



सत्यमेव जयते

GOVERNMENT OF GUJARAT

NARMADA, WATER RESOURCES, WATER SUPPLY

& KALPSAR DEPARTMENT

DRAFT TENDER PAPERS FOR

Construction of Box Type RCC Culverts at Panava (Khorī faliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.

Cost Put to Tender: Rs. 1,54,79,836.54/-

Date of Downloading	Up to Dt. 19 / 05/2026
Date of online Submission	Up to Dt. 08 /06/2026 up to 18.00 Hrs
Date of Submission of Tender Fee, EMD & Other Documents	Up to Dt. 17/06/2026
Date of opening of Bid	Dt. 09/06/2026 at 12.05 Hrs.

**OFFICE OF THE SUPERINTENDING ENGINEER
DAMANGANGA PROJECT CIRCLE, VALSAD**

PHONE: 02632-254501

Details about Tender

Name of Work:- Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.

Period of sale of bidding document online	Up to Date: 19 / 05 /2026 up to 18.00 Hrs.
Time and Date of Pre-Bid Conference	Date: 00 / 00 /2026 Time 12.00Hrs
Time and Date of opening of Pre-Qualification Bid online	Date: 00 / 00 /2026 Time 12.00 Hrs
Place of opening of Pre-Qualification Bid online	
Department Name	Narmada, water Resources, water Supply and Kalpasar Department, Government of Gujarat
Circle / Division	Damanganga Canal Distry Division No.3, Balitha (Vapi)
Name of Project	Damanganga Project
Name of work	Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.
Estimated Contract Value	Rs. 1,54,79,836.54/-
Period of completion (in months)	9 (Nine) months (including Monsoon Period)
Bidding Type	Open
Bid Call (Nos)	One
Tender Currency Type	Single Indian Rupee (INR)
Tender Currency Settings	Indian Rupee (INR)
Joint Venture	Not allowed
Rebate	Applicable
Amount Details	
Bid Document Fee	Rs. 3,600.00
Bid Document Fee Payable to	Executive Engineer, Damanganga Canal Distry Division No.3, Balitha (Vapi)
Bid Security / EMD (INR)	Rs. 1,55,000/-
Bid Security / EMD in favour of	Executive Engineer, Damanganga Canal Distry Division No.3, Balitha (Vapi)
Tender Dates	
Bid Document downloading start Date	Up to Date: 19 / 05 /2026 up to 18.00 Hrs.
Bid Document downloading end Date	Up to Date: 08 / 06 /2026 up to 18.00 Hrs.
Pre-Bid Meeting	Date: 00 / 00 /2026 Time 12.00Hrs
Last Date & Time for receipt of Bids	Up to Date: 08 / 06 /2026 up to 18.00 Hrs.
Last Date of Time for Physical submission of DD for tender Fee& EMD (FDR,BG) etc.	Date: 17 / 06 /2026
Bid Validity Period	120 days counted from the date of online opening of Technical Bid

Remarks	The Tender fee Demand Draft for Bid Document / 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 ‘Executive Engineer, Damanganga Canal Distry Division No.3 Balitha Vapi. within 7 Days(dt.17/06/206) from the last day of bid submission. If Tender fee and Bid Security /E.M.D. is not paid as shown in bid document, action to hold his registration in abeyance shall be taken and his E-tendering code will be cancelled for one year. In the case of E.M.D. exemption certificate, it shall have to be submitted electronically through online. Any other documents in supporting of tender bid shall be submitted in electronic format only through online (by scanning etc.) & hard copy will not accepted separately.
Pre-Qualification opening date	As per 3 (B)- Viii on page no.03
Other Details	
Officer inviting Bids	Executive Engineer, Damanganga Canal Distry butory Dn.No.3 Near Tata Motors, Balitha- Vapi-396191. Phone No.(0260)-2432204
Bid opening Authority	Superintending Engineer
Address	Superintending Engineer, Damanganga Project Circle, 2 nd Floor, Damanganga Bhavan, B/H JillaSeva Sadan-1, Valsad-396001
Contact Details	Phone No. (02632)- 253308 FaxNo-(02632)- 254501 e-mail: sedpcvalsad@gmail.com

STANDARD BIDDING DOCUMENT

PROCUREMENT OF

CIVIL WORKS

Name of Work: Construction of Box Type RCC Culverts at Panava (Khorī faliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.

COMPLETE BIDDING DOCUMENT



GOVERNMENT OF GUJARAT
Water Resources Department

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INVITATION FOR BID
(IFB)

NATIONAL COMPETITIVE BIDDING

1. The office of **the Executive Engineer, Damanganga Canal Distry Division No.-3, Balitha (Vapi)**. invites bids for the construction of works detailed in the table. The bidders may submit bids for any or all of the following works.

TABLE

Pack age No.	Name of work	Approximate value of works (Rs.)	Bid security (Rs.)	Cost of docum ent	Period of completi on	#Class of Registratio n/ Category of contractor if required
1	2	3	4	5	6	7
	Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta.Dharampur, Dist.Valsad.	15479836.54	155000/-	3600/-	09 Months (Including Monsoon)	Class-B & 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>.

#

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 Valsad and in favor of '**Executive Engineer, Damanganga Canal Distybutory Division No.3 Balitha-Vapi**'. 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 '**Executive Engineer,**

Damanganga Canal Distributory Division No.3 Balitha-Vapi within 7 Days from the last day of bid submission.

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

4. Bids received online, will be opened on the time, date and place as specified in the online NIT at website <https://www.tender.nprocure.com> in the presence of the bidders or their authorized representatives, who wish to remain present.

- ~~5. A pre bid meeting will be held onathrs. at the office of Executive Engineer, Damanganga Canal Investigation Division,Valsad. 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.~~

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.

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.

The intending bidder have to submit the following documents physically as well as in Electronic Format by scanning.

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. Undertaking by the Agency that he has access to, or has available, liquid assets (aggregate of working capital, cash in hand and uncommitted bank guarantees) and / or Bank Certificate for Evidence of Access to or Availability of Credit Facilities, as per Section 4.5.6 of SBD Book (Amount As per Appendix to ITB, point no. 8 & in the form prescribed in Section-2 of SBD Book)
7. Affidavit (as per Section 2 of SBD Book)
8. Litigation History as per section-1, clause 4.5.8 & in the form prescribed in Section-2 of SBD Book
9. FORM OF BID (as per Section 6 of SBD Book)
10. Partnership Deed (If Any) of bid (If Any)
11. Power of Attorney of the signatory of bid
12. Bid Capacity: It is Mandatory to provide information for assessment of bid capacity as per Section-1, point 4.7. It is to be provided in the form prescribed in section 2, point 1.2 & 1.4. Also provide calculated/derived value of your Bid capacity as per given formula & attach the Calculation sheet for the same. Necessary Certificates showing year wise breakup of work done amount, issued by concerned Engineer-In-Charge, are required to be attached.

