall be filled with sand and then after sand shall be removed and filled with bitumen filler. Before applying the primer, the joints shall be thoroughly cleaned and allowed to dry if wet and all loose particles and foreign matter shall be removed. The primer shall be applied by means of a brush or any other suitable applicator so as to completely cover the sides and the bottom of the joint. The sealing compound shall be heated to an appropriate pouring consistency and poured in to the joint with minimum loss of temperature.

7. TMT Bar Reinforcement

7.1 **Scope of work:**

This shall include supplying, bending, binding, cutting and erecting position TMT steel Fe 500, anchor bars and anchor rods etc.

7.2 **Reinforcement Bars:**

7.2.1 TMT reinforcement bars shall meet the requirement of I.S 1786 Fe 500& relevant part of I.S 456/1978. Before steel reinforcement is placed in position, the surface of the reinforcement shall be cleaned of rust, scale, dirt grease and other objectionable foreign substances likely to destroy or reduce bond. Heavy flaky crust that cannot be removed by the firm rubbing with burlap or equivalent treatment shall be considered objectionable. The fact that light, early stage rust has no detrimental effect on bond and hence could be disregarded, shall not be used as excuse for careless handling and storage of steel. In storing, bars of the same size, length, shape, and grade shall be assembling in racks and marked distinctly. Before the reinforcement bars are fixed in position, it shall be verified, that they are of the specified size and are cut and bent in accordance with the plans and specification. They shall be accurately placed and secured in position by means of built in concrete blocks, metallic chairs, hangers, spacers, or other suitable devices at sufficiently close interval so that they will not sag between supports nor be displaced during the placing of the concrete or by any operations for the work. Special care shall be exercised to prevent any disturbance of the reinforcement in concrete that has already been placed. The reinforcement after being placed in position shall be maintained in clean condition until it is completely embedded in concrete to prevent further damage to the concrete or unsightly rust stains on a closed concrete surface.

7.2.2 Supports for reinforcement shall be made of cement mortal of the same water cement ratio as the concrete to be used in the particular work.

7.2.3 Reinforcement shall not be straightened or bent in a manner that will injure or weaken the materials. Bars with kinks or bends not shown on the plans shall not be used. Bars shall be bent to the shape and dimensions shown on the drawings, or as directed using a bar bender operated by hand or power to attain bandings,

or as directed using a bar bender operated by hand or power to attain bending to correct specified radius. The radius for bends along the edge of bar shall be not less than 4 times the diameter of the bar. Heating of reinforcement bars to facilitate bending will not be permitted. However, such heating is permitted in the case of large diameter bars. The temperature of the steel shall not exceed that corresponding cherry red colour as specified by the Executive Engineer in charge of work. The reinforcement available from rejected concrete shall not be used.

7.3. Binding:

Wire for tying reinforcement shall be of soft annealed steel. The wire may be of 16 to 18 BWG and shall have an ultimate tensile strength of not less than 80.000 lbs/sq.inch (5624.6 kg/cm^2) and yield point of not less than 55,000 lbs/sq.inch (3866.88 kg/cm2). Metal bar supports and spacers shall be fabricated from non-corrodible metal. Dissimilar metals shall not be placed in concrete at intimate proximity with each other or be joined by the conductor, especially in the continued presence of moisture, unless it is known that no galvanic action will result. The minimum allowable clearance between parallel round bars shall not be less that l ½ times the diameter and for square bars shall not be less than twice the dimensions of the bars or l ½ times that maximum size of aggregate whichever is greater than and shall conform to I.S. 432-1982 or revised from time to time.

7.4. Splicing:

7.4.1. Bar splices as indicated in the Drawing or as specified by the Engineer shall only be allowed. The lapped ends splicing shall not be done in the region of maximum bending moment and splicing of adjacent bars shall be avoided as far as possible. Suitable splice length as permitted by the Engineer-in-charge or as shown in the Drawing shall be provided wherever needed. Also splices shall be suitably staggered.

7.4.2 Bars above (1") 25 m.m. in dia. May be welded without loss of strength instead or being lapped when permitted or directed by the Engineer. The bar to be spliced shall be lap welded or butt welded by electric welding in the manner specified.

7.4.3 Suitable means shall be provided for holding the bar securely in position during the welding process. Ends of bars to be spliced shall be cleaned of all dirt, scales, rust, paint and the foreign matter before welding. All welding shall conform to the standard welding code of practice. The welded joints shall be paid in terms of length of the bar equal to 40 times diameter of the bars. The welded joints shall be staggered in an approved manner. Three per cent of the of the welded joints shall be tested for the tensile strength at the contractor" cost before placing reinforcement and the strength shall not be less than the standard specified for M.S. bars.

7.5 Covers:

7.5.1 Sufficient concrete coverage shall be provided to protect reinforcement from corrosion as indicated in the drawings.

7.5.2 Cover for concrete shall be as per detailed drawing. Unless shown otherwise on the drawing, the minimum thickness of concrete any reinforcing material, as

measured from the outside surface of concrete to the bar center line shall be as follows:

Type of construction	**Dry Interior (Faces in)**	**Exterior faces above high water and ground (inches)**	**Faces Exposed be water ground (Inches)**
Floor and roofs slabs and light walls (12 inches & less) (0.3 mt& Less)	1.5 (37 mm)	2 (50 mm)	2.5 (62 mm)
Beams and girders	2 (50 mm)	2.5 (62 mm)	3.5 (87 mm)
Columns & heavy walls (12" and over) (0.3 m and over)	2 (50 mm)	2.5 (62 mm)	3.5 (87 mm)
Heavy section	2 (50 mm)	2.5 (62 mm)	5 (125 mm)

7.5.3 All projecting bars from concrete or masonry to which the other bars are to be appliquéd and that will remain exposed to action of weather for an indefinite period shall be protected from rusting by a thin coat of neat cement grout. Accurate records shall be kept at all times of numbers, sizes, lengths and weight of bars placed in position for different parts of the work.

7.5.4 Inspection before concreting:

No concreting shall be started unless the reinforcement as laid is finally checked and certified by the engineer.

7.6 Measurement and Payment

a) Measurement for payment for providing and placing reinforcing bars will be made only on the calculated weight of the bars placed in concrete on tonnage basis, in accordance with the drawings or as directed by the Engineer-in-Charge. Payment shall be made as per the quoted rate of relevant item on the basis of calculated weight in tone as shown in Schedule-B. After placing the reinforcement in position as per the drawing on site, Contractor shall have to give advance information to the Engineer-in-Charge or his authorized subordinates for verifying & recording reinforcement as laid in position by him to avoid delay and dispute etc. No concrete work shall be started prior to taking the detail measurement of reinforcement as laid on site. The calculated weight for reinforcing bars shall be determined as follows.

i) The calculated weight/meter of reinforcing bars used shall be based on the standard weight and the corresponding lengths of bars placed in concrete by the Contractor.

ii) All other joints or splices shown on the drawings or as directed by the Engineer-in-Charge shall be measured as laps. Mechanical coupling and welded joints approved by the Engineer-in-Charge shall be measured for payment in terms of length of equivalent lap joint. Payment for furnishing and placing reinforcement bars shall be made at the rate tendered thereof in the Schedule-

B. The rate shall include the cost of preparing reinforcement as per detailed drawings including bar placing drawings, bar bending diagrams, submitting the drawing to the department preparing all necessary bar cutting lists, furnishing and attaching wire ties and cutting bending, cleaning, securing and maintaining in position all reinforcing bars as shown on the drawings or as directed by the Engineer-in-Charge. The unit rate shall also include cost of all incidental operations necessary to complete the work as per specifications.

iv) Supporting chairs/ separator prepared from TMT Fe-500bar reinforcement shall be measured and paid for as per the standard weights on the line of payment for reinforcing bars.

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

APPLICABLE PUBLICATIONS

All items of work concrete, its constituents, methods and procedures of manufacture shall conform to Indian Standard Specifications and other publications listed below unless otherwise specified.

Indian Standards

1	IS: 383-1970	Specification for coarse and fine aggregates from natural sources for concrete (third revision)
2	IS: 456-2000	Code of practice for plain and reinforced concrete (third revision)
3	IS: 457-1957	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
4	IS: 460-1985	Specification for test sieves (Part 1 to 3)
5	IS: 516-1959	Method of test for strength of concrete (Amendment No.1)
6	IS: 650-1966	Specification for standard sand for testing of cement (first revision) (Amendments No. 1,2 & 3)
7	IS: 1199-1959	Method of sampling and analysis of concrete
8	IS: 1489-1976	Specification for Portland Pozzolana cement (second revision) (Amendments No.1 to 7)
9	IS: 1791-1985	Specification for batch type concrete mixers (second revision)
10	IS: 2386-1977 (Part I to VIII)	Methods of test for aggregates for concrete
11	IS: 2430-1986	Methods for sampling of aggregates for concrete (first revision)
12	IS: 2505-1980	General requirements for concrete vibrators, immersion type (second revision)
13	IS: 2506-1985	General requirements for screed board type concrete vibrators
14	IS: 2580-1982	Jute sacking bags for packing cement (second revision) (with Amendments No.1 to 3)
15	IS: 3085-1965	Methods of test for permeability of cement, mortar and concrete
16	IS: 3535-1986	Method of sampling hydraulic cement (First revision)
17	IS: 3873-1978	Code of practice for laying in situ cement concrete lining of canals (first revision)
18	IS: 4031-1988 (Part 1 to 13)	Methods for physical test for hydraulic cement (first revision)
19	IS: 4032-1985	Method of chemical analysis of hydraulic cement (first revision)

20	IS: 4558-1983	Code of practice for under-drainage of lined canals (first revision)
21	IS: 4634-1968	Method for testing performance of batch-type concrete mixers.
22	IS: 4656-1968	Specification for form vibrators for concrete
23	IS: 4845-1968	Definitions and terminology relating to hydraulic cement (Reaffirmed 1987)
24	IS: 4925-1968	Specification for concrete batching and mixing plant
25	IS: 4926-1976	Specification for ready mixed concrete (first revision)
26	IS: 5256-1968	Code of practice for sealing joints in concrete lining on canals.
27	IS: 5512-1983	Specifications for flow table for use in test of hydraulic cement and pozzolanic materials (first revision)
28	IS: 5513-1976	Specification for Vicar apparatus (first revision) (AmendmentNo.1)
29	IS: 5515-1983	Specification for compacting factor apparatus (first revision)
30	IS: 5529-1985 (Part I & II)	Code of practice for in-situ permeability test
31	IS: 5640-1970	Method of test for determining aggregate impact value of soft coarse aggregates
32	IS: 5816-1970	Method of test for splitting tensile strength of concrete cylinders
33	IS: 5889-1970	Specification for vibratory plate compactor
34	IS: 5892-1970	Specification for concrete transit mixer and agitators
35	IS: 6461 (Part I to XII)	Glossary of terms relating to cement concrete
36	IS: 6923-1973	Method of test for performance of screed board concrete vibrators
37	IS: 6925-1973	Method of test for determination of water-soluble chlorides in concrete admixtures
38	IS: 7245-1974	Specification for concrete pavers
39	IS: 7320-1974	Specification for concrete slump test apparatus (Amendment No. 1)
40	IS: 7861-1975 (Part I & II)	Code of practice for extreme weather concreting
41	IS: 8041-1978	Specification for Rapid Hardening Portland cement (first revision) (Amendments No. 1 to 4)
42	IS: 8043-1978	Specification for Hydrophobic Portland Cement (first revision) (Amendments No. 1 to 3)
43	IS: 8112-1989	Specification for 43 grade ordinary Portland Cement (First Revision)

44	IS: 8142-1976	Method of test for determining setting time of concrete by penetration resistance
45	IS: 9013-1978	Method of making, curing and determining compressive strength of accelerated cured concrete test specimens.
46	IS: 9103-1979	Specification for admixtures for concrete
47	IS: 9284-1979	Method of test for abrasion resistance of concrete
48	IS: 12200-1987	Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams.
49	IS:12269-1987	Specification for 53 grade ordinary Portland Cement (First Revision)

1.1.2 Other Technical Publications

1 Concrete Manual: USBR

2 ASTM: (i) C-156-80 water retention test

(ii) C-309-81 Type -2 Liquid membrane forming compound for curing concrete

(iii) C-491-80 Water Reducing Agent

(iv) E-97 Light reflectance Test

(v) C-494-80

3 Design Aids for Reinforced Concrete SP-16(S&T)-1980
To IS: 456-2000

4 CBIP: (Manual on Canal Lining)

Note:(i) Generally the Bureau of Indian Standard code will be followed for all items of works. Whenever this code does not exist the reference will be taken to other technical publications directed by Engineer-In-Charge.
(ii)Latest Version of IS and other publications shall be used.

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

PART – 2

WORK AND SITE CONDITIONS

WORK AND SITE CONDITIONS

Name of work:- **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.**

1.LOCATION **:**

The work includes **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.** of Ta. Valsad, Di-Valsad to be carried out under jurisdiction of Ambica Division Navsari.

The above information is given for general guidance to contractor. The contractor shall however ensure and satisfy himself regarding all viz. the sites condition, source of material and their quantum, available service etc.

2. BRIEF DESCRIPTION OF THE WORK:

The work is to be carried out under jurisdiction of Executive Engineer, Ambica Division Navsari. The work under the contract, Specification & drawing

Sr. No.	District	Name of Work	Estimated Amt. Rs. Ps.
1	Valsad	**Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.**	**776482.47**

4. LABOUR :

Only unskilled Labour are available locally at the site. All skilled and semi skilled Labour will have to be brought from outside.

5. ACCOMMODATION.

Housing accommodation is not available at the site. No storage facilitates are available at the site and the department will not be in a position to provide such facilities at the site. The contractor shall have to make required arrangement for the work at his own risk and cost if found necessary.

6. MATERIALS TO BE USED :

In the proposed work , Rubble stone, sand ,aggregate, Cement , steel etc. are to be used.

7. WATER SUPPLY :

Potable water will be available in the village nearby the site. Contractor shall have to make their own arrangement m on for drinking water supply and also for the construction purpose on the site of work, if needed.

8. THE INFORMATION AND DATA:

The information and data mentioned herein above as well as shown or given in the various drawings accompanying the tender documents are for general information only. The department shall have no responsibility in respect of accuracy of these information's, interpretation and conclusions drawn by the contractor in so far as the information's / data are concerned. The contractor shall have to make their own investigations to satisfy themselves in regard to information's/data given herein abov

9. SITE CONDITION:

The work are to be executed on canal out of which major canals run rotationally with 15 days closer with sufficient discharge. It is advise to have site visit before quoting rates. It shall be deemed that the contractor have satisfied themselves as to the nature and pertaining to transport handling and availability of labour, weather condition at site and that the tenderer has estimated his cost accordingly and the department will bear no responsibility for any of such knowledge of site conditions and also consequences thereof.

10. ROADS :

The contractor shall construct and maintain suitable service / Infrastructure roads & inspection path or vehicle road in the work limit. Any haul or approach roads if necessary for the contractor's work shall be constructed / removed if necessary at his own cost. There will, however, be no charge of any reasonable use of any road constructed by Government. Above operations shall be carried out by the contractor at their risk & cost and no Payment shall be made by the Department.

11. ELECTRIC POWER :

The contractor shall have to make their own arrangements for getting power supply. If any difficulty is experienced in getting the power, the department may help in settling the difficulty to the extent possible without any obligation on the part of the department on this issue. The power supply is available at village nearby the site.

12. OBSERVATION OF FOREST RULES :
During the construction period, the labourer's and other employed by the contractor agencies shall strictly observe the following requirements :-

(a) Shall not possess or make use of any sorts of weapons (gun, spears etc.) explosive etc. and also shall not engage in hunting animals either for their flesh or for their bites.
(b) Shall not fall or break the trees for use as fire wood.
(c) Purchase all the requirement of teak wood from authorized fire wood depots run by the forest department.

13. MEDICAL AID :

The contractor shall make his own arrangement for normal medical aid to their staff and Labour. For serious cases which have to send to Civil and other Hospital at Navsari.

The contractor shall also provide at his own cost first aid arrangement at various works spots in accordance with the Labour rules and regulations and as may be directed by the engineer.

14. POST & TELEGRAPH :

There is sub post & telegraph office at local villages & taluka places.

15. SUPPLY OF PETROL & DIESEL :

At present there is no such facility available for petrol and diesel at the work site. But this facility is available at taluka places.

Signature of Contractor

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

PART – 3

SPECIAL CONDITIONS

SPECIAL CONDITIONS

1. The Canals of Ukai Kakarapar Project are Perennial Canals and hence very limited canal closure period is available for the construction of structure. Also the canals being flown on rotation basis.
2. Award of the work shall be decided by the department considering the options which are beneficiary to government. If required the contractor's bid capacity and capability for completion of work, past performance records will also be considered for award of packages and decision of department for award of work shall be final and binding to all the bidders under different packages. If the bidder will submit more than two bids, he shall have no any right for the choice of the particular package.
3. The work of **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.** is to be carried out under jurisdiction of Ambica Division, Navsari. The work includes **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.** on same . The works is to be completed within available canal closer period. The works are to be carried out on the existing canal.
4. Probable Working period: Favorable period will be within available canal closer period during Irrigation season as the works are to be carried out on the existing canal.
5. Works under scope of tender are required to be carried out during closer of canal during rotation period. Closer period may vary from 30 to 40 days during each rotation for Branch and its system. So, contractor shall have to carry out work during closer period of canal and depending upon closer period, he has to deploy required resources day & night in order to complete the work. Contractor shall have to remain continuous contact with engineer –in- charge for getting details regarding closer period for different canals during each rotation and accordingly contractor has to plan for carrying out works. It is the contractor's responsibility for completion of work during closer period as per direction of engineer-in-charge. Contractor shall have to give advance planning for execution of works in each closer of rotation in consultation of engineer-in-charge. If contractor does not complete the work within prescribe time limit without valid reasons as does not fit to department action against the contractor shall be taken as per tender clause as well as prevailing rules of Govt. Contractor shall have to start works simultaneously as per direction of engineer-in-charge.