The bidders should note that the above documents should be scanned electronically invariably. Scanning of Each & every above documents are mandatory, for the purpose of opening of the tender. The bidders who will not scan the above documents, their tender will not be opened.

Tender documents are only available in Electronics form. Bidders shall download the tender documents up to time specified in column No.3(B)-2. The demand draft towards tender documents fees along with Earnest Money deposit can be submitted during the period as specified in para -3(B)-3 above.

SECTION - 1
INSTRUCTIONS TO BIDDERS
(ITB)

Section 1: Instructions to Bidders

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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 / Govt. of India for centrally sponsored projects.

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: (Not Applicable)

~~(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	20—20—	1.00
-1	20—20—	1.10
-2	20—20—	1.21
-3	20—20—	1.33
-4	20—20—	1.46
-5	20—20—	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 (defined as billing for works in progress and completed in all classes of civil engineering construction works only) in any one year, over the last five years of the annual value of contract / contracts applied for.~~
- ~~(b) Experience in successfully completing or substantially completing at least one contract of highway (road and / or bridge works) airport runway of at least 40 percent of the value of proposed contract within the last five 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.~~

~~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.~~

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 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 4.5.1& 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 the next (period of completion of work for which bids are invited); and

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

Note :- In Case of joint venture, the available bid capacity will be applied for each partner to the extent of his proposed participation in the execution of the work.

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:

Part I 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 the bidder enter which no rate or price 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 for bid 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/4/2023/0057/D.M.O. Date 21/04/2023 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/22/2017/6369/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. Modification and Withdrawal of Bids

- 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 Contract, 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 of the Defects Liability Period and the Additional Performance Security shall be valid beyond 28 (twenty-eight) days of Project Completion Date.

- 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/4/2023/0057/D.M.O. Date 21/04/2023 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 or 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

1. The Name of the Employer is Executive engineer, [Cl.1.1]
Damanganga Canal Distry Division No.-3, Balitha (Vapi)
2. The last five financial years.
~~2024-2025~~
~~2023-2024~~
~~2022-2023~~
~~2021-2022~~
~~2020-2021~~
3. This Annual Financial Turnover Amount is [Cl.4.5.3 (a)]
Rs.
4. Value of Work is Rs. 1,54,79,836.54/-
5. Deleted
6. The cost of electric work is Rs. 0
7. The cost of water supply / sanitary works is Rs.
8. Liquid assets and / or availability of credit facilities is [Cl.4.5.6]
Rs. N.A
9. Price level of the financial year 2026-27 [Cl.4.5.2]
10. The pre-bid meeting will take place at [Cl. 9.2.1]
.....
11. The technical Bid will be opened at the office of the
Superintending Engineer, Damanganga Project Circle,
2nd Floor, Damanganga Bhavan, B/H JillaSeva Sadan-1,
Valsad-396001 on dt. at AM / PM
12. Address of the Employer: Executive engineer,
Damanganga Canal Distry Division No.-3, Balitha (Vapi)
13. Deleted
14. The bid should be submitted latest by As stated [Cl. 20.1 & 20.2]
on online NIT
15. The bid will be opened at As [Cl. 23.1]
stated on online NIT
16. The Bank Draft in favor of Executive Engineer,
Damanganga Canal Distry Division No.-3, Balitha (Vapi)
17. Deleted
18. Escalation factors (for the cost of works [Cl.4.5.2]
executed and financial figure to a common base value) for
works completed

<u>Year</u>	<u>Financial Year</u>	<u>Multiplying factor</u>
Base year of inviting tender	2026-27	1.00
-1	2025-26	1.10
-2	2024-25	1.21
-3	2023-24	1.33
-4	2022-2023	1.46
-5	2021-2022	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	4	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 constructions 20 ____ 20~~
~~Work performed in the last five years 20 ____ 20~~
~~(— in Rs. Lakhs) 20 ____ 20 ____~~
~~20 ____ 20 ____~~
~~20 ____ 20 ____~~

1.1.1 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.

Project Name	Name of the Employer	Description of work	Contract No.	Value of contract (Rs. Crore)	Date of issue of work order	Stipulated period of completion	Actual date of completion*	Remark explaining reasons for delay & work Completed

*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 nominated 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__							

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:

Description of works	Place & State	Contract No.	Name & Address of Employer	Value Contract (Rs. Cr)	Stipulated Period of Completion	Value of Works* remaining to be completed (Rs. Cr)	Anticipated of completion
1	2	3	4	5	6	7	8

*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	

~~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.				

~~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

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 *)

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

1. Deleted

2. Additional Requirements

2.1 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.

(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 undertak.....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

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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 hereunder

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 (except the Works, Plant, Materials and Equipment) in connection with the Contract; and
 - (d) Personal injury or death.
- 13.2 Policies and certificates for insurance shall be delivered by the Contractor to the 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, Damanganga Project Circle, Valsad** 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, Damanganga Project Circle, Valsad**
- (a) For the work up to Rs.100 Cr., if any of the parties is not satisfied with the decision of the **#Superintending Engineer, Damanganga Project Circle, Valsad** 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, Damanganga Project Circle, Valsad** both the parties have to refer to the Secretary, NWRWSK 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. Program me

- 27.1 Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Program me 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 Program me shall be a program me 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 program me at intervals no longer than the period stated in the Contract data. If the Contractor does not submit an updated program me 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 program me has been submitted.
- 27.4 The Engineer's approval of the program me shall not alter the Contractor's obligations. The Contractor may revise the program me and submit it to the Engineer again at any time. A revised program me 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 6 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 up to 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
- 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 programme 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 program me 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 2.3 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
$$R = \text{Total value of work done during the month. It would include the amount of secured advance granted, if any, during the month less the amount of secured advance recovered, if any during the month. It will exclude value for works executed under variations for which price adjustment will be worked separately based on the terms mutually agreed.}$$
- 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 6 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 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 date of expiry of Defects Liability Period 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.

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 Equipments, 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 or 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 CONDITIONS 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 thereunder, 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, Damanganga Project Circle, Valsad** (Higher Authority) 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, Damanganga Project Circle, Valsad**

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, Damanganga Project Circle, Valsad both the parties have to refer to the #Chief Engineer-Central Gujarat 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, Damanganga Project Circle, Valsad both parties have to refer to the #Secretary, NWRWS 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
Address: Damanganga Canal Distry Division No.-3, Balitha (Vapi)
Name of authorized Representative (will be intimated later)
2. The Engineer is Deputy Executive Engineer, Damanganga Quality Control Sub Dn., Dharampur
Name of Authorized Representative:
3. The Defects Liability Period is 3 (Three) years from the date of completion. [CL.1.1&33]
4. The Start Date shall be 1st day for 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 [CL.1.1,17&2]
09 (Nine) Months after start of work with the following milestones:
Milestone dates: [CL.2.2& 49.1]
Physical works to be completed Period from the start date
Milestone 1 i.e. 25 % 2.25 Month.
Milestone 2 i.e. 50 % 2.25 Month.
Milestone 3 i.e. 75 % 2.25 Month.
Milestone 4 i.e. 100 % 2.25 Month.
6. The Site is located at Village:- Panava, Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas Faliyu, Ta-Dharampur, Dist-Valsad [CL.1.1]
7. The name and identification number of the Contract is: [CL.1.1]
8. The works consist as per schedule-B, B.O.Q. The works shall, inter alia, include the following, as Specified or as directed: [CL.1.1]

(A) WRD Works

Site clearance; setting – out and layout; carry out required earthwork as suggested by Engineer also to carry out levelling trimming dressing with required compaction, Carry out CC lining using concrete as per approved mix design curing same with water or membrane all as per item specifications 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.

(B) Other Items

- Any Other Items as required to fulfill all contractual obligations as per the Bid documents. [CL.1.1]
- ~~10. The following documents also form part of the Contract:
Pre-qualification criteria As per clause 2-3~~ [CL.2.3(9)]
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. [CL.13]
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 programme updates will be 30 days. [CL.27.3]
21. The amount to be withheld for late submission of an updated program shall be Rs 50,000/- [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

S_0 = 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_0 = 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 retail price of bitumen of IOC depot at the nearest centre for the 15th day of the month under consideration.

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_0 = 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 15th 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

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

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 India 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:

1.	Labour	P_l	21.51 %
2.	Cement	P_c	26.69 %
3.	Steel	P_s	9.33 %
4.	Bitumen	P_b	0.00 %
5.	POL	P_f	0.46 %
6.	Plant & Machinery Spares	P_p	39.94 %
7.	Other Materials	P_m	2.07 %
	Total		100 %

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 10 percent of the Initial {CL. 49}
For delay in completion work Contract Price rounded off to
the nearest thousand

~~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~~ ~~5 percent~~ of the Contract {CL. 50}
~~Completion of work~~ ~~Price~~

~~30. The amount of the advance payment are: {CL. 51 & 52}~~

~~#Nature of Advances~~ ~~Amount (Rs.)~~ ~~Conditions to~~
~~Be fulfilled~~

i ~~Mobilization~~ ~~10% of the contract~~ ~~On submission of unconditional~~
~~Price~~ ~~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~~ ~~After equipment is brought to site~~
~~depreciated value for old~~ ~~(provided the Engineer is~~
~~equipment. Total amount~~ ~~satisfied That the equipment is~~
~~will be subject to a~~ ~~required for performance of the~~
~~maximum of 5% of the~~ ~~contract) and on submission of~~
~~Contract Price~~ ~~unconditional Bank Guarantee for~~
~~amount of advance~~

iii Secured Deleted
Advance for
Non-persish
able material
Brought to site

~~(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.~~

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 50,000/-
- 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

WORK AND SITE CONDITIONS

PART – 1

Name Of Work:- Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.

Work And Site Condition

1. LOCATION :

The works Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad under in Damanganga Quality Controll. Sub Div. Dharampur, Under jurisdiction of Damanganga Canal Disty Division No.3 Balitah-Vapi.

2. DETAILS OF SOURCES OF MATERIALS ARE AS UNDER :

Sr. No.	Name of Materials	Sources	Approximate distance from the site of work
1.	Coarse Aggregates	Chikhli, Jamanpada	45 K.M.
2.	Fine Aggregates	Par, Ambica & Tapi River	90 KM.

The above information are 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.

3. BRIEF DESCRIPTION OF THE WORK :

The work is to be carried out under jurisdiction of Executive Engineer, Damanganga Canal Disty Division No.-3, Balitah (Vapi). The work under the contract, Specification & drawing pertains to the **Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad**

LIST OF WORKS TO BE EXECUTED

Sr. No	Distri ct	Taluka	Village	Name of Work	Estimate Cost In Rs. Ps.
1	Valsad	Dharampur	Panava	Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad	15479836.54
				Total Rs.	15479836.54

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 go down or 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, 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 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, interpretation and conclusions drawn by the contractor in so far as the information / data are concerned. The contractor shall have to make their own investigations to satisfy themselves in regard to information/data given herein above.

9. **SITE CONDITION:**

Construction of Box Type RCC Culverts at Panava (Khorī faliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad Constructed by DCDD-3, Balitha-Vapi Division. It is required to maintain now to serve better. It is advice to have site visit before quoting rates & study the nature of work. It shall be deemed that the contractor have satisfied themselves as to the nature and pertaining to transport handling and availability and storage of materials, 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 labourers 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 Valsad.

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

Executive Engineer
Damanganga Canal Distybutory DivisionNo.3
Balitha-Vapi

PART- 2
GENERAL TECHNICAL SPECIFICATION
(SECTION-VI)

SECTION-VI

(I) GENERAL TECHNICAL SPECIFICATION

- 1.0** The work is located near village- Panava (Khorī faliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu), Ta-Dharampur, Dist-Valsad. The work consist of Construction of a Box Culvert on Local Kotar.. The Work consist of Excavation for foundation, Providing & Placing of reinforcement, Plain cement concrete of M-15, M-25 grade for foundation & super structure, Back filling, Providing graded filter & PVC pipe weep holes etc.
- 2.0** The work area is situated in relatively heavy rainfall zone. The rainy season commence normally from the middle of June and lasts up to mid of October. It has been observed that works are required to be totally closed in monsoon. If during the monsoon breaks, the works are in progress, it shall be the responsibility of the contractor to preserve and maintain the safe condition of all materials, machinery, tools and work sites from the floods due to seasonal or unseasoned rains, cyclone etc. The damages to the work, plant, Materials, Machinery etc. shall be done good by the contractor without any claims. No payment shall be made for any part of earth work or materials washed away or damaged during the monsoon or other period and it shall have to be made good by the contractor at his own cost. It is the responsibility of the contractor to make good or repair any Government property, material to be utilized for the present work or completed part of present work damaged during the construction period.

3.0 EXCAVATION :

CLEARING SITE, EXCAVATION

SCOPE : The work to be done under this specification shall include clearing site, excavation to designed section, removal of excavated materials, their sorting out if specified and their deposition either in spoil bank or at a space as directed within the lead and lift specified in the item.

CLEARING SITE : The site of excavation and space shall be cleared off all tree vegetation, root, bushes and the other objectionable matters. All tree shall be cut down to at least 60 cm. below ground level as directed, so as not to cause obstruction to the work.