6. For this work the stipulated time limit for the completion of work is 4 months, which include the work of **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.**
7. The concrete for lining work shall be manufactured using the concrete automatic Batching mixing plant (Fiori) . The plant should have an auto measuring facility of different ingredients used for producing concrete on weight basis and have facility of printing the batching of concrete. Ordinary mixer with weigh batcher shall not be allowed.
8. The contractor shall have to complete the mobilization of sufficient man-power, machinery, material and other resources in advance for each structure work before starting of closer period of canal and on closer of canal, immediately shall have to start the works of all structure simultaneously and to complete the works of all structures in canal prism within a closer period.
9. The contractor shall have to submit the complete schedule and programme for completion of work of each included in advance to Engineer-in-charge and get approved.
10. The payment for the work executed shall be made as per availability of fund. If the payment will be delayed due to any reason, the contractor shall have to make his own arrangement for financial resources for the completion of works awarded to him within the canal prism.
11. The contractor shall have to submit the complete schedule and programme for completion of work of each included in advance to Engineer-in-charge and get approved.
12. For site visit it is requested to contact following authorities.
    Office of the Deputy Executive Engineer, Valsad Irrigation Sub Division, Valsad, ,Ta.-Valsad, Dist.-Valsad. Contact no: 8780259073 (DEE) 8735949521(AE)
13. The said work includes major items includes Concrete and lining work.
14. Contractors registered under Class “E-2 and above" are eligible for the works.
15. Contractor have to make his own arrangement for tools and tackles size trolley, ropes, sharp edge tools, scaffolding etc. required for working facilities of this works. No such materials will be supplied by the department.
16. The contractor will have to produce test result from manufacturer and also bring material testing certificate.

17. All material to be used shall be purchased from standard ISO certified reputed company as finalized by Engineer-in- charge. No local manufacturer company will be allowed. Contractor will have to purchase material directly from company or authorized dealer. He will have to produce original bill and authorized dealer certificates before consumption of material.
18. All materials shall be used after approval of samples from Engineer in-charge for the above said work. Contractor shall have to bring all of brand approved by Engineer in-charge. No brand other than finalized by Engineer in-charge will be allowed to use for said work.
19. Sand/M-Sand to be used and it shall be washed, Screened and approved from Engineer in charge.
20. Deductions from running account bill on account of the following items shall be made to the extent mentioned against each item.

    1. Performance Security at stipulated rates
    2. Penalty if any in full
    3. Expenditure incurred by government on behalf of the contractor.
    4. Recoveries on account of secured advanced on material in full. (If applicable)
    5. Hire charge to plant and equipment in full, as applicable
    6. Other recoveries in full.
    7 Income-tax, GST, Service tax etc deductions as applicable
    8. Testing charges at stipulated rates
    9. Labour Cess

21. Contractor will have to stack all material quantity to be used at site as soon as work order is given.
22. Contractor must have brought safety equipment for all skill and unskilled workers. Contractor will responsible for all type accident occur on site. Contractor must have brought labours insurance and follow prevailing labour lows.
23. Contractor shall have to produce digital photography/ Videography of the work before start the work, during the work and after completion of work of different stages and execution of new item when started and submit the Hard Copies 3 (sets) and soft copy (CD) of the same.
24. Accuracy of Lines, Levels and Grades:

    The works shall be done true to line, level and grade. The personal checking of these by the Government staff shall not absolve the contractor of his responsibility

regarding their accuracy. In case of any deviation or discrepancy in line, level or grade at the meeting faces the contractor shall make good the discrepancy at his own cost and without any additional cost involved. Whenever such a discrepancy is found to arise at the junction of works of different contractors, the relative liability to set right their respective discrepancy shall be fixed by the Engineer who's concerned. The Engineer, shall, further have the unquestioned right, if need be to rectify the discrepancies and according to proportions as he may consider reasonable,

25. Testing of materials and works:

(a) All materials before being incorporated in the work shall be inspected and shall be tested. Material before being used on work shall be approved by the Engineer-in-charge.

Any work, on which materials are used without prior inspection and necessary testing and without approval of the Engineer in charge shall be rejected and considered to be defective and not acceptable.

(b) The day to day and periodical tests to be carried out on materials, mixes and placed concrete, mortar etc., are specified in the tender. Additional tests if required by the Engineer in charge from time to time, the contractor shall allow all facilities and co-operation. All labour for collecting samples for tests will be supplied by contractor free of cost to Government. Testing charges will be deducted as per SBD Norms.

The contractor shall, however, make arrangements for transport of all materials, mixes, and cores required to be tested at his cost,

An authorized representative of the contractor shall remain present at the time, when the samples or cores etc. are taken and tested and shall authenticate the sampling and testing, if so required. Should the contactor’s agent fail to be present during sampling or testing, the samples or cores etc., taken by the Engineer in charge or his representative shall be considered to be authentic. The contractor will, however, be informed of the details of such samples and cores etc. having been taken.

(c) The materials, mixes and cores etc. shall be tested day to day or periodically at the Government Laboratory and the results given thereby shall be considered correct and authentic by the contactor. The contractor shall be given access to all operations and tests that may be carried out as aforesaid so that he may satisfy himself regarding the procedure and methods adopted. It shall be the

contractor's responsibility to the standards based on the laboratory designs and tests.

(d) The methods of sampling and testing and the procedures and standard shall be as laid down by the Engineer in charge from time to time.

(e) During the execution of work, the work of other agencies on the same canal in preceding or successive reaches will be in progress. In these circumstances, any hindrance that may occur will have to be resolved by the contractors mutually and no claim for this shall be entertained by the Government.

(f) To execute work as per quality control criteria as specified in tender and as directed by Executive Engineer during execution is the responsibility of contrctor. So contractor shall have to establish its own quality control setup of skilled technical staff which maintains required registers of testing of all materials, concrete mix and other items under scope of tender.

(g) Contractor shall have to establish field laboratory at work site for testing of materials and field tests etc. with following equipment's.

(1) Sieve sets for Fine Aggregate and coarse Aggregates
(2) Field density equipment
(3) Cube moulds, core cutter, weight balance slump cone etc.

26. Closer Period:

Though time limit of the work is 04 (Four) Months, Favorable period will be within available canal closer period during Irrigation season as the works are to be carried out on the existing canal.

27. Quantity mentioned in the Bill Of Quantities are tentative. For consideration of excess quantities occurring in a tender for a particular item involving different leads or lifts, the excess will be considered on the basis of total quantity for different leads or lifts and not on individual fraction.

28. The Contractor should make his own arrangement for Diversion of Road & Planning of work should be done in such a way that after Completion of scheduled closer the irrigation activity is not disturbed.

29. EARTHWORK:

Borrow area for borrowing soil shall be identified by contractor. Borrow area shall not be given by the Government. Borrow area shall be approved by the Engineer-in charge.

30. BATCHING AND MIXING EQUIPMENTS.

The Batching and mixing shall be done with On-wheel Batching Plant (Fiori) or Ready mix concrete from such digital weighing system of required capacity as instructed by engineer-in-charge.

31. ~~Mix Design to be Carried out at GERI/GOVT. Engineering Collage as decided by the Engineer-in-charge.~~

32. Contractor shall have to carry out Photography of the work of all stages. And contractor shall have to submit 2 sets of photographs in soft and hard copy during Running bill and final bill.

Signature of Contractor

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

PART – 4

SPECIFICATIONS FOR MATERIALS

PART – 4

1. Technical Specification of Materials

GENERAL:

1. All materials to be used shall conform to I.S. 4031-1988 or the relevant specifications as per the latest version of Indian standard, unless otherwise stated in the detailed specifications of items of work.

2. Wherever a reference to any Indian standard appears in the specifications, it shall be taken to means reference to the latest version of the standard.

3. Tests for materials shall invariably be got carried out by the contractor when the same are specified in the out, even the same are not specifically mentioned in the specifications if in the opinion of the Engineer-in-charge, the same are required to be carried out. All such tests shall be got carried in any Government approved Laboratories or GERI and cost there of shall be entirely borne by the contractor.

4. No collection of materials shall be made before it is got approved from the Engineer-in-charge.

5. Collection of approved materials shall be done at site of working a systematic manner. Materials shall be stored in such a manner as to prevent deterioration, intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.

6. Materials, if rejected by the Engineer-in-Charge shall be immediately removed within twenty four hours of receiving such an information, Engineer-in-Charge dispose of such materials in a manners he choose and the contractor shall not be entitled to any compensation for the cost of such materials.

7.Approval to the samples of various materials given by the Engineer-in-Charge will not absolve the contractor from the responsibility of replacing the defective materials brought on site of materials used in the work found defective at a later date. The contractor shall have no claim to any payment to compensation whatsoever on account of any such materials being rejected by the Engineer-in-Charge.

The contractor shall be responsible for observing the laws, rules, and regulations imposed under the "MINOR MINERAL ACTS" and such other laws and rules prescribed by central/state Govt. from time to time.

DETAILED SPECIFICATION OF MATERIALS

M-1 WATER :-

Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and trace of oil and injurious alkalis, salts, organic matter and other deleterious materials which will either weaken the mortar or concrete or cause effluence or attack the steel in R.C.C. containers for transport storage and handling of water shall be clean. Water shall confirm to the standard specified in I.S. 456-1978.

Water for drinking will generally be found suitable for mortar or concrete.

Water for curing mortar, concrete or masonry should not be too acidic or too alkaline.

It shall be free of elements which significantly effect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing of these which produce objectionable stains or other unsightly deposition concrete or mortar surface.

Hard and bitter water shall not be used for curing. Potable water will generally be found suitable for curing mortar or concrete or masonry.

The turbidity in water shall not be more than 2000 ppm and shall preferably be as low as possible.

M-2 CEMENT

1.1 Only Ordinary Portland Cement of grade 53 shall be used conforming to I.S. 12269 - 1987 or it's latest version for the entire work under the tender in all respects and shall be procured in bag. The contractor shall have to make his own arrangement to procure the cement (bearing I.S.I. mark & which Cement brand / Company should be approved by department) directly from the manufacturer / authorized Dealer of Cement Company. The contractor shall arrange a suitable & adequate infrastructure for procuring, conveying with loading & unloading and proper storing the same to the site of work at his own cost with sufficient quantity for advance planning of work to be done in next fifteen days as approved by the Engineer-in-charge of the work, so that Deptt. shall be conduct minimum required test to ascertain its quality. For verification of such purchase, the contractor shall have to produce all the bills of manufacturer / authorized dealer's along with testing details (i.e. manufacturer's test result conducted in the it's Q.C. laboratory for each batch of cement which is brought to the work site) to the Engineer- in-charge of the work, so that works can be allowed if manufacturer's lab. result are found OK till the receiving of test results from approved lab of Deptt.

1.2 All cement shall be stored in dry, water tight stored shade, facilities to protect cement from dampness & properly ventilated structure. In case of storage of cement bag, the floor on which cement is to be stored shall be raised at least 30cm. above ground level & the bags shall not be piled more than 10bags height and shall be arranged in headers & stretches fashion as close as possible. The Contractor shall be responsible for proper storage of cement and if any damage or deterioration there in, shall be responsible for the change or removed at his own cost.

Cement should be used in the work, in order of receipt to the store/ site, for this purpose, such consignment it arrives should be stacked separately and play card barring the date of arrival should be pinned to the pile. The arrangement of storage and utilization shall be such that to ensure the utilization of the cement in order of its arrival at the

storage and the contractor shall maintain updated record which would at any time show the date of receipt and proposed utilization of cement laying in the store at the site.

The contractor shall provide a double locking arrangement for the store and the key of one lock will remain with the Engineer-in-charge of the work or his authorized. The Engineer-in-charge shall any time have an easy access to the store and the site of the work for checking. The Engineer-in-charge or his authorized shall have authority to check and examine the method of storage, records, accounting and security provided by the contractor. The Contractor shall produce the proof by way of record, books, return, Performa etc. maintain by his staff on site, on demand from Engineer-in-charge of the work or his authorized and the contractor shall at all time keep this records update to enable to Engineer-in-charge of the work or his authorized to apply the check may desire to impose.

1.3 The cement brought by the contractor at the site, department shall be sampled as per I.S. 3535 (or latest version of I.S.) & sent it in approved lab. of Deptt. for testing as per I.S. 4031, 4032 (or latest version of I.S.). The contractor shall made arrangement for sampling work & it's submitted to the Government Laboratory or Govt. approved laboratory at his own cost. The testing shall be done for each consignment received at the site. The cement consignment shall be more than 50 tons or part thereof, each consignment shall be stacked separately.

1.4 The cement not satisfying the criteria as per I.S. 12269 for grade 53 and IS 1489 shall be rejected and such stack of cement shall be removed immediately from the site of work. No extra cost either for testing or for rejected cement shall not paid to the contractor. No cement shall be used for the work without being tested and such work shall not be paid by the Engineer-in-charge and shall be removed at contractor's own cost. The results of the cement should be submitted by the contractor as and when required by the Engineer-in-charge or his authorized. Manufactures result as per lot of manufacturing will also have to be submitted.

1.5 A regular day to day account of cement received and consumed / used in the work, together with the particulars tender item & quantity of each of the work shall be maintained in ink by the responsible representative of the department and shall be signed both i.e. by the departmental representative as well as the contractor, after proper verification at the end of the day's work. The accounting shall be shown to the inspecting officer when asked for. The Engineer-in-charge of the work or his authorized shall have the authority to verify the stock and check on the consumption in any manner he thinks proper. The volume of one bag cement weight 50kg shall be considered as 0.0342 cum for mixing in concrete

1.6 Frequency for Cement testing shall as under.

Weight of lot / batch (in tonne)	No. of Sample to be taken
Up to 50	1
51 to 100	2
101 to 200	3
201 to 300	4
301 to 500	5
501 to 1000	6
1000 to 1300	7

Physical / chemical properties of cement shall confirm to IS 3535-1986 or its latest version.

The contractor shall have to procure cement directly from the large scale manufacturer main producer or authorized dealer which shall confirm I.S.I. The cement so purchased only shall be permitted to be used. The contractor shall provide satisfactory evidence to the Engineer-in-Charge in support of such purchase.

The cement after it is brought on sight (store) by the contractor, can only be allowed to use after obtaining necessary certificate of the test from any Government approved Laboratory/Institute & Company test result about its suitability for the use on the concerned works. The contractor shall produce/ submit the laboratory test results of cement samples as prescribed in I.S. 12269-(1987) & I. S. 4031-1999. Manufactures result as per lot of manufacturing will also have to be submitted. The contractor shall collect the required samples from the cement bags brought on site or work in the presence of Engineer-in-Charge or his authorised supervisory staff of the department, each sample shall be of 15kg by weight. The number or sample shall be taken as prescribed in IS 269-1976 & 4031-1968 or as revised from time to time. The cement brought on site of work shall be utilised within six month from the date of manufacturing. The quality of cement which does not confirm to the requirement of I.S. standard shall have to be removed from the site of work at the risk and cost of contractor.

The cement to be used shall be O.P.C as per I.S.12269-1987. Each bag of cement shall contain full quantity of 50 kg. The contractor shall take every precaution to store the cement properly so that it is not supplied by dampness of moist atmosphere or influence of foreign matter as per the satisfaction of Engineer-in-Charge. Cement shall be stored in such a way as to allow the removal and use of cement in chronological order of receipt i.e. first receive in first used. Different brands of cement or cement of the same brand from the different factories shall be stored in separate groups and shall not be mixed during use. Cement shall be kept in a store under good condition. Any cement which is found defective shall not be used. Daily account of receipt and use of cement bags shall be

maintained by the department and the contractor in proforma approved by the Engineer-in-Charge. The contractor shall be fully responsible for the scope of local transport of cement from the site godown to the place of work.

Cement shall be kept in a store under double locking arrangements.

The cement shall be measured by one bag for all uses in concrete (except otherwise stated) and masonry etc. In no case cement shall be measured by the boxes or other means for the volumetric proportion of concrete and mortar. For calculation for the proportion, the volume of one cement bag taken as 0.0342 cu. Mt. (1.20 cft) and measuring box / bag shall be of size 30 cms x 30cms x 38 cms. For weight batch of concrete to be used, the cement shall have to be used as per actual weight and the contractor shall not be entitled for any compensation for loss in weight due to shifting of bags or on account of any reasons.

M-3 <u>SAND :-</u>

The sand to be used will be from the natural river bed. The max. size shall be limited to 5 mm. (3/16"). The sand is available from river. It shall be tested in Government laboratory or Government approved institute.