DISPOSAL OF WASTE MATERIALS FROM CLEARANCE : Waste materials decided as such by the engineer, obtained from clearing operations shall be burnt or removed beyond the proposed location so as not to interfere with the construction operation.

PAY LINE:

The basis for the width of excavation shall be bed / foundation level as marked in the drawing When the actual depth of foundation considered is same with the proposed foundation level, the pay line shall be the line starting from the limiting lines of structure of foundation level.

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

Initial levels of the work shall be taken by the Officer of the rank of Deputy Executive Engineer of works and 10% levels shall be checked by the Engineer-in-charge prior to the starting of the work. The field book shall also be signed by the contractor in token of

acceptance. The quantity of work shall be arrived by plotting cross section on the standard cross section sheet as per progress of works achieved.

UNDER CUTS AND OVER CUTS: 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 the expense of contractor. Refilling required of such unauthorized excavation with concrete, masonry or other suitable materials as may be directed by the engineer shall also be done by the contractor at his own expenses.

DISPOSAL OF THE EXCAVATED STUFF : The excavated stuff shall be deposited in spoil banks or as directed by Engineer-in-charge after the bank area is thoroughly ploughed and to loose the existing strata to give sufficient bond with the new earth work, on in spoil banks in regular layers as directed by the Engineer-in-charge. The excess stuff declared shall be led and dumped to a space as directed by Engineer-in-charge within specified lead as per detail description of respective items. Excavated material would be deposited with all lead and all depth in spoil bank in the particular section or at a space as directed by the Engineer-in-charge.

- 4.0** The Contractor shall make his own survey, arrangement for construction materials as per tender Specification. The information is given for general guidance to the contractor and it does not in any way limit the performance of work under this tender. The contractor shall have to make his own arrangement of the quality and the quantity of the construction materials as also requiring the accessibility to the structures, locations nature of work etc. Department does not bind itself to any conclusion or towards any conclusion that may be made by the contractor in this respect from this information and no claims on this account shall be entertained.
- 5.0** 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.
- 6.0** The work in general shall be carried out in workmen like manner as well as to the correct section, 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.
- 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 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.
- 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.

6.0 TESTING OF MATERIALS:

7.1 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.

7.2 The day-to-day / periodical tests to be carried out on materials, 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 labour for collecting samples of materials & transport facilities with loading, unloading to samples of materials from work site to field laboratory / Govt. laboratory / Govt. approved 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.

The contractor shall supply necessary materials at testing laboratory at his own cost. 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.

7.3 The materials shall be tested periodically at the Government Laboratory / Government approved 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.

7.4.1 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.

7.4.2 Contractor shall provide all testing equipments including compressive strength testing machine at site and 10 % test shall be carried out in Govt. laboratory / Govt. Organization.

8.0 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.

9.0 Cement Concrete-(1) M-15

9.1 COMPOSITION

Concrete shall be composed of cement, fine aggregate (Natural and /or crushed sand), coarse aggregates (crushed or natural or otherwise where specifically mentioned in the item in the schedule B of the tender) and water, well mixed in specified proportion ascertained by mix design of M-15 and M-25 grade with to be utilized for work.

Applicable Indian Standards and Other Publications: (for Concrete work)

1	IS :8112	Specification for 43 grade ordinary Portland cement (First revision)
2	IS:12269	Specification for 53 grade ordinary Portland cement.

3	IS :650	Specification for standard sand for testing of cement(First revision) (Amendment No.1,2&3)
4	IS :383	Specification for coarse & fine aggregate from natural sources for concrete (Second revision)
5	IS :460	Specification for test sieves (Part 1 to 3)
6	IS :2430	Methods for sampling of aggregates for concrete (First revision)
7	IS : 2386 Part I - VIII	Method of test for aggregates for concrete.
8	IS :5640	Method of test for determining aggregated impact value of soft coarse aggregates.
9	IS :456	Code of practice for plain & reinforced concrete (Fourth revision)
10	IS :1199	Method of sampling and analysis of concrete.
11	IS :516	Method of test for strength of concrete (Amendment No.1)
12	IS :3085	Methods of test for permeability of cement, mortar and concrete.
13	IS :7320	Specification for concrete slump test apparatus (Amendment No.1)
14	IS :8142	Method of test for determining setting time of concrete by penetration resistance
15	IS :4990	Specification for plywood for concrete shuttering work (First revision (Amendment No.1)

9.2 MATERIALS:

Cement shall confirm to para M-1 of specification of material.

Sand shall confirm to para M-2 of specification of material. Coarse

Aggregate shall confirm to para M-3 of specification of material.

Water shall confirm to para M-4 of specification of material.

9.3 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/cm ² of 150 mm cubes	
	7 days	28 days
M-10	70	100
M-15	100	150
M-20	150	200

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 falls short of the requirement mentioned in the table, such concrete shall be classified for all purposes, as the concrete mix in above table which corresponds to that strength.

9.4 PROPORTIONING CONCRETE

- (a) The cement, sand and coarse aggregates shall be proportioned on weight basis, The sand and coarse aggregates shall be measured dry on weight basis in Batching plant to be

used for this work as per Mix Design. Each cement bag shall be considered to weigh 50 kg. and has a volume equivalent to 0.034 cubic meter.

- (b) The sand shall be corrected for bulkage due to moisture.
- (c) The quantity of water for different concrete mixes shall be decided on the basis of the specified workability in terms of slumps, for the ingredients which the contractor will plan to use.
- (d) All measuring equipments shall be maintained in a clean and serviceable condition. Their accuracy shall be checked periodically.
- (e) The cement level for cement concrete M-15 and M-25 considered is 300 kg and 380 kg per Cubic respectively.

If cement level as per design mix works out less than assumed cement level the difference in cement cost shall be recovered from the tenderer at the star rate provided in tender for cement. In case of higher cement level the tenderer shall not be entitled for extra payment for use of extra cement.

9.5 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 below:

	Type of work	Slumps allowed
(i)	Mass concrete for footings and retaining walls	10 mm to 25 mm
(ii)	Beams, slabs and columns	25 mm to 40 mm
(iii)	Thin RCC. Section with congested steel	40 mm to 50 mm

9.6 PRODUCTION OF CONCRETE

9.6.1 Batching

The prescribed amount of the various materials of concrete including water, cement and aggregates shall be by weight batching based on dry weights. In case of sand, there is a bulkage due to moisture, as such, this aspect shall be considered for the amount of water to be added for getting the required slump. In the case of fine aggregates the surfaces due to moisture shall be determined in accordance with the method prescribed in IS:456-2000 and its subsequent amendments.

9.6.2 MIXING :

The tenderer(contractor) should have to establish centralized computerized concrete mixing plant, however, if it is not possible to set up a concrete batching plant, considering the site situation than operated digital weighing Flori at the nearby site shall be allowed with the prior permission of 'Executive Engineer' or shall have to procure ready-mix concrete of required grade at the site. The computerized abstract of the daily concreting should be maintained. In case, Manually operated mixer shall be allowed. The mixing shall result in a homogeneous mix of uniform color where in the coarse aggregate is uniformly coated with the paste of cement and sand. The mixing shall be done for at least two minutes after the ingredients are placed in the drum. The mixing time will be increased in case, required uniformity is not obtained in the mix.

9.7 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 of 25 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.

9.8 PREPERATION FOR PLACING CONCRETE

9.8.1 General Requirement

- (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 in 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.

9.8.2 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 from the concrete.

9.8.3 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 uncompact 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.

9.9 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 40 mm maximum size aggregate and 10% extra cement with a slump of about 25 to 75 mm placed several centimeters deep on the joints at the bottom of the form. Concrete placement shall commence immediately there after.
- (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.

10.0 FORM WORK

10.1 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) Form work 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 form work 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 work. 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 form work 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.

10.2 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 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.

10.3 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
 - (i) 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 to 6 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.

11.0 FINISH AND REPAIRS TO 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.

12 CURING OF CONCRETE

12.1 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.

12.2 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 14 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.

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	5

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 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 be eligible for payment for this. The preparation of the cubes shall be carried out by the contractor at his cost.

14 MEASUREMENT AND PAYMENT

14.1 General

The prices entered in the Schedule-B for the incorporation of the various classes of concrete, plain and reinforced required by this section shall be inclusive of mobilizing, demobilizing, supplying all equipment's, 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 schedule-B.

- (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. 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 formwork required for the work unless otherwise specified in the contract.
- (f) The unit rate also includes the cost of dewatering, diversion 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 schedule-B.

Executive Engineer,
Damanganga Canal Disty Division No.3
Balitha-Vapi

PART- 3

SPECIFICATIONS FOR MATERIALS

DETAILED SPECIFICATION OF MATERIALS

M1: CEMENT

1.1 Only Ordinary Portland cement of grade 53 shall be used conforming to I.S. 12269 - 1987 or its 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 Department 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 is found OK till the receiving of test results from approved lab of Department.

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 Department 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 tone)	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. 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 authorized 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 utilized 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 receives 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 Performa approved by the Engineer-in-Charge. The contractor shall be fully responsible for the scope of local transport of cement from the site go down 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 beg taken as 0.0342 cu. Mt. (1.20 cu. ft) and measuring box / bag shall be of size 30cms x 30cms x 38cms. 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.

M2: SAND

The sand to be used Shall be preferably from Tapi River. The maximum size shall be limited 5 mm (3/16"). The sand is available from river. It shall be tested in Government laboratory or Government approved institute at contractor's risk and cost.

Details regarding F.M. etc. may be pointed out in particular that all the sand will be available in natural conditions and may require blending to specification.

Quality:-

The sand shall consist 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 I.S. No. 200

Sieve B. S. S. or (I. S. No. 8): 3 (three) percent by weight

Clay lumps: 1 (One) percent by weight

Cinders and clinkers 0.5 (Half) percent by weight

Mica 2 (two) percent by weight

However the sum of the percentage of all deleterious substances, Mica, coated grains, soft and flaky particles, Loam etc. 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 3.2 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 from 10 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.

M3: 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 conform to the standard specified in I.S. 456-1978. If required by the Engineer-in-Charge, it shall be tested by the comparison with distilled water. Comparison shall be made by means and mortar strength as specified in I.S. 269-1976 and indication of unsoundness, change in time of setting by 90 minutes or more or decrease of more or decrease of more than 10% in strength of mortar prepared with water samples when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

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.

M4: Black Trap Stone Coarse Aggregate:-

- 4.1** 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.
- 4.2** 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 somewhat 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.

- 4.3** The percentage of deleterious substances in only size of coarse aggregate as 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

- 4.4** 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: TMT Bars:

- 5.1** T M T bars reinforcement FE-500 for R.C.C works shall confirm to IS: 1786-FE 500 and shall be of tested quality it shall also comply with relevant part of IS 456-1978.
- 5.2** For the purpose of payment the bars shall be measured correct up to 10mm length and weight payable at the rate specified below.

1.	6 mm	0.22 Kg/Rmt	8.	20 mm	2.47 Kg/Rmt
2.	8 mm	0.39 Kg/Rmt	9.	22 mm	2.98 Kg/Rmt
3.	10 mm	0.62 Kg/Rmt	10.	25 mm	3.85 Kg/Rmt
4.	12 mm	0.89 Kg/Rmt	11.	28 mm	4.83 Kg/Rmt
5.	14 mm	1.21 Kg/Rmt	12.	32 mm	6.31 Kg/Rmt
6.	16 mm	1.58 Kg/Rmt	13.	36 mm	7.99 Kg/Rmt
7.	18 mm	2.00 Kg/Rmt			

- 5.3** The contractor shall have to procure TMT directly from the Main Producer or its authorized 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 certificate of the manufactures shall be produced, if so required by the Engineer-in-charge. 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.

M6: Binding Wires:

- 6.1 The TMT 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.
- 6.2 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.
- 6.3 Storages : The wire coils shall be stored so as to avoid deterioration.
- 6.4 The other requirements are as per Para which are applicable.
- 6.5 Measurement: No measurement will be taken of the wire used for tying reinforcement bars. The rate for reinforcement steel and its fabrication shall include the cost of binding wire.

M7: Membrane :

- 7.1 The compound shall meet with the requirement of water retention test as per ASTM designation C- 156-80. The loss of Water in this test shall be restricted to not more than 0.55 Kg/m² of exposed surface in 72 hours.
- 7.2 The white pigmented compound (Type-2) when tested as specified in accordance with method E-97 of ASTM shall exhibit a daylight reflectance of not less than 60 of that of magnesium oxide.
- 7.3 It shall fulfill the requirement of drying time when tested in accordance with ASTM-C-309-81. The compound applied shall be dry to touch in not more than 4 hours. After 12 hours it shall neither be tack off (peel off) concrete when walked upon nor it shall impart a slippery surface.
- 7.4 Necessary testing will be taken in laboratory approved by Engineer in charge and contractor will have to produce manufacturers result.

M 8: Asphalt:

Bitumen 80/100: The characteristics of this grade confirm to that of IS 90 grade of IS-73-1992

M-9 STONE (RUBBLE) :-

The stone shall be of the specified variety such as granite / trap / quartzite or any other type of good hard stones. The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials, etc. and weathered portions and other soundness and strength. The stones with round surface shall not be used.