Details regarding F.M. etc. may be pointed out in particular that all the sand will be available in a natural conditions and may require blending to specification. The contractor may however consider the alternative of bringing sand from the outside source which may meet with the specifications.

<u>Quality :-</u>

The sand shall consists of hard, dense, durable, uncoated siliceous gritty material from rock fragments. It shall be free from injurious amounts of dust, lumps, soft and flaky particles, shale, alkali, organic matter, loan, mice and other deleterious substance, the max, percentage of the deleterious substance in sand as delivered to the mixer shall not exceed the following values.

Material passing S. No. 200	
Sieve B. S. S. or (I. S. No. 8)	3 percent by weight
Clay lumps	1 percent by weight
Cinders and clinkers	0.5 percent by weight
Mica	2 percent by weight
Total of all	Not more then
Deleterious substances	5 percent by weight
Mica, coated grains, Soft and flaky particles, Loan etc.	

The sum of the percentage of all deleterious materials however shall not exceed by 5% of weight. The sand impurities and sand producing a colour darker than the standard colorimetric test for organic impurities and sand producing a colour darker than the standard calorimetric test for organic impurities shall be rejected.

Grading :-

The sand shall be well graded and the sieve analysis of natural sand shall confirm to the following limits of gradation.

I. S. Sieve	Cumulative % of weight passing through sieve
10 mm	100
4.75 mm	92 – 100
2.36 mm	75 – 92
1.18 mm	55 – 82
600 Micron	30 – 64
300 Micron	10 – 40
150 Micron	3 – 10

Deviations from the prescribed limits of cumulative percentage retaining on sieve 10 mm, 4.75 mm, 2.37 mm, 1.18 mm, 600 micron, 300 micron and 150 micron shall be permitted provided the total of such deviation should not exceed 10%.

Fineness Modulus :-

The sand shall have a **fineness modulus ranging between 2.4 and 3.0** subject to the gradation specified in the preceding paragraph. The modulus shall be computed by adding cumulative percentage of the sand retained on the standard screens from10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron I.S. Sieve and dividing the sum by 100. The gradation of the sand shall be controlled that the fineness modulus of at least 9 out of 10 consecutive test samples of finished sand shall not vary by more than 0.10 from the average of 10 test samples. Any deviation from the specified range of gradation and fineness modulus will not be permitted without the written permission of the Engineer.

M-4 Black Trap Stone Coarse Aggregate :-

Coarse aggregate shall be machine crushed stone of black trap and shall be hard, strong, dense, durable, clean, free from skin and coating likely to prevent proper adhesion of mortar. All aggregates shall conform to IS 383-1963 and IS 515-1959 or as per latest version of Indian Standard.

The aggregate shall generally be cubical in shape, unless special stones of particular quarries are mentioned. Aggregate shall be machine crushed from the best black trap stone as approved by the Engineer-in-charge. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement for plain cement shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to

6mm less than the minimum lateral clear distance between bars or 6mm less than the cover whichever smaller.

Table-1

I. S. sieve	Percentage passing for single size aggregate for Nominal size.		
	40 mm	20 mm	10 mm
63 mm	100	---	---
40 mm	85-100	100	---
20 mm	0-20	85-100	---
16 mm	---	---	---
12.5 mm	---	---	100
10 mm	0-5	0-20	85-100
4.75 mm	---	0-5	0-20
2.36 mm	---	---	0-5

Table:1 Uniform grading of aggregate

IS Sieve Designation	Percentage Passing for Single-Sized Aggregate of Nominal Size						Percentage Passing for Graded Aggregate of Nominal Size			
	63 mm	40 mm	20 mm	16 mm	12·5 mm	10 mm	40 mm	20 mm	16 mm	12·5 mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
80 mm	100	—	—	—	—	—	100	—	—	—
63 mm	85 to 100	100	—	—	—	—	—	—	—	—
40 mm	0 to 30	85 to 100	100	—	—	—	95 to 100	100	—	—
20 mm	0 to 5	0 to 20	85 to 100	100	—	—	30 to 70	95 to 100	100	100
16 mm	—	—	—	85 to 100	100	—	—	—	90 to 100	—
12·5 mm	—	—	—	—	85 to 100	100	—	—	—	90 to 100
10 mm	0 to 5	0 to 5	0 to 20	0 to 30	0 to 45	85 to 100	10 to 35	25 to 55	30 to 70	40 to 85
4·75 mm	—	—	0 to 5	0 to 5	0 to 10	0 to 20	0 to 5	0 to 10	0 to 10	0 to 10
2·36 mm	—	—	—	—	—	0 to 5	—	—	—	—

Note :This percentage may varied some what by the Engineer-in-charge, when considered necessary for obtaining better density and strength of concrete. In concrete for canal lining the percentage at 4.75 to 10mm fraction shall be reduced to about 5 to 10 percent of the total coarse aggregate). However the exact gradation required to produce a dense concrete of specified strength and desired workability shall be decided by the Engineer-in-Charge.

The percentage of deleterious substances in only size of coarse aggregates delivered to the mixture shall not exceed the following value.

Material passing No. 100	**percentage by wt**.
Screen	
Shale	1 percent by weight
Coal	1 percent by weight
Soft fragments	1 percent by weight
Other deleterious substances	1 percent by weight
Clay lumps	1 percent by weight

The Grading test shall be taken in the beginning and at the change of source of materials. The necessary test indicated in the I. S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner to prevent the intermixing of different aggregates. If the aggregates are covered with dust, it shall be washed to make it clean. The coarse aggregates for plain and ordinary reinforced concrete shall be measured by volume as per the direction of the Engineer-in-charge.

M-5 T.M.T Bars

Thermo mechanical treated M.S. Bars, conforming to IS : 1786- FE 500 and 1786/1966 shall be used for R.C.C. works shall confirm to IS 432 (Part-II) 1996 and shall be of tested quality it shall also comply with relevant part of IS 456-1978. The steel shall be used in various components of various canal structures as per the drawing or as per instruction of Engineer-in-Charge.

For the purpose of payment the bars shall be measured correct up to 10 mm length and weightTable :

Cross Sectional Area And Mass (IS : 1786)payable at the rate specified below :

Nominal size mm	Cross-Sectional Area mm^2	Mass per Metre Run kg	Nominal size mm	Cross-Sectional Area mm^2	Mass per Metre Run kg
8 mm	50.3	0.395 Kg/mt	25 mm	491.1	3.855Kg/Rmt
10 mm	78.6	0.617 Kg/mt	28 mm	616.0	4.836Kg/Rmt
12 mm	113.1	0.888Kg/mt	32 mm	804.6	6.316 Kg/Rmt
16 mm	201.2	1.579Kg/mt	36 mm	1018.3	7.994 Kg/Rmt
18 mm	254.6	1.999Kg/mt	40mm	1257.2	9.869 kg/mt
20mm	314.3	2.467g/mt	45 mm	1591.1	12.49 kg /mt

The contractor shall have to procure T.M.T Bars directly from the Main producer/authorised dealer which shall conform to I. S. The steel so purchased shall only be permitted to use. The contractor shall provide satisfactory evidence to the Engineer-in-charge in support of purchase, test certification of the manufactures shall be produced, if so required by the Engineer-in-charge shall be produced. If further test be necessary, they will be done according to I.S. 226-1968 and I.S. 223-1950 or as revised from time to time.

M-6 <u>Mild Steel Binding Wires :-</u>

The mild steel wires shall be of 1.63 mm or 1.22 mm or (16 or 18 gauge) diameter and shall confirm to I. S. 280-1972 and I. S. 432-1982 or as revised from the time to time.

The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil, paint, grease, loose or thick rust, mild scale of any other undesirable coating which may prevent adhesion of cement mortar.

M-7 Preparation of surface :

1 The surface shall be throughly cleaned of all dust, dirt, mortar croppings and other foreign matter before white wash is to be applied.

2 The surface spoiled by smoke soot shall be scrapped with steel wire brushes or steel scrapers or shall be rubbed with over-burnt surkhi or brick bats. The surface shall be then broomed to remove all dust, dirt and shall be washed with clean water.

3 Oil or grease spots shall be removed by suitable chemical and smooth shall be rubbed with wire brushes.

4 All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portion shall be wetted and allowed to dry. They shall then be given one coat of white wash.

5 All unnecessary nails shall be removed, the holes cracks patches etc. shall be made good with materials similar in composition to the surface to be prepared.

M-8 Cement Mortar.

Water shall conform to specification M-1.

Cement : Cement shall conform to specification M-2.

Sand : Sand shall conform to M-3.

Proportion of Mix :

1 Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 Kg. / Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed or machine mixed as directed.

Preparation of Mortar :

In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed by on a clean impervious platform by turning over atleast 3 times or more till a homogenous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extractors material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The Water cement ratio shall be adopted as directed. The Mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-9. Structural Steel

12.1. All structural Steel! shall conform to I S. 226-1985: The steel shall be free from the defects mentioned in I.S 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. River bars shall conform to I.S. 1148-1973.

12.2. When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-10. Bricks

10.1. The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws and nodules of free lime they shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be- moulded with a frog of 100 mm. x 40 mm. and 10 mrn. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.
10.2. The size of modular bricks shall be 190 mm.x 90 mm.x 90 mm.
10.3. The size of the conventional bricks shall be as under : (9" x 4.3/8" x 2,3/4") 225 x 110 x 75 mm.
10.4. Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work. Length + 1/8" (3.0 mm.) Width ± 1/16'' (1.50 mm.) Height + 1/16" (1.50 mm.)
10.5. The crushing strength of the bricks shall not be less than 35 Kg/Sq. Cm. The average water absorption shall not be more the 20 percent by weight Necessary tests for crushing strength and water 13 absorption etc. shall be carried out as per I.S. 3495 (Part-l to IV) – 1976

M-11 ASHPHALT :-

Bitumen 80/100 : The characteristics of this grade confirm to that of S 90 grade of I.S.-73-1992

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

PART – 5

ITEMWISE DETAILED TECHNICAL SPECIFICATIONS

Name of Work: **Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.**

Item No. :01

Excavation for foundation in all sorts of soil including yellow, sandy, gravelly soil, soft & hard murrum, etc. dry condition including depositing the excavated stuff in uniform layers in banks or as directed etc. complete for lead up to 1.0 Km and all lifts. (By machinery).

Scope:

- The work is to be carried out in various structures of Canal & Its system Item involves the work of excavation in existing canal structure to bring the structures to the designed section as shown in the drawing. As the structures are constructed since last many years, it is heavily damaged. Material available from excavation of structures shall either be used for filling according to its suitability or shall have to be disposed off as per instruction of Engineer in Charge.
- General specification of Excavation shall be applicable.

Technical Specification:

- Before commencement of work, fresh levels shall be taken by contractor at suitable intervals on the proposed site. Drawing shall be prepared on which those levels together with final levels of prepared site shall be shown. This drawing shall be signed both by the Engineer-in-charge and the contractor.
- The structure having been set out foundation pegs shall be driven four fact (1.25 m) way on each side. Wire nails shall be driven on top of pegs to locate the exact points and pegs are to be surrounded with cement concrete so that the same are not disturbed until the ground level is reached.
- The site shall be cleaned of all vegetation trees, rubbish etc. The sides of trenches shall be kept vertical and all foundation trenches shall be at one level unless it is directed that they should be taken out in steps.
- Trenches for foundation shall be excavated to exact width, length and depth as shown on the drawing or as may be directed by the Engineer-in-charge.
- Pot holes and weak spots on the foundation shall be dug out square and filled with material approved by Engineer-in-charge and properly consolidated.
- The bottom of foundation pits shall be dressed, perfectly levelled and before any concrete or masonry is put in it shall be well watered and thoroughly rammed. No filling shall be allowed without bringing the foundation bed to proper level throughout.
- Excavation greater than shown on approved drawing shall not be paid for unless ordered by Engineer-in-charge in writing. The trenches which are excavated more than the required dimensions the same shall have to be filled with cement concrete of the same mix and grade as used for filling the foundation of the structure by the contractor at his own cost.
- After the excavation of trenches is completed, the contractor shall notify the Engineer-in-charge and no concrete shall be placed until after the engineer-in-charge has checked the width.
- Approved depth and the character of the state and taken such measurements which cannot be checked afterwards. Levels shall be taken and recorded to measure the depth of the foundation. The width of the trenches even if it be more than what is shown on the drawings shall be measured only as stipulated on the drawing or as directed in writing by the Engineer-in-charge.
- Excavation for foundation shall include the removal of all materials of above nature. It includes the furnishing of all necessary materials, equipments and labour for

suitable setting out, shoring, strutting of strong and durable nature as directed by the Engineer-in-charge.

- The rate also includes necessary boiling and pumping out water from the foundation trench during excavation concrete work and till masonry reaches above low water level.
- No material excavated from foundation trenches of whatever kind it may be is to placed nearer than four fact (0, 125m) or greater distances prescribed from the outer edges of the excavation. The excavated materials also should be disposed of away from the site as directed by the Engineer-in-charge. The rate shall be inclusive of the filling in the sides of the excavated trenches after masonry/ concrete work is constructed with the materials available from excavation if suitable or by bringing suitable materials for outside and work of filling shall be done in suitable layers not exceeding 6" (15 cm) and properly rammed and watered as directed by the Engineer-in-charge.
- The excavated materials deposited in river bed or at any suitable place or surplus materials be lost or being by washed away by flood or by any other cause. The contractor shall replace it with an equal quantity of other approved materials at his own expense.

Mode of Measurement and payment:

- Mode of measurement shall be foundation level basis.
- Payment shall be made on cubic meter basis.

ITEM NO: 02

Providing and filling rubbles including hand packing and filling interstices with quarry spalls behind abutments and between returns as directed.

WORKMANSHIP:

1.0 The stone shall be Black trap type as approved by Engineer-in-charge.

2.0 Stone shall be hard, sound, durable and of uniform texture & free from defects like Cavities, cracks, sand, holes, flaws, injurious veins, patches of loose or soft materials etc. and weatherd portions and other structural defects or imperfection tending to affect their soundness and strength. The stones with round surface shall not be used.

3.0 Flanky and elongated stones shall not be used.

4.0 Stone used in soiling work shall be weighing .

5.0 A sample test of representative rubble stone shall be carried by contractor at approved laboratory to confirm specifications laid from a lot of every 300 cm rubble stones used. The test shall be carried out to ascertain following tests

(A) **SPECIFIC GRAVITY TEST :**

As per Is : 1124 – 1974 using specific gravity bottle (50 ml), value generally shall not be less than 2.5

(B) **WATER ABSORBTION TEST :**

As per Is : 1124 – 1974, stone shall not absorb water more than 5 (Five) percent of its weight after 24 hours immersion in water.

(C) **WEATHERING TEST :**

As per IS: 1125-1976, there should be no weather effect to the rubble stone. This test measures durability and strength of stone. The value shall not exceed 10%.

The rubble shall be stacked in a rectangular stack (2.0mt x 2.0mt 0.50mt size) for cross checking of material required for the surface of sollingaccording to thickness.

Mode of measurement & payment :-

1. The measurement shall be paid in C.M. and the basis of the measurement of the rubble stack which are previously measured before spreading to ensure the required quantity of for solling.

ITEM NO: 03

Providing and filling sand Below R.C.C Raft in Layers including Ramming and watering complete.

Sand shall be natural sand, clean well graded, hard strong durable and gritty particles free from injurious amounts of dust clay, kankar, nodules, soft or flaky particles, shale, alkali, salts, organic matter loam, mica or other deleterious substances and shall be got approved from the engineer-in-charge. The sand shall not contain more than 5 percent of silt as determined by field test. If necessary the sand shall be washed to make it clean.

The Sand shall be stacked in a rectangular stack (2.0mt x 2.0mt x 0.50mt size) for cross checking of material required for the surface of filling according to thickness.

Mode of measurement & payment :-

The measurement shall be paid in C.M. and the basis of the measurement of the Sand which are previously measured before spreading to ensure the required quantity of for filling.

ITEM NO: 04

Providing & laying plain/reinforced Nominal Mix cement concrete of various grade with cement, sand and coarse aggregates including cantering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all lead and lift. (Baching Plant Based, including dewatering)

(B) Raft, Bottom slab of barrel, footing of columns, peirs, abutment and bottom slab of sump etc.

(i) M - 15 Grade,

(C) Piers, abutment, wingwalls, headwall, returnwall etc.

(ii) M-15 grade.

(C) Piers, abutment, wingwalls, headwall, returnwall etc.

(iii) M-20 grade.

(B) Raft, Bottom slab of barrel, footing of columns, peirs, abutment and bottom slab of sump etc.

(ii) M-20 grade.

(B) Raft, Bottom slab of barrel, footing of columns, peirs, abutment and bottom slab of sump etc.

(iii) M - 25 Grade

(D) Walls of barrels, brestwall, staunching rings, pedestals of bearing, stoplog piers, well stainning, transition wall etc

(iii) M-25 grade.

&

(E) Roadway slab, approch slab, chute floor slab, kerb, pier cap, abutment cap, hoisting platform, top slab of barrel etc.

(ii) M-25grade.

General specification of ordinary cement concrete/Plain or R.C.C shall be applicable.

7.1 COMPOSITION

Concrete shall be composed of cement, fine aggregate (Natural sand), coarse aggregates (specifically mentioned in the item in the Bill of Quantity of the tender) and water, well mixed in specified proportion

7.2 MATERIALS:

Water shall confirm to M-1 of specification of material.
Cement shall confirm to M-2 of specification of material.
Sand/M-sand shall confirm to M-3 of specification of material.
Coarse aggregate shall confirm to M-4 of specification of material.

7.3 GENERAL:

Concrete mix shall be "DESIGN MIX" only and is to be design by preliminary tests in the laboratory. The proportions for ingredients shall be by mass only except for water. The grade of concrete shall be as specified above as per item with maximum size of aggregate is 20 mm

7.4. DESIGN MIX CONCRETE

The design mix shall be design to produce the grade of concrete having the required workability and a characteristic strength and target mean strength as per IS-456-2000. The design mix shall be carried out in Govt. laboratory (GERI) as per IS-10262./ OR Govt. approved laboratory, Government college.

7.4.1 MIX DESIGN

C) BATCHING & MIXING PLANT.

The Batching and Mixing shall be done Batching Plant installed at site of work/camp of required capacity as directed by Engineer-in-charge.

Canal Works planned in this work are to be executed in Branch Canal,

(2) Particularly tail ends of Minors where the acquired width is less, concrete will allow to be done by Fiori machine (On-wheel batching plant) machine.

(3) More ever, where Fiori machine is also not transportable, only latest Conventional Concrete Mixer with digital weighing system. Said Conventional mixer digital system must have option of battery-operated control panel and USB/printer system will be allowed.

Above said Conventional Concrete Mixer shall only be allowed after prior approval of Engineer-in-charge. In many canals where at present, canal's banks are eroded, as a result at which canal bank width are less in that case earth work in embankment for raising & strengthening has been planned in this work.

Hence, works related to earth work in embankment will have to started immediately on priority basis with sufficient machinery for easy moving of Transit Mixers.

B) (i) The contractor shall prepare mix design of concrete in accordance with IS 456-2000 and relevant codes to achieve desired strength durability and workability and using approved ingredients viz. cement, fine aggregates and water. The ingredients of concrete shall be got tested and approved by the Engineer-in-charge. The contractor shall approve the mix design thus prepared by him from Engineer-in-charge and only after approval of Engineer-in-charge, the same shall be used for construction.

The Engineer in charge shall check and carry out necessary tests on mix design given by the contractor in accordance with Para (a) above to determine its strength, workability durability as well as economy. For this purpose, the contractor shall submit mix design and its details prepared by him to the Engineer in charge well in advance of commencement of work as directed by the Engineer in charge.

Department reserves right to accept or reject the mix design given by the contractor and also to direct him to use mix design given by Engineer in charge Decision in this regard shall be final and binding to the contractor.

Over and above specified in (a) above, if required Engineer in charge shall make a test to determine the mix proportions required to produce the strength specified with the material to be used in the work. (The necessary ingredients shall be provided to department free of cost by contractor.)

The mix shall be designed using representative samples of approved coarse and fine aggregates as well as cement and water to be made available by the Contractor to the Engineer in charge, to achieve the required workability, cohesion, strength and durability at minimum level of cement. Mix design studies and test will be carried out by the Deptt.

The proportion of mix design ingredients shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with the means available.

During the execution of the work if the source of any ingredient of the concrete changes or in new working season, the Contractor shall inform the Engineer-in-Charge sufficiently in advance so as to allow him to proportion a new mix design to attain the specified strength of concrete. At that time the representative samples of approved ingredient shall be supplied by the Contractor to the Engineer-in-Charge without any extra cost.

The details of mix design including the proportion of each separate size and grading of aggregates and actual cement level required shall be declared to the Contractor in writing by the Engineer-in-Charge.

As a result of para (d) if there is any subsequent change in mix design, similarly the same shall be declared.

7.4.2 Strength Requirement of Concrete

Ordinary Portland cement grade 53 conforming to lS 12269 shall be used. The permission of Engineer-in-charge shall be obtained for other grade of concrete. The compressive strength requirements for the various grades of controlled concrete shall be as given in Table.

TABLE

Grade of Concrete	Compressive test strength in N/mm^2 on 150 mm cube in accordance with IS:456-2000 (Min. at 28 Days)
M-10	10 N/mm^2
M-15	15 N/mm^2
M-20	20 N/mm^2
M-25	25 N/mm^2
M-30	30 N/mm^2

In all cases the 28 days compressive strength specified in Table shall along be the criterion for acceptance or rejection of the concrete.

Where the strength of a concrete mix as indicated by tests lies in between the strength for the two grades specified in Table, such concrete shall be classified for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

7.4.3 Proportioning Concrete

a) Except when it can be shown to the satisfaction of the Engineer-in-Charge that supply of properly graded aggregates of uniform quality can be maintained till the completion of the work, grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions as required. Different sizes, however, shall be stacked in separate stockpiles. Required

quantity of material shall be stockpiled several hours, preferably a day, before use. Grading of coarse and fine aggregates shall be checked as frequently as possible, frequency for a given job shall be determined by the Engineer-in-Charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tank or weight. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked. b).To keep the specified water cement ratio constant as determined by mix design, moisture content in both fine and coarse aggregates shall be pre-determined by the Engineer-in-Charge. The amount of mixing water shall be adjusted to compensate for any variations noted in the aggregate IS: 2386-1977 (Part-III) shall be referred to make suitable arrangement in weight of water. Suitable adjustments shall also be made in the weight of aggregates to allow for variations in weight of aggregates due to variations in their moisture content.

7.4.4. Mix Design and Testing:

For Design Mix Concrete the mix design shall be designed according to IS 10262 and SP :23 to provide the grade of concrete having the required workability and characteristics strength less than appropriate values given in IS – 456. The design mix shall be such that it is cohesive and does not segregate and should result in dense and durable concrete. And also capable of giving the finish as specified. For water retaining structures. the mix shall be also result in watertight concrete. The contractor shall be exercise great care while designing the concrete mix and executing the works to achieve the desired result.

The cement level for the controlled concrete shall be as under.

TABLE NO. 1

Sr.No.	Grade of concrete	Cement level required in Kg per cubic meter of concrete
1	M-10	220
2	M-15	300
3	M-20	360
4	M-25	380

d) However, depending on the technical requirement various size of aggregate may be required to be used in various components of the structure.

e) Actual cement level required for the aggregate to be used shall be determined by tests. The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing so that after compaction it surrounds all reinforcement and completely fills the formwork. When concrete is hardened, it shall have the required strength, durability and surface finish.

A mix shall be designed to produce the grade of concrete having the required workability and cohesiveness and characteristic strength not less than that stipulated in IS 456 -2000. However, due to change in design mix, if it becomes obligatory to use less or more cement per cubic metre of concrete, the Contractor shall do the same without claiming any extra cost for handling and using of cement In case of actual use being less than the cement level specified in Table no-1,Column no.3, the Dept. Shall deduct the cost of cement from the bill at Input rate, per tone of cement used at worksite for the reduced consumption of Cement. The contractor will not be paid in any case any extra amount for the increase in use of cement. i.e. for more than the cement level specified in the Table no-1,Column no. 3 of above table.

Mix designs shall be furnish to Engineer at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained. The strength requirements of the concrete mixes ascertained on 150 mm cubes as per IS:516 shall comply with the requirements of IS:456.

f) The quantity of water shall be just sufficient to produce a dense concrete of required workability cohesiveness, durability and strength for the job. An accurate and strict control shall be kept on the quantity of water.

g) In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slump tests. Following slumps shall be adopted for different types of works.

Sr. No.	Type of Work	Slumps allowed Without any Admixtures
1	Mass concrete for RCC raft, Foundation, footing and retaining Walls	45 mm to 55 mm
2	Pier, Pier cap, Pedestal, Transition wall etc.	25 mm to 40 mm
3	Thin RCC section with congested steel	60 mm to 70 mm
4	Baffle wall, chute blocks and sills	25 mm to 40 mm
5	CC Lining Works	60 mm to 70 mm

7.5 STRENGTH REQUIREMENT OF CONCRETE

The compressive strength requirements for the various mixes by concrete shall be as follows:

Type of concrete.	Minimum Compressive strength in kg/cm² of 150 mm cubes	
	7 days	28 days
M-15	2/3of 28 days strength	150
M-20	2/3of 28 days strength	200
M-25	2/3of 28 days strength	250

7.6.1 Quantity of Water

(a) The quantity of water shall be just sufficient to produce a dense concrete with required workability.

(b) The workability shall be such that the concrete gives values of slumps as specified in pera 5-(g).

7.6.2 PRODUCTION OF CONCRETE

7.6.2.1 MIXING

(a) Concrete shall be dense as possible, plastic enough to consolidate well and stiff enough to stay in place on the slopes.

(b) Mixing shall be continuous until there is uniform distribution of the materials and the concrete is uniform in cool and consistency. The time of mixing shall be as shown in Table 1 of IS:457-1957 reproduced below:

Capacity of Mixture	Minimum time of mixing	
	Natural aggregate	Manufactured aggregate
3 cum. or larger	2 Minutes	2.5 Minutes
2 cum.	1.5 Minutes	2 Minutes
1 Cum or smaller	1.5 Minutes	1.5 Minutes

7.6.3 Consistency:

The quantity of water to be used in the concrete shall be determined from time to time during the course of concreting work in order to secure concrete of proper consistency and also adjust for any variation in the moisture content or grading of the aggregates as they enter the mixer.
Addition of water to compensate the stiffening of the concrete resulting from over mixing or objectionable drying before placing shall not be permitted. Uniformity in concrete consistency from batch to batch shall be ensured by taking slump test. Concrete shall be laid from the bottom to the top of the slope, for which consistency shall be such that the concrete will just stay in place on the slope.

7.6.4 TRANSPORTING CONCRETE

(a) Concrete shall be transported from the mixer to the placing position as rapidly as practicable by methods that will prevent segregation or loss of ingredients or the loss of slumps in excess of25 mm before the concrete is placed in position.

(b) Chutes used for conveying concrete shall be of such size and shape as to ensure a steady uniform flow of concrete in a compact mass without separation or loss of ingredients and shall be protected from wind and sun wherever necessary to prevent loss of slump by evaporation, and shall be furnished with a discharge hopper. Free fall or drop of concrete shall be limited to 150 cm. Chute sections shall be made of or lined with metal and all runs shall have approximately the same slopes not flatter than 1 vertical to 2½ horizontal. The required consistency of concrete shall not be changed in order to facilitate chuting. Wherever there is a free fall within the conveying system, suitable baffle plates, splash boards or down spouts shall be provided to prevent segregation, splashing or loss of ingredients. Whenever it is necessary to hold the discharge end of a chute more than 3 meters above the level of the fresh concrete, a flexible down spout shall be used to break the fall and to confine the flow. The lower end of the spout shall be held close to the place of deposit. Wherever depositing is intermittent, a discharge hopper shall be provided. All chutes shall be thoroughly cleaned before and after each run. All wash water and debris shall be disposed off outside the forms.

7.7 PREPERATION FORPLACING CONCRETE

7.7.1 General Requirement

(a) No concrete shall be deposited until the foundation has been inspected and approved and until all formwork required is completed, embedded parts if any installed and checked and surfaces prepared for placing.

(b) All surfaces of forms and embedded materials that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned off all such mortar or grout fresh concrete is placed.

7.7.2 Foundation Surfaces

(a) Immediately before placing concrete, all soft or loose stuff shall be removed. For foundation over soil, the surface shall be moistened to depth of about 15 cm to prevent the sub grade from absorbing water from the fresh concrete. Just before placing the concrete, the surface of the earth shall be tamped or otherwise consolidated sufficiently to prevent contamination of concrete during placing. If subsoil water is met with the foundation, it shall be dewatered. The dewatering shall be continued till the placing and the setting of concrete is completed.

(b) Foundation of porous or free draining material shall be thoroughly wetted and compacted by tamping or rolling if necessary. The finished foundation surface shall then be blanketed with a layer of a tar paper or a closely woven burlap, carefully

lapped and fastened down along the seams. This shall be done to prevent the loss of ingredients including water form the concrete.

7.7.3 Surface of Construction and Contraction Joints

(a) The surface of construction/ contraction joints shall be clean, rough and damp but free from standing pools of water at the time of receiving the next lift. Cleaning up shall comprise removal of all loose or uncompacted materials surface coating, and other foreign materials, through by scrapping, chipping, water jetting or other suitable means.

(b) The method used in disposing off waste water employed in cutting, washing and rinsing of concrete surface shall be, such that the waste water does not stain, discolour or affect exposed surfaces of the structures. Methods of disposal of waste water shall be subject to approval.

(c) Nominal cover to meet durability requirements (clause 26.4.2) I.S 456-2000.

Exposure	Nominal concrete cover in mm not less than
Mild	20
Moderate	30
Severe	45
Very Severe	50
Extreme	75

7.0 PLACING AND COMPACTING CONCRETE

(a) As far as it is possible, concrete shall be placed directly in its final position and shall not be caused to flow in a manner to permit or cause segregation. Methods and equipment employed in placing concrete shall ensure that aggregate is not separated from the concrete mass.

(b) Manual concrete placing by head basket shall be permitted. The concrete shall be used within 30 minutes of mixing. Re-tampering of concrete shall not be permitted. Any concrete which has become so stiff that proper placing without re-tampering cannot be ensured, shall be wasted.

(c) In form work, structural concrete placement shall generally be started with an over-sanded mix containing 20 mm maximum size aggregate and 10% extra cement with a slump of about 125 mm placed several centimeters deep on the joints at the bottom of the form. Concrete placement shall commence immediately thereafter.

(d) Concrete shall be compacted to the maximum practicable density, in such a manner that it is free from pockets of coarse aggregate and is in intimate contact with surface of forms and embedded materials. Unless otherwise permitted, all concrete shall be compacted by mechanical vibrator.

(e) Compaction of concrete shall whenever practicable be carried out by the use of immersion type vibrators. Vibrators having vibrating heads less than 100 mm in diameter shall be operated at speed of at least 7,000 revolutions per minute in the concrete. Normally formwork shall be designed to provide for the insertion and operation of mechanical vibrators in the placed concrete. Form vibrators shall be used wherever internal vibration is not possible or would be inadequate.

(f) In compacting each layer of concrete, the vibrator shall be operated in almost vertical position and the vibrating head shall be allowed to penetrate and re-vibrate

the concrete in the upper portion of the under laying layer. In the area where freshly placed concrete in each layer joints with previously placed concrete, more vibration than usual shall be performed with the vibrators penetrating deeply at close intervals along these contacts. Layers of concrete shall not be placed until layers previously placed have been vibrated thoroughly as specified. Contacts of the vibrating head with surface of the forms shall be avoided.

(g) During placing and until curing is completed, the concrete shall be protected against the harmful effect of exposure to sunlight, wind and rain as directed.

9.0 FORM WORK

9.1 General

(a) Forms shall be used wherever necessary to confine the concrete and shape it to the required lines, or to ensure against contamination of the concrete by material caving in or sloughing from adjacent surface left by excavation or other features of the work. All exposed concrete surface left by excavation or other features of the work and all exposed concrete surfaces having slope steeper than that of two horizontal to one vertical shall be formed.

(b) Formwork shall be of timber, or steel, form work shall be substantially and rigidly constructed to the shapes, lines and dimensions required, efficiently propped and braced to prevent deformation due to placing, vibrating and compacting concrete, other incidental loads or the effect of weather.

(c) The surfaces of formwork shall be made such as to produce the surface finishes as specified. The form work joints shall be tight enough to prevent loss of liquid from concrete. Joints between the form work and existing concrete structures shall also be "grout tight". Form work shall be arranged to facilitate easing and removing of the various parts in correct sequence, without jarring or damaging the concrete. Fixing block bolts or similar devices may be embedded in the concrete, provided they do not reduce the strength or effective cover of any part of the structures below the required standard but the use of through bolts shall be avoided whenever possible. Temporary openings shall be provided at all points necessary in the forms to facilitate cleaning and inspection immediately before placing of the concrete.

(d) Forms shall overlap the hardened concrete in the lift previously placed by not more than 75 mm and shall be tightened strongly against the hardened concrete so that when concrete placement is resumed, the forms will not spread and allow offset or loss of mortar at construction joints. Additional bolts or form ties shall be used as necessary to hold forms tight against hardened concrete. Particular attention shall be paid in setting and tightening the forms for construction joints so as to get a smooth joint free from sharp deviations or projections.

(e) Moulding strips shall be placed in the corners of forms so as to produce chamfered edges as required on permanently exposed concrete surface.

9.2 Form, Centering and Temporary Works

(a) All centering, formwork and temporary works shall be constructed according to the approved drawings and specifications.

(b) As soon as practicable, after the acceptance of the tender, the Contractor shall submit a scheme showing the order of procedure and method by which he proposes to carry out the work, together with such details as are necessary to demonstrate the adequacy, stability and safety of the methods.

(c) The approval to the general scheme of centering as well as design criteria and loading shall be obtained in good time to facilitate all preparatory works. Any delay on this account shall be the responsibility of the Contractor.

(d) After approval of the general scheme, the contractor shall prepare detailed designs and drawings for execution of the form work, centering and temporary works. These shall be forwarded to the Engineer-in-charge for approval. No work shall be carried out without prior approval of the Engineer-in-charge.