M-10 POLYVINYL CHLORIDE (PVC) PIPE :-

- 10.1 SCOPE: This specification covers the furnishing of PVC pressure pipe for Hydraulic Structure.
- 10.2 PIPE AND FITTINGS: All PVC water pipe and fittings shall be manufactured in accordance with one of the following Standard Specifications:
 - a. Polyvinyl Chloride (PVC) Pressure Pipe, 100 mm dia. for Abutment & Sidewall.
 - b. No Joint should be allowed.
 - c. Contractor will have to produce results from manufacturer.

M-11 NP-2 / NP-3 CLASS HUME PIPES:-

- 11.1** The pipe shall confirm to I.S. 458 of 1988 or its latest version so far they apply to NP-2 / NP-3 class pipes in all respects, such as materials, design, manufacturing, dimensions, workmanship and finish, tests, sampling and inspection, etc.
- 11.2** The surface and edges of the pipes shall be well defined and true and their ends shall be perpendicular with longitudinal axis.
- 11.3** The internal diameter, wall thickness, length and thickness of roller of pipes, the minimum reinforcement and strength test requirement shall be as specified in I.S. 450-1988.
- 11.4** Pipes shall be straight and free from cracks. The ends of pipe shall be right angle with their longitudinal axis so that when placed in a straight line in trench no opening between the pipes shall exceed 3 mm. in pipes up to 600 mm. diameter (inclusive) and 6 mm. in pipes larger than 600 mm. diameter.
- 11.5** The outside and inside surface of the pipes shall be smooth dense and hard and shall not be coated with cement wash or other preparation unless otherwise directed by Engineer-in-charge for better bond, inner surface of collar may be finished rough.
- 11.6** The pipes shall be free from defects resulting from imperfect grading of the aggregate mixing of molding.
- 11.7** Pipes shall confirm requirement as per relevant Indian Standard code as practice when subject or to hydrostatic test, three-edge bearing test, absorption test, dimension test, etc.

**Executive Engineer
Damanganga Canal Distry Division No.3
Balitha-Vapi**

PART - 3

ITEMWISE DETAILED

TECHNICAL SPECIFICATIONS

Name of work: - Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.

SPECIFICATION

Item No.1

Dismantling the existing foundation concrete including disposing the dismantled stuff including sorting out and stacking the useful materials and removing the debris and making good the damage etc. complete as directed.(b) In cement mortar.

Workmanship:

- The dismantling shall consist of dismantling the existing Concrete Work 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 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.
- All materials obtained by dismantling shall be the property of government. Unless otherwise specified. Materials having any salvage value shall be placed in neat stacks of like materials within the right-of-way as directed by the engineer-in-charge, for which contractor will remain responsible for its safe custody and preservation. Structural steel removed from old structure shall, unless otherwise specified or directed, be stored in a neat and presentable manner. Structures or portions thereof which is dismantled, if it is found satisfactory to the engineer in charge are specified in the contract for re-erections shall be stored in separate piles.
- On completion of work the site shall be cleared of all debris rubbish and cleaned as directed.
- The damage due to additional Dismantling done to any adjoining work by contractor shall have to be made good at the cost of the contractor and to the entire satisfaction of the Engineer in- charge. The Dismantling shall be done by chipping, chiselling and hammering and if required controlled blasting will be carried out under supervision of Engineer in-charge. Due care shall be taken to prevent any damage to adjoining canal section.
- Contractor Shall have to take photograph/Videography of structure which to be dismantled before dismantling and after complete dismantling and same shall be handed over to engineering in charge.

Mode of Measurement:

- Measurement of all works except hidden works shall be taken before dismantling and no allowances for increase in bulk shall be allowed. The dismantling of brick masonry shall be measured under this item. Specification for deduction for voids, opening etc. shall be on same basis as that employed for construction of work.
- The work shall be measured in decimal system as fixed on its place. The rate shall include cost of all labours involved and tools used in dismantling including scaffolding. The rates shall also include the charges for separating out and stacking the serviceable material properly and disposing the unserviceable material with all leads and lifts. The rates shall also include for temporary shoring of the safety of the property.

Mode of Payment:

- Payment shall be made on cubic meter basis of actual work done.

Item No.2

**Dismantling the existing R.C.C. pipes of the following diameter including sorting out and stacking of the useful materials including refilling the trenches etc. comp. as directed. (NP-2 Pipe)
(c) 650 mm to 900 mm dia.**

Workmanship:

The dismantling R.C.C.pipe shall consist of dismantling the existing R.C.C.pipe as specified or shown in the drawing. Dismantling implies taking up or down or breaking. This shall consist of dismantling R.C.C.pipe including all relevant items as specified or shown in the drawing.

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

All materials obtained from dismantling R.C.C.pipe 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.

For old pipe which are to be replaced and if old pipe found in good condition minimum about 40% recovery from contractor bill at prevailing S.O.R. rates and against diameter of pipe will be made for contractor bill. If pipe are not useable then concern section officer and Deputy Executive Engineer has to certify that old pipe which are to be replaced with new one and not useable, supporting documents of photograph have to be submitted.

Mode of Measurement and payment:

The rate shall include cost of all labours involved and tools used in dismantling R.C.C. pipe. The rate includes scrapping, straightening & stacking the reinforcement category wise including cutting of reinforcement. The rates shall also include the charges for separating out and stacking the serviceable material properly and disposing the unserviceable material with all leads and lifts. The rates shall also include for temporary shoring of the safety of the property.

Payment shall be made on running meter basis of actual work done.

Item No.3

Providing temporary all weather and fair weather diversion of road suitable for traffic during the construction period of the strcture including providing necessary drains and all safety measures including sign boards on both the sides, red lamps, signals at night for traffic etc. comp. (I) O.D.R. / V.R.B.

(1) Temporary Diversions

(a) Provisions of Diversions

Where some portions of the existing road cannot be used by through traffic, diversions as may be required to deviate traffic from such portions shall be constructed.

(b) Survey Beacons and Monuments

Diversions shall be constructed so as not to damage or displace trigonometrical survey beacons and road monuments. In exceptional cases where this is not possible, arrangements shall be made to have survey beacons suitably referenced before they are displaced and relocated after the completion of the work.

(c) Access to Properties

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

(d) Temporary Works

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

(e) Public Services

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

(f) Width of Diversions

The usable width for accommodation of two-way traffic shall not be less than 6m. Where diversions consist of two separate one-way lane the minimum usable width of each lane shall not be less than 3.5 m.

(g) Temporary Drainage Works

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

(h) Earthworks for Diversion

Diversions shall be shaped and graded making full use of all material that can be sufficient material cannot be obtained in this manner, material shall be imported from other sources. Where necessary, cuttings shall be made to obtain a satisfactory vertical alignment. All necessary clearing including the removal of all trees and stumps shall be performed.