(e) The approval of the Engineer-in-charge is specified with a view to reasonably ensure that the formwork in general, is adequately designed. Notwithstanding the approval given to the design criteria and loading and the general scheme for the centering, the entire responsibility for the satisfactory execution of the centering and all temporary works shall rest with the Contractor and he shall be liable to pay all claims and compensation arising from any loss or damage to life and property due to any deficiency, failure or malfunctioning of the centering or the temporary works.

(f) Forms required to be used more than once shall be maintained in serviceable condition and shall be thoroughly cleaned and repaired before reuse. Where metal sheets are used for lining forms, the sheets shall be placed and maintained in the forms without humps or other imperfections. All forms shall be checked for shape and strength before reuse.

(g) **Slab to be girder of supports as canal with start running after 50 days.**

9.3 Cleaning and Treatment of Forms

At the time the Concrete is placed in the forms, the surface of the forms shall be free from encrustations of mortar, grout or other foreign material. Before the concrete is placed, the surface of the forms shall be oiled with a commercial form oil, that will effectively prevent sticking and will not stain the concrete surface. For timber forms, form oil shall consist of pure refined pale paraffin mineral oil or other approved form oil. For steel forms, form oil shall consist of refine mineral oil suitably compounded with one or more ingredients which are appropriate for the purpose. Care shall be taken to keep form oil out of contact with reinforcement.

9.4 Removal of Forms

(a) Except as otherwise provided in this sub-clause, forms shall be removed as soon as the concrete has hardened sufficiently, for earliest practicable repair of surface imperfections.

(b) Forms on upper sloping surfaces of concrete, such as forms on the water sides of warped transition, shall be removed as soon as the concrete has attained sufficient stiffness so as to prevent sagging. Any needed repair or treatment required on such slopping surface shall be performed at once and be followed immediately by specified curing.

(c) In order to avoid excessive stresses in the concrete that might result from swelling of the forms, timber forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.

(d) Subject to the approval, forms on concrete surface close to the excavated rock surface may be left in place provided that the distance between the concrete surface and the rock is less than 400 mm and that the forms are not exposed to view after completion of the works.

(e) Forms shall be removed with care so as to avoid damage to the concrete. Damage if any due to form removal shall be repaired immediately.

(f) For ordinary Portland cement concrete the following minimum intervals of time as per specifications in IS: 456-2000 shall generally be allowed between placing the concrete and striking the formwork. The period shall be modified if required, in case of wet weather etc. as per direction of the Engineer-in-charge.

(i)	Wall, columns and vertical faces.	24 to 48 hours
(ii)	Slabs (Props left under)	3 days
(iii)	Beam soffits (Props left under)	7 days
(iv)	Removal of props under:	
	Slabs spanning up to 4.5m	7 days
	Slabs spanning over 4.5 m	14 days
(v)	Removal of props under beams and arches	
	Spanning up to6 m	14 days
	Spanning over 6 m	21 days

The number of props left under, their sizes and deposition shall be such as to be able to safely carry full dead load of slab, beams or arch as the case may be together any live load likely to occur during the curing or during further construction.

10 FINISH AND REPAIRSTO CONCRETE

(a) All exposed concrete surfaces shall be finished true to line and level, either manually or by mechanical contrivances. It shall be cleaned off impurities, lumps of mortar or grout and unsightly stains. The finished surface shall be even, smooth and free from pockets and equivalent to that obtainable by the effective use of a long-handled steel trowel. Where the surface produced meets the specified requirements, no further finishing operation shall be required.

(b) The surface of concrete finished against form shall be smooth and shall be free from projections, honeycombing and other objectionable defects. Immediately on removal of the forms, all unsightly ridges or lips shall be removed and undesirable local bulging on exposed surface shall be removed by tooling and rubbing.

(c) Repairs to concrete surface and additions where required shall be made by cutting regular openings into the concrete and placing fresh concrete to the required lines. Chipped openings shall be sharp and shall not be less than 75 mm in depth.

11 CURING OF CONCRETE

11.1 General

All equipment, material etc. needed for curing and protection of concrete shall be kept handy and ready for installing before actual concreting begins. Detailed plans, methods and procedures whereby the various phases of curing and protection shall be firmly established, shall be settled and got approved from the Engineer-in-charge sufficiently in advance of the actual concreting.

11.2 Watering/ Curing

(a) Uniform top surfaces of walls, piers etc. shall be moistened by covering with water saturated material or by other effective means as soon as the concrete has hardened sufficiently to prevent damage by water. These surfaces and steeply slopping and vertical formed surfaces shall be kept completely and continuously moist, prior to and during form removal, by water applied on the unformed top surfaces and allowed to pass down between the forms and the formed concrete faces. This procedure shall be followed by the specified water curing.

(b) Concrete cured with water shall be kept wet for at least 28 days immediately following placement of the concrete or until covered with fresh concrete by covering with water saturated material or any other suitable method, which will keep all surfaces continuously (not periodically) wet.

12 REQUIREMENT OF CONCRETE CONSTRUCTION

12.1 General

All concrete construction shall conform to the permissible tolerance and technical provisions as described in this section and to the detailed requirements of the following paragraphs. All structures shall be built in a workman like manner or to the lines, grades and dimensions shown in the design drawings or as prescribed by the Engineer-in-charge. The location of all the construction joints shall be subject to the approval of the Engineer-in-charge. The dimensions of each structure shown on the working drawings, which shall be given after award of contract shall be subjected to such changes as may be found necessary by the Engineer-in-charge.

12.2 Concrete in Structures Block outs

(a) The item of the schedule for concrete in foresaid structures include all concrete in the various components of the structure and in the blocks left for subsequent concreting.

(b) All concrete required to be placed in blocks to permit the installation and adjustment of mechanical and other equipment's shall be included in the respective concrete as directed above. The concrete surface inside the blocks left un-concreted, blocks shall be chipped and roughened as described hereinafter before the block concrete is placed.

(c) Exceptional care shall be taken in placing the concrete in a block in order to ensure satisfactory bond with the concrete previously placed and to secure complete contact with all metalwork in the blocks left.

(d) The roughening of the concrete surface in the space left for the blocks shall be performed by chipping or sand blasting as approved by the Engineer-in-charge and in such a manner as not to loosen, crack or shatter any part of the concrete beyond the roughened surface. After being roughened the surface of the concrete shall be cleaned thoroughly to remove loose fragments, dirts and other objectionable substances and shall be sound and hard to ensure good mechanical bond between the existing and new concrete. All concrete, which is not hard, dense and durable, shall be removed to the depth required to the satisfaction of the Engineer-in-charge.

12.3 Embedment in Concrete

At some of the locations of structures as shown on the relevant drawings a few conduits or openings shall have to be provided through R.C.C./P.C.C. work. Construction of the surface for either placement of concrete shall have to be suitably carried out so as to meet with the placement of such conduits or openings. No extra claim for such provisions in constructions shall be entertained. Similarly, for gates, stop logs etc. anchors shall have to be embedded for blocks in concrete as shown in the drawings. For this also no extra payment shall be entertained.

12.4 CONSTRUCTION JOINTS

(a) Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown on approved drawings or as directed by the Engineer-in-charge.

(b) For vertical construction joints stopping boards shall be fixed previously at a predetermined position and shall be properly stayed for sufficient lateral rigidity to prevent its displacement or bulging when concrete is placed against it. Concreting shall be continued right up to the board. The board shall not be removed before expiry of the specified period of removal of vertical forms.

(c) Before resuming work at any construction joint when concrete has not yet fully hardened, all laitance shall be removed thoroughly, care being taken to avoid dislodgement of coarse aggregates.

(d) When work has to be resumed on a surface which has hardened, it shall be thoroughly racked, swept, clean, wetted and covered with a layer of neat cement grout, just prior to the placement of the concrete.

(e) In all cases, the position and detailed arrangement of all construction joints shall be predetermined and got approved by the Engineer-in-charge.

13 TESTING FOR CONCRETE AND ACCEPTANCE OF WORK

(a) Sampling Procedure

A random sampling procedure shall be adopted to ensure that each concrete batch has a reasonable chance of being tested, i.e. the sampling shall be spread over the entire period of concreting and shall cover all mixing units.

(b) Frequency:

The minimum frequency of sampling of concrete of each mix shall be in accordance with the following:

Quantity of concrete in m³	Number of Samples
1 to 5	1
6 to 15	2
16 to 30	3
31 to 50	4
51 and above	4 Plus one additional sample for each additional 50 m³ or part thereof, however, at least one set of cubes in a week, irrespective of quantity of concrete shall be taken.

(c) Test Specimen

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes, such as to determine the strength of concrete at 7 days or at the time of striking formwork, or to determine the duration of curing or to check the testing cubes cured. The specimen shall be tested as directed in IS: 516-1959.

(d) Test strength of Samples

(i) The test strength of the sample shall be the average of three specimen. Individual variation more than 15 percent of the average, shall be deleted for the purpose of averages.

(ii) Contractor shall provide necessary unskilled labour and facilities for transport, for collection of samples, cores, etc. and shall remain present at the time when the samples are taken. Testing shall be carried out at the project testing laboratory or at any other laboratory that the Engineer-in-charge may decide upon and the results given thereby shall be considered as correct and authentic and acceptable to

the contractor. The Contractor shall be given access to all operations and tests that may be carried out as aforesaid.

(iii) The material and labour including transport for the materials for testing shall be provided by the contractor at his cost. He shall not be eligible for payment for this. The preparation and the testing of the cubes shall be carried out by the contractor at his cost.

(e) Acceptance Criteria

(i) The average strength of the group of cubes cast in shall not be less than the specified works cube strength 20 % of the cubes cast may have values less than the specified strength provided the lowest value is not less than 85% of the specified strength.

(ii) In case the concrete does not conform to the acceptance criteria for strength as specified above the Engineer-in-charge reserves the right to reject the work or accept the same at a reduced rate corresponding to the mix under which that concrete satisfies the strength requirements specified at para 3.6.2.6 for the leanest mix, the reduced rate shall be derived from the contract rate in proportion of reduction of strength.

(iii) Whenever necessary for the purpose of obtaining economy, workability, density, impermeability, durability or strength or on account of variation in the quality and gradation of aggregates or other materials. The Engineer-in-charge, in consultation with laboratory organization shall after testing make necessary changes in the proportion of mix. Contractor shall have to effect these changes and shall not been titled to any compensation on account of such changes.

14 STEEL REINFORCEMENT

Steel shall confirm to para M-6 of specification of material of steel.

15 TOLERANCES FOR DRAIN STRUCTURE

Variation in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawings shall be within the tolerance specified in Table below. Variation shall not be cumulative.

(i) Departure from established alignment 25 mm
(ii) Departure from established grade. 25 mm
(iii) Variation from plumb as for surfaces of columns, piers and walls when overall length of surface is 3 m or less Exposed 10mm Buried 20mm More than 3 m Exposed 12 mm Buried 25mm
(iv) Variation in cross-sectional dimensions of columns, beams, slabs, walls and similar members of Minus 6mm or Plus 12 mm
(v) Variation in location form those specified for slab and wall openings 12mm

16 CENTERING AND SCAFFOLDING

(a) The scaffolding must take account of all construction loads as well as speed of erection. Scaffolding may be bolted on the sleeves embedded in the concrete wall (initially used for fixing shuttering). After concreting, the scaffolding will have to remain in position near stressing points till all the stressing is completed. Complete drawings of false work, accompanied where necessary by calculations shall be

submitted for the approval of the Engineer-in-charge, 3 months prior to commencement of erection.

(b) Any modification that the Engineer-in-charge may require shall be made by the Contractor. Notwithstanding the approval of or alternation suggested by the Engineer-in-charge in the submitted design for any of the temporary works, etc. the contractor shall remain wholly and entirely responsible until the final acceptance of works, for the efficiency, security and maintenance and for all obligation and risks in regard to such work specified or implied in the contract. He shall reinstate the work at his own cost, should any mishap or accident occur causing damage or injury thereto, subject, however, to such provisions of the conditions of contract as may be applicable in the case of such damage or injury.

(c) Scaffolding may be released as per the convenience of the work. Centering shall be lowered only with the approval of the Engineer-in-charge and in a manner which shall not damage the work. Scaffolding shall rest on wedges or sand boxes or on screw jacks in order to permit controlled de-shuttering. After initial lowering, centering shall be kept in place till all finishing, repairing work is completed on the underside of the structure.

A suitable designed flight of stairs giving temporary access to the top shall be provided by the Contractor at his own cost as a part of the false work scheme.

17.Joints

Item shall consist of filling of grooves kept in lining for expansion joints with the mixture of asphalt, fine sand or with mastic asphalt as approved by Engineer-in-Charge. Transverse joints shall be uniformly spaced at an interval of required length as specified in measurement sheet or as directed by Engineer- in- Charge.

Item shall be executed after specified period of curing of concrete for lining is over and concrete has strengthened well.
Asphalt, fine sand or mastic asphalt whichever are to be used shall be got approved from Engineer-in-Charge prior to their use.
Grooves kept in lining for expansion joints shall be opened well, cleaned, washed and dried well before filling.
When asphalt, fine sand dust is used for filling joints, they shall be mixed in proportion as mentioned by the Engineer-in-Charge. While mixing care shall be taken to keep the mixture free from foreign substances.
Mixture of asphalt, fine sand and asbestos or mastic asphalt shall be filled in grooves kept in lining carefully and pressed hard to have no cavities or hollows in joints. Joints shall be finished flush with the top surface of the lining.
Joints dully filled and finished shall be allowed to set and strengthen without any disturbance or damage for the period as directed by the Engineer-in-Charge.
Care shall be taken by the contractor to prevent distortion of grooves or joints shape and damage to the concrete lining.

18 MEASUREMENT AND PAYMENT

18.1 General

The prices entered in the Bill of Quantity for the incorporation of the various classes of concrete, plain and reinforced required by this section shall be inclusive of mobilizing, demobilizing, supplying all equipments, forms, materials, labour, supervision and all incidental work except for any item specifically exempted there from and for which, in addition, a specific item for payment has been included in the Bill of Quantity.

(a) Except or otherwise especially for in the specifications, measurement of concrete for payment shall be made on the basis of the volume of concrete calculated as being contained within the concrete outlines shown on the relevant drawings.

(b) Measurement, for payments, for the concrete laid in pockets in the foundation shall be made on the basis of the volume of the pockets filled.

(c) No payments shall be made for the concrete backfill beyond the minimum lines of excavation shown on the drawings except where such payment is specifically authorized. Contractor have to make own arrangement for dewatering. No Extra payment shall be paid for dewatering. Measurement of concrete shall be made after deducting the volume of all recesses, passageways, chambers, openings, cavities and depressions, but without deductions for round or beveled edges or space occupied by electrical conduits and reinforcement.

(d) Concrete shall be measured on the basis of volume of concrete calculated as being contained within the concrete outlines shown on the relevant drawings.

(e) The unit rate for concrete shall include the cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as per direction of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown in the drawings and according to these specifications. The rate shall also include the cost of providing, fixing and removing of all centering and form work required for the work unless otherwise specified in the contract.

(f) The unit rate also includes the cost of dewatering and protection work as may be necessary during and after concreting work.

(g) All expenses likely to be incurred by the Contractor in transporting materials supplied to him to the site of work, the expenses incurred in improving the quality of materials to acceptable levels (such as screening, washing etc.) and the expenses incurred in proper storage of materials as directed by the Engineer-in-charge etc. are deemed to be included in the unit rate.

(h) Payment for the various classes of concrete shall be made on the basis of unit rate per cubic meter quoted for relevant items in Bill of Quantity.

19.0 Mode of Measurement:

The concrete work shall be measured in length, breadth and depth (i.e. in m3) as specified in drawing or as directed.

ITEM NO: 05

Providing and laying 75mm wearing coat of ordinary portland cement concrete M-15 grade including laying on proper camber, tamping, screening, finishing, broomung or grooving etc. complete for all leds and lifts.

Materials :

- Water shall confirm to M-3 of specification of material.
- Cement shall confirm to M-1 of specification of material.
- Sand shall confirm to M-2 of specification of material.
- Corase aggregate shall confirm to M-4 of specification of material.

Workmanship :

- The concrete shall be of M-15 grade considered equivalent to 1:2:4 and minimum standard consumption of cement should be observed.
- Wooden forms shall be dressed and erected equal in depth to the thickness of the wearing coat at the center and sides of the slab. The cross form shall be checked for the accuracy in camber with the camber board prepared in advance confirming to the specified camber for the type of road way carried over the crossing.
- In case of skew crossing, the transverse forms shall be at parallel to the line of pie making an angle with the center longitudinal wooden form running parallel to the road way over the crossing.
- The joints shall be plain but joints at right angle and as directed by Engineer-in-charge.
- The wearing coat shall be laid after cleaning the surface and thoroughly washing it with water, panels, shall be of suitable size with longitudinal and transverse joints at places as directed.
- The concrete shall be laid either as alternate bay method or as directed. A heavy screed or tamper fitted with handle shall be used in tamping the concrete.
- The joints shall be filled with asphalt sand and sawdust mixture as directed.

Mode of Measurement and payment:

The measurement and rates shall be paid on Cumt. basis.

ITEM NO: 06

Providing & Placing in position reinforcement bars including cutting, bending welding joints where necessary, hooking etc, complete as per drawing for all leads and lifts. (b) TMT

General specification of TMT reinforcement shall be applicable.

1.0 General

(a) The Fe -500 TMT or Higher grade of Bars be procured by the Contractor from approved manufacturers. Steel reinforcing bars shall be placed in concrete were shown on the drawings as directed by the Engineer-in-Charge. The tender drawings issued with these specifications show only tentative requirement of reinforcement and further detailed construction drawings shall be issued by the Engineer-in-Charge during the course of the contract.

(b) The contractor shall go through the schedule of reinforcement given with the construction drawing and if there is discrepancy in the same, the contractor shall bring to the notice of the Engineer-in-Charge for construction. The Engineer-in-Charge after ascertaining the discrepancy from Design Organization shall issue new superseded drawing which shall from the basis for bending schedules. In case

of detailing of structural member where bending schedules are not given, the contractor shall prepare and get it approved by Engineer-in-Charge.

(c) As far as possible Thermo-mechanical treated Bars, conforming to IS: 1786-FE 500 shall be used as reinforcement as shown in the drawings. The steel shall be used in various components of various canal structures as per the drawing or as per instruction of Engineer-in-Charge. The payment shall be made and considered as per the unit rate quoted in the respective items of Bill of Quantity.

(d) The reinforcement steel shall be procured from the BIS approved manufacturer or his authorized dealer only, before thirty days prior to the using in works. The contractor shall furnish BIS manufacturer's test certificate along with test results for each category for every lot brought to the site of work. The manufacturer's test results shall be from the manufacturer's lab only. The test results from other lab shall not be accepted and the consignment will be rejected. Testing of steel shall be carried out as per relevant IS code. In no case rerolled steel shall be allowed.

Frequency for steel testing (Physical properties) are as under as per IS: 1786 - FE-500.

Nominal Size of bar	Quantity	
	Lot below 100 tones	Lot above 100 tones
Up to 10 mm	1 sample from each 25 tone	1 Sample from each 40 tone
10 to 16 mm	1 sample from each 35 tone	1 sample from each 45 tone
Over 16 mm	1 sample from each 45 tone	1 sample from each 50 tone

(e) Stacking of each type of steel shall be made separately at the central lace for stacking, if established by the contractor or at each site of work.

(f) Thermo-mechanical Treated conforming to the chemical, physical and corrosion resistant properties as below shall be used in the work as per drawings and as per the instruction of the Engineer-in-Charge.

The contractor has to procure TMT bars as per the BIS standards

The Engineer-in-Charge shall decide the acceptable test result and field requirement for use of TMT bars in the RCC work and it shall be considered as final.

TMT bars shall be used in the work for the various components of various canal structures to be constructed under the contract.

TMT bars shall be tested prior to use in the work and after getting the acceptable test results for the assessment of its quality, before it shall be used in the work.

2.0 Testing of TMT bars:

a) The testing of TMT bars for Unit Weight as well as Tensile Strength shall have to be done prior to use in the work.

b) The steel shall also confirm the above-mentioned required standards for the above tests for which the contractor shall have to produce the authentic certificates from the manufacturer for such type of testing for each lot of steel

manufactured at a time and transported to the works site. Moreover, the further testing shall be done by approved Laboratory before its use in the work. The TMT bars shall be used after getting satisfactory results however if no adequate facility for above mentioned testing shall be available in Government laboratory, in such case and considering the express request of contractor. Engineer-in-Charge may allow the contractor for testing of TMT bars at the laboratory established by manufacturer or any other laboratory approved by the Engineer-in-charge.

3.0 Cutting, Bending and Binding

(a) The Contractor shall be responsible for the accuracy of the cutting, bending and placing of the reinforcement. Reinforcement shall be inspected for compliance with the requirements as to grade, size, shape, length, placing and locations after it has been placed. No concreting shall be started unless the reinforcement as placed in the work is finally checked, recorded and certified by the Engineer-in-charge.

(b) Before the reinforcement is placed, the surface of the bars and the surfaces of any metal bar supports shall be cleaned off the rust, scale, dirt, grease and other objectionable foreign substances. After being placed, the reinforcing bars shall be maintained in a clean condition until they are completely embedded in the concrete.

(c) Reinforcing bars shall be accurately placed and secured in positions so that the clear distance between two main bars shall not be less than the greatest of the following:

(i) The diameter of the bar if the diameters are equal.

(ii) Diameter of larger bar if diameter is unequal.

(iii) 5 mm more than the Specified maximum size of coarse aggregate.

The bars and fabric shall not be displaced during the placing of concrete. The Contractor shall ensure that there is no disturbance of the reinforcing bars in concrete during placement in concrete and correct location shall be maintained in the cast concrete.

(d) Wire for binding reinforcement shall be of soft and annealed TMT and shall conform to IS: 280-1978*. Binding wire shall have a tensile strength of not less than 56 kg/mm^2. The wire shall have a minimum diameter of 1mm. Chairs, hangers, spacers and other supports for reinforcement may be of concrete, metal or other approved material. The minimum allowable clearance between parallel round bars shall not be less than 1.5 times the diameter of the largest bars and for square bars shall not be less than twice the side dimensions of the larger bars or 1.5 times the maximum size of aggregate whichever is greater. Bars crossing each other, where required shall be secured by binding wire in such a manner that they do not slip over each other during the fixing and concreting. Wire used for binding reinforcement shall not be measured for payment.

4.0 Care of placed Reinforcement and Concrete

- Reinforcement bars shall be discontinued at construction joints

5.0 Cover and Cover Block

- The clear cover & cover to the reinforcement shall be provided as shown in the drawing. In case it is not shown, the clear cover and cover block to be ascertained from the Engineer-in-charge.

- To maintain the correct clear cover, cement mortar block of size 5 cm x 5cm and thickness according to the clear cover as of the strength of the concrete shall be casted. The cover block shall have binding wires rigidly inserted in them to tie it with the reinforcement. The cover block shall be sufficiently close to attain the required strength.

6.0 Measurement and Payment

(a) Measurement, for payment for furnishing and placing reinforcing bars shall be based on the calculated weight of the bars placed in concrete. The payment shall be made on the basis of unit rate per quintal quoted for relevant items in Bill of Quantity.

(i) The weight of reinforcing bars shall be based as per unit weight mentioned below

Table: Cross Sectional Area and Mass (IS: 1786)

Nominal size mm 1	Cross-Sectional Area mm^2 2	Mass per Meter Run kg 3
8	50.3	0.39
10	78.6	0.62
12	113.1	0.89
16	201.2	1.58
18	254.6	2.00
20	314.3	2.47
22	380.3	2.98
25	491.1	3.85
28	616.0	4.83
32	804.6	6.31
36	1018.3	7.99

(ii) The joints or splices shown on the drawings or as directed by the Engineer-in-charge shall not be measured or paid separately. Measurement shall be taken as per the length of bars placed in position as per drawing. Payment for placing reinforcement bars shall be made at the rate tendered thereof in the Bill of Quantity. The rate shall include the cost of preparing workshop drawings for reinforcement based on the construction drawings, issued by the Engineer-in-charge.

(b) Steel reinforcing bars (TMT) shall be placed in concrete were shown on the drawing or as directed by the engineer- in- charge. The tender drawing issued with these specifications show only tentative requirement of reinforcement and further detailed construction drawings shall be issued by the engineer –in-charge during the course of the contract.

(c) The contractor shall go through the schedule of reinforcement given with the construction drawing and if there is discrepancy in the same, the contractor shall bring to the notice of the engineer-in-charge after ascertaining the discrepancy from design

organization shall issue new superseded drawing which shall from the basis for binding schedules. In case of detailing of structural member where binding schedules are not given the contractor shall prepare and get it approved by the engineer-in-charge. The contractor's reinforcement detailed drawing for approval shall be prepared in accordance with is: 456-1978 "Code of practice for plain and reinforced concrete IS: 2502-1963 code of practice for bending and fixing of bars for concrete Reinforcement" and IS: 5525-1969 "Recommendation for detailing of Reinforcement in reinforced concrete work" unless otherwise shown on the reinforcement detail drawings. Contractor's drawings shall show necessary details for checking the bars during placement and for use in establishing payment quantities. Reinforcement bars shall conform to requirements shown on the drawings or as directed by the engineer-in-charge. The approval of the engineer-in-charge to the contractor's reinforcement detailed drawings shall not absolve the contractor of his responsibility for the correctness of details or for conformation with the requirements of these specifications.

ITEM NO: 07

Providing & Fixing in position 110 mm dia. PVC pipes weep holes in abutment, wing wall and laying training etc. comp.

The work shall be carried out as per the instruction of Engineer- in - charge.

The material required for the P.V.C pipe should satisfy the I.S.I standard & should be of required or stated diameter.

P.V.C pipes should be laid in transverse direction i.e. perpendicular to length of wall and should be laid in such way that face of pipe and wall should be surfaced. Inside part of P.V.C pipe i.e. on back side of wall should be covered with brick bats & other coarse material such that the inside hole of the pipe should not chalked up by earth .Surrounding of pipe the cement mortar should be laid in such a way that no pores should be occurred & piping thru' surrounding should be avoided. P.V.C pipes should be laid at even distance as specified by Engineer in Charge.

Mode of measurement and payment:

The measurement and payment shall be given on **Meter** basis.

ITEM NO: 08

White or colour wash in following coats including scrapping, scaffolding etc.comp.

(12-B) For three coats.

- White lime & color of approved brand and manufacture shall be sued for white wash / color wash.
- Where scaffolding is required it shall be erected in such a way that as for as possible no pail of scaffolding shall rest against the surface to be white washed. A properly secured and well tied suspended platform (Jhoola) may be used for white wash or color wash.
- The surface to the color wash or white washed shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. All unnecessary nails shall be removed. A coat of white or color wash shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of lime or color wash is allowed.
- Before applying color / lime wash any unevenness shall be made good. The item consists of two coats of white / color wash with finishing.

Mode of measurement and payment:

The payment should be made on **sq.mt.** basis of the area to be white washed / color washed.

ITEM NO:9

Providing and laying plain / Reinforced cement concrete lining of 1:2:4 praportion (Nominal mix) in bed, side slope and curveture including mixing transporting, placing, smooth finishing, curing including dewatering where required (Manually With Conventinal Mixer Without Paver) a) 7.50 cm in Bed & slope (with water curing)

General specification of cement concrete lining shall be apply.

2.

3. **7.1 Scope of work:**

In this item the 7.50 cm thick paver lining is to be carried out in M-15 Grade with required quantity of water to maintain water cement ratio as per design mix.

4. 7.2 MATERIALS:

2. CEMENT:

Cement shall be confirm to M-1 of Specification of Materials

1. SAND:

Sand shall be confirm to M-2 of Specification of Materials

1. **COARSE AGGREGATE:**

Coarse Aggregate shall be confirm to M-4 of Specification of Materials

2. WATER:

Water shall be confirm to M-3 of Specification of Materials

~~**MEMBRANE:**~~

~~Membrane shall be confirm to M-7 of Specification of Materials~~

7.3 CLEARING SITE:

The area proposed for lining the canal as a whole shall have to be cleared of all objectionable material. Any waste material obtained from such site clearance shall be disposed off in a manner directed by the Engineer-In-Charge. The cost of this operation shall be deemed to have been covered under the rates quoted for canal lining.

7.4 PREPARATION OF SUB GRADE CONSISTING OF EARTH.

The sub grade shall be prepared, dressed and rolled true to level and according to the required cross section of canal to form a firm compacted bed for lining.

If at any point material of prepared sub grade has been excavated beyond the pay line required to receive the lining, the excess excavation shall be refilled in horizontal layers with selected material compatible with sub grade material and thoroughly compacted.

7.5 PROPORTIONING CONCRETE:

7.5.1 Concrete

(a) Concrete mix shall be designed in GERI or Government engineering college . The proportion of ingredients shall be such that concrete has adquacte workability for conditions prevailing on the work in question and can be properly compacted with the means available.

(b) Except when it can be shown to the satisfaction of the Engineer-in-Charge that supply of properly graded aggregates of uniform quality can be maintained till the completion of the work, grading of aggregate shall be controlled by obtaining the coarse aggregate in

different sizes and blending them in the right proportions asrequired. Different sizes, however, shall be stacked in separate stockpiles. Required quantity of material shall be stockpiled several hours, preferably a day, before use. Grading of coarse and fine aggregates shall be checked as frequently as possible, frequency for a given job being determined by the Engineer-In-Charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary test. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Water shall either be measured by volume in calibrated tank or weight. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

(c) To keep the specified water cement ratio constant as determined by mix design moisture content in both fine and coarse aggregate shall bepre determined by Engineer-In-Charge. The amount of mixing water shall then be adjusted to compensatefor any variations noted in the aggregate IS:2386-1977 (Part-III) shall be referred to make suitable arrangement in weight of water. Suitable adjustments shall also be made in the weight of aggregates to allow for variations in weight of aggregates due to variations in their moisture content

(d) The cement level for various grades of concrete shall be considered asunder for the purpose of working out the rates to be quoted in Schedule-B.

Table no-1

Sr.No	Type of concrete	Grade of concrete	Cement level required in kg for one cubic metre of concrete.
1	2	3	4
1	Plain	M-15 (MSA-20)	300

(e) Actual cement level required for the aggregates to be used shall be determined by laboratory tests. The mix proportions shall be selected to ensure that the workability of the fresh concrete is suitable for the conditions of handling and placing so that after compaction it surrounds all reinforcement and completely fills the Form work. When concrete is hardened, it shall have the required strength, durability and surface finish.

(f) A mix shall be designed to produce the grade of concrete having the required workability and cohesiveness and characteristic strength not less than stipulated in table under Para 5.1(b) above. However, due to change in design mix, if it becomes obligatory to use less or more cement per cubic meter of concrete, the contractor shall do the same without claiming any extra cost towards laboursfor work carried out by using of extra cement. In case ofactual use of cement will be less w.r.t cement level specifiedin above table, col No.4, the cost of cement used less in quantity in the work w.r.t cement level as mentioned in col.No.4 shall be deducted from the bill at the base price of the star rates of cement.If the consumption of the cement in the work is more w.r.t cement level specified in col.No.4, No payment shall be made for excess use of cement to the contractor. i.e. if the cement level of concrete mix is more w.r.t cement level as specified in above table, col.No.4, no payment shall be made to the contractor for excess use of cement in the work and if the cement level of concrete mix is less w.r.t cement level as specified in

above table, col. No.4, recovery of less consumption of cement in the work shall be made from the bill of at base price of Star Rate of cement..In case of actual use being more than that specified above, the contractor will not be paid for the increase in use of cement. Design mix details of this includes the proportion of each separate size or grade of aggregate and actual cement level required shall be declared to the contractor in writing by the Engineer-in-Charge & any subsequent changes in the mix shall be suitably decided.

STRENGTH REQUIREMENT OF CONCRETE

The compressive strength requirements for the various mixes by concrete shall be as follows:

Type of concrete.	Minimum Compressive strength in kg/cm²of 150 mm cubes	
	7 days	28 days
M-15	2/3of 28 days strength	150

(g) The quantity of water shall be just sufficient to produce a dense concrete with required workability. The quality of water shall confirm to M-3 of specification of material.

(h) In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slump tests. Following slumps shall be adopted for different types of works.

Sr. No.	Type of work	Slumps allowed (without any Admixture)
1	C. C. Lining	60 mm to 70 mm

(g) The quantity of water shall be just sufficient to produce a dense concrete of required workability, cohesiveness, durability and strength for the job. An accurate and strict control shall be kept on the quantity of water.

(h) In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slump tests. Following slumps shall be adopted for different types of works.

Sr. No.	Type of work	Slumps allowed (without any Admixture)
1	C. C. Lining	60 mm to 70 mm

7.6 PRODUCTION OF CONCRETE:

7.6.1 CONTROLLED CONCRETE.

7.6.1.1 Batching and Mixing Concrete by weight.

The contractor shall provide such means and equipmentsas are required to accurately determine and control the relativequantity of the various materials including water, cement, admixtures, sand and each specified size of coarse aggregates entering the concrete and such means and the equipment and its operation shall be subjected at all times, to the approval of the Engineer-in-Charge. The amount of cement, sand, each size of coarse aggregate and water entering each batch of concrete shall be determined by weighing. The measuring equipments shall operate within the limits of accuracy specified. Standard tests of weights and other auxiliary equipments required for checking their satisfactory performance shall be provided. The equipment shall be capable of controlling the delivery of materials for weighing measurement so that the in accuracies in feeding and measuring during normal operations will not exceed 1.50 percent for water, cement and admixtures and 3 percent for sand and coarse aggregates. Periodical tests shall be made at least once in every two weeks in the case of equipments for measuring water, cement and admixture sand at least once every month in the case of equipment measuring and coarse aggregates. However, this will not obstruct any surprise checking and testing at any time as desired by the Engineer-in-Charge. Repairs, replacements or adjustments shall be made as necessary to secure satisfactory performance.

The weighing equipment shall conform to the requirements of the relevant portions of IS:2722-1964. Portable wing weight batchers for concrete and ordinary concrete mixer conventional type shall confirm to the requirement of relevant portions IS:5891-1970.

The mixer should be able to handle all the grades of coarse aggregates, fine aggregates, water and cement and admixtures where specified, facility should be available to obtain samples of each ingredients entering the mixture. The contractor shall maintain a record of number of batches mixed and all other required for checking the correctness of the mix asper the directions of Engineer-in-Charge.