(i) Maintenance of Diversions

All diversions shall be maintained in a safe and smooth trafficable condition. Whenever required the diversions shall be bladed by means of graders to provide a smooth riding surface free of corrugations. All potholes shall be promptly repaired. Diversion shall be watered to keep down dust from traffic and in order to facilitate the proper blading of the surface. All drainage works shall be maintained in good working condition and kept unblocked.

(j) Removal of Diversions

When traffic is routed permanently onto the new road following the completion of construction, the diversions which are no longer required shall be removed and the ground reinstated to its original condition.

(2) Accommodation of Traffic Where the Road is Constructed in Half Widths

Where by reason of difficult terrain or for any other reason, the construction of diversions is not possible, the road shall be constructed at the time. The lengths of the half width for construction shall be kept to a minimum, with a provision for traffic traveling in opposite directions to pass at frequent intervals. The works in one half width of the road shall be so arranged that the traffic will have free one-way movement in another half during construction period.

(3) Measurement and Payment

Unless stated otherwise, no separate measurement and /or payment shall be made for all materials and works required under this Clause. All costs in connection with the work specified herein shall be considered to be included with other related items of the work in the Bill of Quantities.

Item No.4

Excavation for foundation in all sorts of soil including yellow, sandy and 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 lift. (By machinery) (a) lift up to 1.50 mts (a) Above water table.

Before commencement of work, fresh levels shall be taken 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.

- 1.1 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.
- 1.2 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.
- 1.3 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.

- 1.4 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.
- 1.5 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, equipment's and labour for suitable setting out, shoring, strutting of strong and durable nature as directed by the Engineer-in-charge.
- 1.6 The rate also includes necessary boiling and pumping out water from the foundation trench during excavation concrete works and till masonry reaches above low water level.
- 1.7 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 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 and properly rammed and watered as directed by the Engineer-in-charge.
- 1.8 Foundation level will have to be cross checked by quality control department or other sub-division as per order of Executive Engineer.

Mode of Measurement and payment:-

- (a) Payment shall be made for quantity executed in Cubic meter at the rate quoted under relevant item of work. Measurement shall be calculated between Initial level and foundation level basis entered in field book.
- (b) Payment shall be made on CM basis.

Item No.5

Providing and laying rubble including hand packing and filling interstices with quarry spall behind abutments and between returns as directed.

- [1] Item consist of supplying stone rubble for soiling including conveying and stacking & laying to the required line, level slope section including all leads and lifts, conveying materials from stacks and packing, interlocking etc. complete as directed by Engineer-in-charge.
- [2] Stones shall be of approved quality, clean, tough, hard sound, durable. Stones shall be free from earth and other soft or decomposed materials, weak cleavages, cavities, cracks sand holes, flows and weathering and quarry rubbish injurious materials. Stones shall be obtained from the quarry approved by the Engineer-in-charge.
- [3] The contractor shall supply at his cost all test specimen and other samples required for various tests and got it tested for below mentioned tests at Govt. laboratory or in the laboratory as directed by Engineer-in-charge. The result shall be supplied to the

Engineer-in-charge for approval. The test result of sample shall comply with specific requirements. Two sets of tests shall be carried out per season for all necessary test. The minimum density of stones should be 2.6 t /cu.mt.

(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 ABSORPTION 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%.

(D) ABRATION TEST:-

The abrasion value of the stone determined using impact abrasion machine shall not exceed 30 percent.

- [4] Stone of specific size/weight and approved quality shall be stacked on site as directed by Engineer-in-charge. Stone shall be stacked in such a manner so that it cannot obstruct the execution of any item of work. Each stack shall be marked "I-6" with Kalichuna to identify as "stones for item No.6". Stones from stacks marked "I-6" only shall be used for the construction of toe and core after getting permission from Engineer-in-charge.
- [5] The contractor shall make at his own cost necessary arrangement for the weighing of individual stones to check the size and weight of individual stones as and when directed by the Engineer-in-charge.
- [6] The method for laying the stones for toe shall be got approved from Engineer-in-charge before starting the execution of item.
- [7] Stones for core shall be laid as per drawing or as directed by the Engineer-in-charge, Stones for toe and core shall be laid in more than two layers, Heavier stones shall be placed in the top and on exterior layer of toe and core. Stones shall be laid breaking joints with great care to have a proper packing and interlocking. Any face or corner of stones shall not protrude appreciatory from average plane of top surface of toe.
- [8] Any disturbance or damage to same shall be rectified or corrected by the contractor at his risk and cost to the satisfaction of Engineer-in-charge.
- [9] The top, side slopes etc. shall be evenly finished generally to the level shown in the drawing or as directed by the Engineer-in-charge. To confirm the section as per drawing and design, cross section shall be taken periodically. On the basis of such checks, contractors shall rectify or correct the alignment, levels etc of the work done as required.
- [10] Any damage or loss of material during construction due to natural cause including, tide shall be made good and remedied by the contractor at his risk and cost to the satisfaction of Engineer-in-charge.

[11] Mode of Measurement and Payment :

Item shall be measured in cubic meters of the stones used for the construction of core. For computing the total quantity of item, cross sectional measurement shall be taken at 30 m. intervals or less depending upon the site conditions. Initial cross sections shall be taken by Engineer-in-charge before starting of this item. Final cross section shall be taken by Engineer-in-charge after completion of this item to his satisfaction. The contractor or his authorized representative shall attend day to day leveling work for initial and final cross sections and sign with date in the field book daily in token of his acceptance.

The rate shall be for unit of one cubic meter of stones used and inclusive of cost of materials as well as cost of carrying out all operations to complete the item. The payment shall be paid in **cubic meter**.

Item No.6

Providing and filling sand below R.C.C. Raft in Layers including ramming watering complete

- Sand shall confirm to para M -3 of General specification of material.
- 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 x2.0mt 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 CM. 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.7

Providing and laying plain/reinforced Nominal Mix cement concrete of various grade with cement, sand and coarse aggregates including centering ,shuttering ,batching,mixing,transporting,placing,vibrating,smooth finishing,curingetc.complete for all lead and lift.(Manual with conventional mixer, including dewatering) (For Raft, bottom slab of baryl, footing of column ,piers , abutment and bottom slab of sump etc.) (i) M-15 grade

1 Composition

Concrete shall be composed of cement, fine aggregate (Natural and /or crushed sand), coarse aggregates (crushed or natural or otherwise where specifically mentioned in the item in the schedule B of the tender) and water, well mixed in specified proportion

2 MATERIALS:

Water shall confirm to para M - 1 of General specification of material.

Cement shall confirm to para M – 2 of General specification of material. Sand shall confirm to para M -3 of General specification of material.