7.6.1.2 Batching

(a) **For lining contractor shall have to use Flouri machine(onwheel batching plant) or Digital weighing system conventional mixer of required capacity.**

(b) The prescribed amount of the various materials of concrete including water, cement, admixtures, the groupings of fine aggregates and each individual size of coarse aggregate shall be measured and controlled within the specified limits of accuracy. The amount of water, cement and aggregate shall be determined by weighing. In the case of fine aggregates, the surface moisture shall be determined in accordance with the method prescribed in Appendix-D of IS: 456-2000 and its subsequent amendments or publications. In the case of coarse aggregates, percentage of free water shall be determined by weighing a representative sample, then surface drying each particle individually with a clean piece of cloth and re-weighing.

(c) The proportions of various materials shall be changed as directed in order to maintain the desired quality of the concrete. The batching equipmentshall be constructed and operated so that the combined inaccuracies in feeding and measuring the materials shall not exceed 1½ percent for water and cement and 2 percent for each size of aggregate.

(d) The operating performance of each scale or other measuring device shall be checked by standard test weight to be supplied by the Contractor and test weight shall be got calibrated by the Contractor and the tests shall cover the ranges of measurements

involved in the batching operations. Tests of equipment in operation shall be made at least once every fortnight and adjustments, repairs or replacement, be made as necessary to meet the specified requirement for accuracy of measurement.

(e) Aggregate shall not be batched for concrete or mortar when free water is dripping from the aggregate.

(f) Before the concreting operation starts the Contractor shall provide communication facility in form of wireless, walky-talky or telephone between the batching and mixing plant and site/sites of various concrete placements and got approved by the Engineer-In-Charge.

7.6.1.3 MIXING

For lining contractor shall have to use Flouri machine(onwheel batching plant) or Digital weighing system conventional mixer of required capacity.

7.7 FORMWORK:-

Wooden orsteel form shall be used for the work. They shall confirm to the shapes line and dimension etc. as indicated on plan or as directed by the Engineer – in – Charge. Form shall be set to the exact grade alignment, curve and slope sufficiently well in advance of depositing concrete. The formwork shall be thoroughly cleaned and oil shall be applied to the same before concrete is placed .No form shall be removed before at least 24 hours. Every care shall be exercised during their removal to ensure that the concrete shall not be damaged any way. The form shall be thoroughly cleaned before reused.

7.8 CAST IN-SITU CONCRETE STRUCTURE / LINING:

7.8.1. General

The work shall conform to IS:3873-1993. All concrete for Structure/ lining shall be governed by IS:456-2000. The concrete shall be of controlled grade with suitable admixtures of approved air entraining agents, using well graded aggregates with maximum size of aggregate of 20 mm. The proportioning of concrete shall be as per Para 5.1

7.8.2 Mix Design.

(a) At the beginning of the work in each working season, a test to determine the mix proportion required to produce the strength specified with the material to be used in the work. (The necessary ingredients shall be provided free of cost by the contractor.)

The mix shall be designed using representative samples of approved coarse and fine aggregates as well as cement and water to be made available by the contractor, to achieve the required workability, cohesion, strength and durability at minimum level of cement.

Mix design will have to done in Government laboratory or Government Engineering college.

(b) The proportion of mix design ingredients shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with the means available.

(c) During the execution of work if the source of any ingredient of the concrete changes, the contractor shall inform the Engineer-in-Charge sufficiently in advance so as to allow him to proportion a new mix design to attain the specified strength of concrete. At that time, the representative samples of approved ingredient shall be supplied by the contractor without any extra cost.

(d) The details of mix design including the proportion of each separate size and grading of aggregates and actual cement level required shall be declared to the contractor in writing by the Engineer-In-Charge.

As a results of Para (d), if there is any subsequent change in mix design, same shall be similarly declared.

7.8.3 STRENGTH REQUIREMENT OF CONCRETE:

Ordinary Portland Cement are used. The compressive strength requirements for the various grades of Controlled / Nominal concrete shall be as given in Table given below:

Type of Concrete	Minimum Compressive Strength in kg/cm^2 of (150 x 150 x 150 mm) cubes	
	7 days	28 days
M-15	100	150

Note: Seven days test results give an early indication of a possible weak concrete. 28 days compressive strength specified in table shall alone be the criteria for acceptance or rejection of the concrete. Where the strength of a concrete mix as indicated by test lies in between strength of two grades specified in table, such concrete shall be classified for all purposes as concrete belonging to lower of the two grades between which its strength lies.

7.9 TRANSPORTING CONCRETE:

(a) Concrete shall be transported from the plant to the placing position as rapidly as practicable by methods that will prevent segregation or loss of ingredientor the loss of slumps in excess of 25 mm and / or a loss in a air content of more than one percent before the concrete is placed in works.

(b) Chutes used for conveying concrete shall be of such size and shape as to ensure a steady flow of concrete in a compact mass without separation or loss of ingredients and shall be protected from wind and sun where necessary to prevent loss of slump by evaporation and shall be furnished with a discharge hopper. Free fall or drop of concrete shall be limited to 150 cm. Chute sections shall be made of or lines with metal and all runs shall have approximately the same slopes not flatter than 1 vertical to 2.5 horizontal. The required consistency of concrete shall be changed in order to facilitate chute conveying. Wherever there is a free fall within the conveying system suitable baffle plates, splash boards or down spouts shall be provided to prevent segregation, splashing of loss of ingredients. Wherever it is necessary to hold the discharge end of a chute for more than 3 meters above the level of the fresh concrete, a flexible down spout shall be used to break the fall and to confine the flow. The lower end of the spout

shall be held close to the place of deposit. Wherever de position is intermittent a discharge hopper shall be provided. All chutes shall be thoroughly cleaned before and after each run. All wash water and debris shall bed is posed off outside the forms.

7.10 PLACING AND COMPACTION

7.10.1 General

(a) No concrete shall be deposited until the foundation has been inspected and approved and until all form work required is completed, embedded parts if any installed and checked and surfaces prepared for placing.

(b) All surfaces of forms and embedded materials that have become encrusted with dried mortar or grout from concrete previously placed shall be cleaned off all such mortar or grout fresh concrete is placed.

(c) Concrete shall be placed only in the presence of a duly authorized representative of the Govt. Concrete shall be placed and compacted before initial setting time and should not be subsequently disturbed. Compaction shall be carried out with proper type of Compactor.

(d) Placing of concrete shall not be started until all form work, installation of parts to be embedded, if any, and preparation of surface upon which concrete is to be laid, have been completely inspected and then so directed by the Engineer-in-Charge. All absorptive surfaces against which concrete is to be laid shall be moistened adequately so that moisture will not be withdrawn from freshly placed concrete. The surface, however, shall be free from standing water and mud.

(e) Concrete shall be deposited in all cases as neatly as practicable directly in its final position and shall not be caused to flow in a manner to permit segregation. Excessive separation of the coarse aggregate caused by allowing the concrete to fall freely from too great a height or at too great an angle from the vertical shall not be permitted and where such separation would otherwise occur, the Contractor shall provide suitable means to convey the concrete without allowing such separation.

7.10.2 Placing

Placing of concrete shall be manually from Transit mixer.

Concrete shall be deposited and spread on the bed and sides of the canal as indicated on the drawing with cutting grooves for panel joints in between them as per drawing but such that in no case panel dimensions exceed3 m. Concrete may be laid to facilitate placing, vibrating, finishing and curing operations. The side lining concrete shall be spreaded up the slope, the concrete being vibrated ahead of the screed. Concrete required for keys as shown on the drawings shall be laid integrally with the side slope lining

7.10.3 Finishing

(a) All exposed concrete surface shall be cleared of impurities, lumps of mortar or grout and unsightly stains. The finished surface shall be even, smooth and free from pockets and equivalent to that obtainable by effective use of a long handle steel trowel.

(b) The surface of concrete finished shall be smooth and shall be free from projection, honeycombing and other objectionable defects. Undesirable local bulging on exposed surfaces shall be remedied by tooling and rubbing.

(a) Repairs to concrete surface and additions where required shall be made by cutting regular openings into the concrete and placing fresh concrete to the required lines. Chipped openings shall be sharp and shall not be less than 75 mm in depth.

7.11. CURING

7.11.1 water Curing

(a) Uniform top surfaces of lining shall be moistened by covering with water saturated material or by other effective means as soon as the concrete has hardened sufficiently to prevent damage by water. These surfaces and slopping and vertical surfaces shall be kept completely and continuously moist, prior to and during form removal, by water applied on the unformed top surfaces and allowed to pass down between the forms and the formed concrete faces. This procedure shall be followed by the specified water curing.

(b) Concrete cured with water shall be kept wet for at least 28 days immediately following placement of the concrete by saturated material or any other suitable method, which will keep all surfaces continuously (not periodically) wet.

7.12 Testing of Concrete & Acceptance of Work:

7.12.1 General

Testing of concrete shall be carried out at the cost of the DEPARTMENT on representative samples taken at the site of laying the concrete in accordance with relevant Indian Standard Specification.

7.12.2 Sampling Procedure and Frequency

A random sampling procedure shall be adopted to ensure that each concrete batch has a reasonable chance of being tested i.e. the sampling shall be spread over the entire period of concreting and shall cover all mixing units.

Frequency: The minimum frequency of sampling of concrete of each mix shall be in accordance with the following :

Quantity of concrete in m3	Number of samples (Set of 6 cubes for 7days and 28 days testing)
1 to 5	1 set
6 to 15	2 set
16 to 30	3 set
31 to 50	4 set
51 and above	4 set Plus one additional sample set for Each additional 50 m3 or part thereof.

Test Specimen:

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes, such as to determine the strength of concrete at 7 days or at the time of striking formwork. The specimen shall be tested as directed in IS: 516-1959.

Test strength of samples:

The test strength of the sample shall be the average of three specimen. Individual variation more than 15 percent of the average of the three samples is found than the test result of the sample are invalid.

Contractor shall provide necessary unskilled labour and facilities for transport, for collection of samples, cores, etc. and shall remain present at the time when the samples are taken. Testing shall be carried out at the project testing laboratory/ GERI /Government Engineering colledge as decided and directed by the Engineer-In-Charge and the results given there by shall be considered as correct and authentic and acceptable to the contractor. The contractor shall be given access to all operations and tests that may be carried out as aforesaid. The material and labour including transport for the materials for testing shall be provided by the contractor at his cost. He shall not eligible for payment for this.

Acceptance Criteria :

i. The average strength of the group of cubes cast for each day shall not be less than the specified cube strength for the work. About 20 percent of the cubes casted for testing may have values less then the specified strength provided the lowest value is not less than 85% of the specified strength.

ii. In case on the basis of laboratory test results, it shows that the concrete does not conform to the acceptance criteria for strength as specified above, the hardened concrete may be acceptable after carrying out destructive or non-destructive tests as specified in IS;456-2000 Para No 17. The Engineer-In-Charge may decide the type of testing and acceptance of concrete on the basis of test results so obtained.

iii. In case, the concrete does not conform to the acceptance criteria for strength as specified above (i) and (ii) the Engineer-In-Charge reserves the right to reject the work or accept the same at a reduced rate derived from tendered rate and as approved by him if technically acceptable. Whenever necessary for the purpose of obtaining economy, workability, density, permeability, durability or strength on account of variation in the quality and gradation of aggregates or other materials, the Engineer-In-Charge shall, after testing, make necessary changes in the proportion of mix. Contractor shall have to effect these changes and shall not be entitled to any compensation on account of such changes.

iv. In case of doubt regarding the grade of concrete used, either due to poor workmanship or based on results of cube strength test, the hardened concrete may be accepted after carrying out the destructive or non-destructive test as specified in Para 17 of IS 456-2000. The Engineer-In-Charge will decide the type of test results and acceptance of concrete on the basis of test results so obtained. The Engineer-In-Charge will carry out the test in the presence of authorised person of the contractor. All the facilities for carrying out such test shall have to be provided by the contractor without any extra cost to the Department.

The material and labour including transport for the materials for testing shall be provided by the contractor at his cost. He shall not be eligible for payment for this. The preparation and the testing of the cubes shall be carried out by the contractor at his cost.

7.13 JOINTS

Transverse joints shall be uniformly spaced at an interval of about 3.5 to 4.5 mt C/C and longitudinal joint 1-No shall be spaced or as directed by Engineer-in-charge. The joints shall be cut up to 1/3 thickness of lining i.e. 25 mm to 27 mm. The dimensions of the joints shall be as per the provision of IS -3873. The width of grove shall be 11 mm joints shall

be filled with sealing compound as directed by engineer- in- charge. It shall be filled with sand and then after sand shall be removed and filled with bitumen filler. Before applying the primer, the joints shall be thoroughly cleaned and allowed to dry if wet and all loose particles and foreign matter shall be removed. The primer shall be applied by means of a brush or any other suitable applicator so as to completely cover the sides and the bottom of the joint. The sealing compound shall be heated to an appropriate pouring consistency and poured in to the joint with minimum loss of temperature. Filling of joints with bitumen will have to be executed without any extra payment.

7.14 DEWATERING

In canal reaches where sub soil water is met with dewatering shall be resorted to and continued during preparation of sub-grades for providing and placing of concrete for lining till such period the concrete attain necessary strength. No separate payment shall be made for dewatering operations .

7.15.0 MODE OF MEASUREMENT AND PAYMENT:

Payment shall be made at the rates for completed items of work tendered therefore in schedule-B on **square meter** basis of actual work done. The rates shall include all expenditure on labour, materials, equipments required for carrying out satisfactory work. The rate of items includes the cost of transporting, dewatering, smooth finishing, curing etc. complete.

ITEM NO.-10

Providing G.I. 100 mm diameter water spouts including necessary iron gratings as per drawing.

- The work shall be carried out as per the instruction of Engineer - in - charge.
- The material required for the P.V.C pipe should satisfy the I.S.I standard & should be of required or stated diameter.
- The PVC water spouts of the size 10cm dia and Galvanize iron gratting shall be of the approved quality and type, and shall be first got approved from the Engineer-in-charge before actual use. The PVC pipe shall be of sufficient length projecting out beyond the concrete surface for sufficient discharge. Iron grating shall be fixed rigidly into the concrete. The gratings shall be painted with two coats of anticorrosive paint.

Mode of measurement and payment:

The measurement shall be recorded and paid on the basis of Each No. of pipe fixed in position.

ITEM NO.-11

Taking photography at site before starting the work, during execution & after completion of work.

This item consists Photography in three stages.

1) **Before starting the work**:
Photography should covered the existing actual position of the work at selected reaches of as directed by Engineer in charge, & contractor shall submit it during the submission of running bill.

2) **During the progress of work** :
During the progress of work Photography of the working should be taken in all different stages of execution, during visit or as directed by engineer in charge.

3) **After completion of work :**

After completion of work the Photography of the work done should be taken to cover the completed work or as directed by Engineer in charge.

Mode of Measurement and payment :

The measurement of the work done of Item includes Album, titling etc. comp. Photographs shall be taken before, after execution of work photo shall be clear enough to represent nature of work done.

Size of photo shall as have directed by engineer-in-charge contractor have to make all arrangement for taking photograph. Developing it & present to department before finalization of work measurement shall be made on the Nos. basis of the actual work done and payment shall be made on **Job** basis.

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

Executive Engineer
Ambica Division
Navsari

GENERAL TEST SCHEDULE

SR. No	Test	Frequency	Acceptance criteria
1	**2**	**3**	**4**
(A)	**Earth work**		
1	Standard compaction (proctor)	1 per sources	1.5 to 1.7 gm/cc.
2	Field dry density	1 per 300m^3 minimum one in each zone per layer	(I) 85 % density of standard compaction
			(ii) Moisture content shall be ± 2% of O.M.C.
3	Atterberg Limits & Swelling pressure	1 per sources	LL: - 35 to 50, PL: - 20 to 30, PI: - 15 to 30
(B)	**Cement**		
1	Setting time		
(a)	Initial setting time	One sample of 15 kg. Collected from 2% bags of 50 T. lot.	(a) Initial time - Not less than 30 minutes.
(b)	Final setting time	50 to 100 T. - 2 sample	(b) Final time - Not less than 600minutes.
2	Fineness (by Sieving)	100 to 200 T- 3 sample	90 % or more shall pass from 90-micron sieve. Not less than 2250 cm^2 /g for OPC
3	Consistency Test	200 to 300 T- 4 sample	About 30 percent
		300 to 500 T- 5 sample	
4	Compressive Strength.	500 to 800 T- 6 sample	Minimum 270 kg/ cm^2 at 3 days (For 53 Grade)
		800 to 1300 T- 7sample	Minimum 370 kg/ cm^2 at 7 days
			Minimum 530 kg/ cm^2 at 28 days
(C)	**Fine Aggregate (sand)**		
1	Silt content	1 Per 150 m^3	Up to 3%
2	Fineness Modulus	1 Per 150 m^3	2.4 to 3.2
(D)	**Coarse Aggregate (Metal)**		
1	Gradation Test	100 C.M. - 1Test	Shall confirm to Mix design
2	Flakiness Test	101 to 500C.M. - 3 Test	Maximum up to 20 %
3	Impact Test	501 to 1500 C.M. - 5 Test	Maximum up to 30 %
		1501 to 5000 C. M. - 7 Test	
5	Specific Gravity & water Absorption	2 per season	Specific Gravity 2.5 to 3.0 Water absorption 1 to 1.5 %
(E)	**Water**		
(I)	Chemical Analysis	1 per source	T.D.S. 300 mg / lit.
			Sulphate 500 mg/lit
			PH Value 6 to 8

SR. No	Test	Frequency	Acceptance criteria
1	2	3	4
			Chloride 2000 mg/ lit.
			Organic (carbonic) Substances 200 mg/lit.
			In Organic (Non- Carbonic) Substances 300 mg/lit.
(F)	**Ordinary & Controlled Concrete IS 456- 2000**		
1	Compressive strength	1 to 5 C.M. - 1 sample	For concrete of different grade, the specified strength shall be as under (kg/cm2)
		5 to 15 C.M. - 2 sample	
		16to 30 C.M. - 3 sample	Grade 7days 28 days
		31 to 50 C.M. - 4 sample	M-10 (1:3:6) 70 100
		51 C.M & above - 4 + 1 Sample	M-15 (1:2:4) 100 150
		for each 50 C.M. or part thereof	M-20 (1:11/2:3) 135 200
		Note: - (a) 1 sample = 6 specimen of 15cm x 15 cm x 15 cm cube) (b) At least 1 sample for a day's work	M-25 (1:1:2) 170 250
2	Slump Test	1 per day	60 mm to 70 mm
(G)	**STEEL**		
	- Tensile Strength - Yield Stress - Elongation -Size	- Size 1 test/ 40 tones / per category	

Note: - Test related to other materials are described in specification of materials and detail specifications of items.

Deputy Executive Engineer
Valsad Irrigation Sub Division
Valsad

SECTION - 6

FORM OF BID

FORM OF BID

Description of the Works:

Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.

BID

To: **Executive Engineer,Ambica Division, Navsari**

Address: **2nd Floor, Sinchai Bhavan, Near Parsi Hospital, Opp-Tata Baug,Lunsikui, Navsari**

1. We offer to execute the Works described above and remedy any defects therein in conformity with the conditions of Contract, specification, drawings, Bill of Quantities and Addenda for the sum (s) of ---------- **As per Financial Bid**----------
2. We undertake, if our Bid is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Engineer's notice to commence, and to complete the whole of the Works in the Contact within the time stated in the document.
3. We agree to abide by this Bid for the period of 120 Days from the date fixed for receiving the same, and it shall remain binding upon it and may be accepted at any time before the expiration of that period.
4. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
5. We understand that you are not bound to accept the lowest or any tender you may receive.

Dated :-_____

Signature :-_____

in the capacity of :-_____
(Authorized Representative or Proprietor or Partner)

on behalf
(Agency Name) :-_____

Address :-_____

Witness Name :-_____

Signature :-_____

Occupation:-_____

Address :-_____

(in block capitals or typed)

SECTION - 7

BILL OF QUANTITIES

BILL OF QUANTITIES

Preamble

1. The bill of Quantities shall be read in conjunction with the Instructions to Bidder, Conditions of Contract, Technical Specifications and Drawings.

2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.

3. The rates and prices tendered in the priced Bill of Quantities shall, except in so far as it is otherwise provided under the Contract, include all constructional plant, layout, supervision, materials, erection, maintenance, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract.

4. The rates and prices shall be quoted entirely in Indian Currency.

5. A rate or prices shall be entered against each item in the Bill Quantities, whether quantities are stated or not. The cost of Items against which Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities (in case of Item rate contract).

6. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no Items are provided the cost shall be deemed to be distributed among the rates and prices entered for the related items of Work.

7. General direction and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before entering rates or prices against each item in the Bill of Quantities.

8. The method of completed work of payment shall be in accordance with the specification for Road and Bridge works. For building works specifications for building are to be followed.

9. Errors will be corrected by the Employer for any arithmetic errors pursuant to **Clause 29** of the Instructions to Bidder.

10. Rock is defined as all materials which, in the opinion of the Engineer, required blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for its removal, and which cannot be extracted by ripping with a tractor of at least 150 kw with a single rear mounted heavy duty ripper

BILL OF QUANTITIES

(A) Percentage Rate Tender (Up to INR 50 Cr.)

Name Of Work :	Constructing R.C.C. Box Culvert Near Survey No/ Block NO-1107, 1234 & 1235 (Old Survey No/ Block NO- 884/2/among 1) on 1L Bifercation 1L Sub Minor Of Chanvai Distry near Ch. 950.0 mt.

:: Schedule B ::

Item No.	Quantities estimated but may be more or less	Unit	Item Description	Tender Rates	Per	Amount
1	39.80	CM	**ITEM NO : 1** Excavation for foundation in all sorts of soil including yellow, sandy, gravelly soil, soft & hard murrum, etc. dry condition including depositing the excavated stuff in uniform layers in banks or as directed etc. complete for lead up to 1.0 Km and all lifts. (By machinery)	81.50	CM	**3243.70**
2	27.00	CM	**ITEM NO : 2** Providing and filling rubbles including hand packing and filling interstices with quarry spalls behind abutments and between returns as directed.	1086.49	CM	**28749.60**
3	14.00	CM	**ITEM NO : 3** Providing and filling sand Below R.C.C Raft in Layers including Ramming and watering complete	552.22	CM	**6725.74**
4	15.00	CM	**ITEM NO : 4** Providing & laying plain/reinforced Nominal Mix cement concrete of various grade with cement, sand and coarse aggregates including cantering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all lead and lift. (Baching Plant Based, including dewatering) (B) Raft, Bottom slab of barrel, footing of columns, peirs, abutment and bottom slab of sump etc. (i) M - 15 Grade	4380.90	CM	**65713.50**
	2.00	CM	(C) Piers, abutment, wingwalls, headwall, returnwall etc.(ii) M-15 grade.	4499.60	CM	**8999.20**
	9.00	CM	(C) Piers, abutment, wingwalls, headwall, returnwall etc.(iii) M-20 grade.	4976.90	CM	**44792.10**
	18.00	CM	(B) Raft, Bottom slab of barrel, footing of columns, peirs, abutment and bottom slab of sump etc.(ii) M-20 grade.	4796.10	CM	**86329.80**
	13.00	**CM**	(B) Raft, Bottom slab of barrel, footing of columns, peirs, abutment and bottom slab of sump etc.(iii) M - 25 Grade	**4844.70**	**CM**	**62981.10**
	9.50	**CM**	(D) Walls of barrels, brestwall, staunching rings, pedestals of bearing, stoplog piers, well stainning, transition wall etc(iii) M-25 grade.	**5753.60**	**CM**	**54659.20**
	10.00	**CM**	(E) Roadway slab, approch slab, chute floor slab, kerb, pier cap, abutment cap, hoisting platform, top slab of barrel etc. (ii) M-25grade.	**5206.30**	**CM**	**52063.00**

5	**79.64**	**SM**	**Item No.-5** Providing and laying 75mm wearing coat of ordinery portland cement concrete M-15 grade including laying on proper camber, tamping, screening, finishing, broomung or grooving etc. complete for all leds and lifts.	**282.30**	**SM**	**22482.37**
6	**40.70**	**Qtl**	**Item No.-6** Providing & Placing in position reinforcement bars including cutting, bending welding joints where necessary, hooking etc, complete as per drawing for all leads and lifts. (b) TMT	**7194.00**	**Qtl**	**292795.80**
7	**8.00**	**Rmt**	**Item No.-7** Providing & Fixing in position 110 mm dia. PVC pipes weep holes in abutment, wing wall and laying training etc. comp.	**263.70**	**Rmt**	**2109.60**
8	**58.50**	**SM**	**Item No.-8** White or colour wash in following coats including scrapping, scaffolding etc.comp. (13-B) For three coats	**21.80**	**SM**	**1275.30**
9	**115.20**	**SM**	**Item No.-9** Providing and laying plain / Reinforced cement concrete lining of 1:2:4 praportion (Nominal mix) in bed, side slope and curveture including mixing transporting, placing, smooth finishing, curing including dewatering where required (Manually With Conventinal Mixer Without Paver) a) 7.50 cm in Bed & slope (with water curing)	**364.50**	**SM**	**41990.40**
10	**2.00**	**Each**	**Item No.-10** Providing G.I. 100 mm diameter water spouts including necessary iron gratings as per drawing.	**536.03**	**Each**	**1072.06**
11	**1.00**	**Job**	**Item No.-11** Taking photography at site before starting the work,during execution & after completion of work.	**500.00**	**Job**	**500.00**
				Total		**776482.47**

Rupees Seven lakh seventy six thousand four hundred eighty two rupees and forty seven paisa only.

I/We am/are willing to carry out the work at…..…..% above/below percent (Should be written in figures and words) of the estimated rate mentioned above. Amount of my /our tender works out as under.

Estimated amount put to tender	Estimated amount put to tender
Deduct……% below	Add……% Above
Net	Net
In words	In words

Note:-GST as per prevailing rate shall be paid Extra.

(B) For Item Rate Tender (Above to INR 50 Cr.) :

Item No	Description of Item (with brief specification and reference to book of specifications)	Quantity	Unit	Rate In (Without GST)		Amount
				Figures	In Words	

(A) Total Tendered Amount
(B) Rebate on above tendered amount (if any) % (in figure) ……
(in words)……..
(C)Net Tendered Amount (A-B) (in figure) ……
(in words)……..

#

1	The Contractor shall exhibit a board with brief details of work as directed by the Engineer-In-Charge for which no extra payment shall be made.
2	The labour Cess will be deducted as per prevailing rules i.e. 1% of the work done.
3	GST and Income tax TDS will be deducted at a source while making payments of bills
4	In all R.C.C. Items in Rate Analysis Standard Cement Consumption has been taken as per Govt. G.R. NO.: MIS102010/17/K1 Dated:30/07/2018 as stated in S.O.R. therefore, in R.C.C. items where there is a change as per actual mix design the cost of difference of cement consumption have been deducted from the rate of original item at the rate of input rate **i.e. Rs 5234/MT** mentioned in all the tender.

SECTION - 8

SECURITIES AND OTHER FORMS

BID SECURITY (BANK GUARANTEE)

WHEREAS, ---------- (name of Bidder) (hereinafter called the "The Bidder") has submitted his bid Dated ---------- (Date) for the construction of ---------- (Name of Contractor hereinafter called "the Bid")

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 ---------- * for which payment well and truly to be made to the said Employer the Bank itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this ---------- day of -------20

THE CONDITIONS of these obligations are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

Or

(2) If the Bidder has been notified of the acceptance of his bid by the Employer during the period of Bid Validity:

A Fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

B. Fails or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders; or

C. does not accept the correction of the Bid Price pursuant to Clause 27 (Correction of Errors)

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 three conditions, specifying the occurred conditions or conditions.

This Guarantee will remain in force up to and including the date ---------- ** days after the deadline for submission of Bids as such the 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----------

WITNESS ---------- SEAL ----------

(Signature, name and address)

* The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1(Bid Security) of the Instructions to Bidders.

****45 days** after the **end of the validity period** of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.

PERFORMANCE SECURITY

TO,
- ----------(Name of Employer)
- ---------- (Address of Employer)

WHEREAS ---------- (name and address of contractor) (hereafter called "the Contractor") has undertaken, in pursuance of Contracts No. ---------- dates ---------- to execute ---------- --------- (name of Contract and brief description of Works) (hereinafter called "The Contract")

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractors such a bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of ---------- (amount of guarantee)* ---------- (in words), such sum being payable in types and proportions of currencies in which the Contract prices is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of ---------- (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting is with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract to of the Works to be performed thereunder or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such charge, addition or modifications.

This guarantee shall be valid until 60 days from the date of expiring of the Defect Liabilities period.

Signature and Seal of the guarantor ----------

Name of Bank ----------

Address ----------
Date ----------

*An amount shall be inserted by the Guarantor, representing the percentage the Contract price specified in the Contract denominated in Indian Rupees.

ADDITIONAL PERFORMANCE SECURITY

[Clause 34.1. (A)]

TO,

- ----------(Name of Employer)
- ---------- (Address of Employer)

WHEREAS ---------- (Name and address of contractor) (hereafter called "The Contractor") has undertaken, in pursuance of Contracts No. ---------- dates ---------- to execute ---------- --------- (Name of Contract and brief description of Works) (hereinafter called "The Contract")

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractors such a bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of ---------- (amount of guarantee) ---------- (in words), such sum being payable in types and proportions of currencies in which the Contract prices is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of ---------- (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting is with the demand

We further agree that no change or addition to or other modification of the terms of the Contract to of the Works to be performed thereunder or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such charge, addition or modifications.

This guarantee shall be valid until **28 days** from the project completion date.

Signature and Seal of the guarantor ----------

Name of Bank ----------

Address ----------

Date ----------

BANK GUARANTEE FOR ADVANCE PAYMENT

TO,

- ---------- (Name of Employer)

- ---------- (Address of Employer)

- ---------- (Name of Contractor)

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub-clause 51.1 ("Advance Payment") of the above mentioned Contract, ---------- (name and address of Contractor) (hereinafter called "the Contractor") shall deposit with ---------- (name of Employer) a bank guarantee his proper and faithful performance under the said Clause of the Contract in an amount of ---------- (amount of Guarantee)* ---------- in words).

We, the ---------- (bank of financial institution), as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to ---------- (name of Employer) on his first demand without whatsoever right of obligation on our part and without his first claim to the Contractor, in the amount not exceeding ---------- (amount of guarantee)* ---------- (in words)

DELETED
E.E.

We further agree that no change or addition to or other modifications of the terms of the Contractor or Works to be performed there under or of any of the Contract documents which may be made between ---------- (name of Employer) and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modifications.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until ---------- (name of employer) receives full repayment of the same amount from the contractor.

YOUR'S TRULY

Signature and Seal _____
Name of Bank/ Financial Institution _____
Address _____
Date _____

* An amount shall be inserted by that Bank or Financial Institution representing the amount of the Advance Payment, and denominated in Indian Rupees.

Letter of Acceptance

(Letter head paper of the Employer)

_____ (date)

To,

_____ (Name and address of the Contractor)

_____

_____

Dear Sirs,

This is to notify you that your Bid dated _____ for execution of the _____ (Name of the contract and identification number, as given in the Instructions to Bidders) for the Contract Price of Rupees _____ (_____) (amount in words and figures) as corrected and modified in accordance with the Instructions to Bidders* is hereby accepted by our agency.

You are requested to furnish performance security, in the form detailed in para 34.1 of ITB for an amount equivalent to Rs. _____ within **10 days** of the receipt of this letter of acceptance up to beyond **60 days** from the date of expiry of defects Liability period i.e. up to _____ and the Additional Performance Security for an amount equivalent to Rs. _____ shall be valid beyond 28 (twenty-eight) days of Project Completion Date i.e. up to _____ and sign the contract, failing which action as stated in Para 34.3 of ITB will be taken.

Yours Faithfully

Authorized Signature
Name and title of Signatory
Name of Employer

---

* Delete "Corrected and" or and modified if only one of these actions applies. Delete as corrected and modified in accordance with the Instructions to Bidders, if corrections or modifications have not been affected.

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 security in ITB Clause 34.1 and signing of the Contract for the construction of_____

_____

_____ at 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)

AGREEMENT FORM

This agreement, made on the _____ day of _____ between _____ (name and address of Employer) (Hereinafter called "the Employer) and _____ (name and address of contractor) hereinafter called "the Contractor" of the other part.

Whereas the Employer is desirous that the Contractor execute

_____

Name and identification number of contract (hereinafter called "the works") and the employer has accepted the Bid by the Contractor for the execution and completion of such works and the remedying of any defects therein, at a cost of Rs.

_____

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the conditions of contract hereinafter referred to and they shall be deemed to form and be read construed as part of this Agreement.

2. In Consideration of the payment to be made by the Employer to the contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to executive and complete the works and remedy any defects therein in conformity in all aspects with the provisions of the contracts.

3. The employer hereby covenants to pay the Contractor in consideration of the execution and completion of the works and the remedying the defects wherein 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.

4. The Following documents shall be deemed to form and be ready and construed as part of this Agreement viz

   i) letter of Acceptance

   ii) Notice to proceed with the works:

   iii) Contractor's Bid

iv) Conditions of contract: General and Special

v) Contract Data

vi) Additional conditions

vii) Drawings

viii) Bill of Quantities and

ix) Any other documents listed in the Contract data as forming part of the Contract.

In witness whereof the parties there to have caused this Agreement to be executed the day and year first before written

The Common seal of _____

Was hereunto affixed in the presence of :

Signed, sealed and Delivered by the said _____

In the presence of

Binding signature of Employer _____

Binding Signature of Contractor _____

UNDERTAKING
(For Investment)

I, the undersigned do hereby undertake that our firm M/s …….. would invest a minimum cash up to **25%** of the value of the work during implementation of the contract.

_____

(Signed by an Authorized officer of the firm)

_____

Title of officer

_____

Name of firm

_____

DATE

UNDERTAKING
(For Validity)

I, the undersigned do hereby undertake that our firm M/s …… …….. agree to abide by this bid for a period.....days for date fixed for receiving the same and it shall be binding on us and may be accepted at any time before the expiration of that period.

_____

(Signed by an Authorized officer of the firm)

_____

Title of officer

_____

Name of firm

_____

DATE

SECTION - 9

DRAWINGS

SECTION - 10

DOCUMENTS TO BE FURNISHED BY BIDDER