Coarse aggregate shall confirm to para M -5 of General specification of material.

T.M.T. Steel shall confirm to para M-.6 of General specification of material.

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 M-15 with maximum size of aggregate is 20 mm.

4. PROPORTIONING CONCRETE

- (a) Concrete mix shall be designed on the basis of preliminary tests. The proportion of 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.
- (b) Except it can be shown to the satisfaction of the Engineer-in-charge that supply of properly graded aggregate of uniform quality can be maintained till the completion of 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 stock piles Required quantity of material shall be stock piled several hours preferably a day before use. In proportioning concrete the quantity of both cement and aggregate shall be determined by weight water shall either be measured by volume.
- (c) It is most important to keep the specified water cement ratio constant to this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge. The amount of mixing water shall then be adjusted to compensate for any variations needed in the moisture content. For the determination of moisture content in the aggregate IS: 2386-1977 (Part-III) shall be referred to Suitable adjustments shall also be made in the weight of aggregate to allow for variations in weight of aggregates due to variations in their moisture content.
- (d) The cement level for various grades of controlled concrete shall be considered as under for the purpose of working out the rates to be quoted in Schedule-B

Sr.No.	Grade of concrete	Cement level required in Kg per cubic meter of concrete
1	M-15	300
2	M-25	380

- (e) Actual cement level required for the aggregate to be used shall have to 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 reinforcements and completely

fills the formwork. 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 characteristic strength not less than that stipulated in tender specification. 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 for handling of extra cement, however due to change in design mix it is obligatory to use less/more cement per cumt of concrete. Contractor shall do same without claiming extra cost for using cement. In case actual cement use being less then cement level specified in table here in above, the department will deduct the cost of cement from the bill at the base price of star rate and rate analysis per tonne of cement at work site for reduce consumption of cement. In case actual use of cement being more than specified above no extra payment for additional cement level shall be made and contractor shall have to bear addition cost. Design mix and actual cement level required shall be communicated to the Contractor in writing by the Engineer-in-charge.
- (g) The quantity of water shall be just sufficient to produce a dense concrete of required workability 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 at work site, Slumps shall be adopted for different types of works by considering medium type degree of workability as per I.S.456-2000

5 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.

6 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/cm ² of 150 mm cubes 28 days
M-15	150
M-25	250

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 4-(h).

6.2 PRODUCTION OF CONCRETE

6.2.1 MIXING

- (a) Concrete shall be mixed in a mechanical mixture and shall be as 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 color 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

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 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 of 25 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 of outside the forms.

8 PREPERATION FORPLACING CONCRETE

8.1 General Requirement

- (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.

8.2 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 from the concrete.

8.3 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, dis colour 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
Exterme	75

9 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.

10 Form Work

10.1 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) Form work 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.

10.2 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 form work 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.

10.3 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 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.

10.4 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 to 6 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.

11 Finish and Repairs to 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.

12 Curing of Concrete

12.1 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.

12.2 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.

13 Requirement of Concrete construction

13.1 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 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.

13.2 Concrete in Structures Block outs

- (a) The item of the schedule for concrete in aforesaid 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 describe edherein after before the block concrete is placed.
- (c) Exceptional care shall be taken in placing the concrete in a blocks 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, 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.

13.3 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.

13.4 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 raked, 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.

14 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+1*

* Plus one additional sample for each additional 50 m³ or part there of However, at least one set of cubes in a week, irrespective of quantity of concrete shall be taken.

(c) Test Specimen

Three test specimen 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 be entitled to any compensation on account of such changes.

15 Steel Reinforcement

Steel shall conform para M-6 & M- 7 of general specification of material.

16 Tolerance 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	10 mm	Buried	20mm
More than 3 m			

Exposed	12 mm	Buried	25mm
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(iv) Variation in cross-sectional dimensions of columns, beams, slabs, walls and similar members of

Minus	6mm
Plus	12 mm

- (v) Variation in location from those specified for slab and wall openings 12mm.

17 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 occurs 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.

18 Measurement and Payment

18.1 General

The prices entered in the Schedule-B for the incorporation of the various classes of concrete, plain and reinforced required by this section shall be inclusive of mobilizing, demobilizing, supplying all equipment's, forms, materials, labour, supervision and all incidental work except for any items specifically exempted there from and for which, in addition, a specific item for payment has been included in the schedule-B.

- (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. 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 formwork required for the work unless otherwise specified in the contract.
- (f) The unit rate also includes the cost of dewatering, diversion and protection works 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 metre quoted for relevant items in schedule-B and relevant item of S.O.R which procedure follow to complete the item.

Mode of Measurement & Payment :-

The concrete work shall be measured in length, breadth and depth as specified in drawing or as directed.

Item No.8

Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all leads and lifts. (Batching Plant Based, Including dewatering) (For Raft, bottom slab of barrel, footing of column, piers, abutment and bottom slab of sump etc.) (iii) M-25 grade

&

Item No.9

Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all leads and lifts. (Batching Plant Based, Including dewatering) (For walls of barrels, breast wall, staunching rings, pedestals of bearing, stoplog piers, well staining, transition wall etc.) (iii) M-25 grade

&

Item No.10

Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching,

mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all leads and lifts.(Batching Plant Based, Including dewatering) (For Roadway slab, approach slab, chute floor slab, kerb, pier cap, abutment cap, hoisting platform,top slab of baryl etc.) (iii) M-25 grade

1.0 Scope of work

This specification covers the requirements of plain and reinforced cement concrete to be used in various components of the structures. The work covered by this chapter consist of furnishing all materials, equipment and labour for the manufactures, transport, placing, finishing and curing of all grades of concrete in the structure including in these specification and performing all the functions necessary and ancillary there to etc. complete. The grade of the mix is specified in the relevant items under Schedule – B.

The item of concrete will have to be split up into several items according to the grade of concrete to be used and its locations and will be measured and paid for accordingly. The general 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. Where it is considered not practicable to use controlled concrete, volumetric mix shall be allowed at the discretion of Engineer-in-charge.

2.0 Applicable Publications

All items of concrete works, concrete, its constituents, methods & procedures of manufacture shall conform to the latest Indian Standard Specifications & other technical publications listed below unless otherwise specified.

3.0 Indian Standards

	IS :303	Specification for plywood for general purposes (Second revision)(Amendment No.1 to4)
	IS:432	Specification for mild steel and medium (Part-1-1982) tensile steel bars and hard drawn steel wire for concrete reinforcement (3rd revision)
	IS-516	Method of test for strength of concrete (Amendment No.1)
	IS :883	Code of practice for design of structural timber in building (third revision)
	IS:2505	General requirements for concrete vibrators: immersion type.
	IS :2506	General requirements for screed board concrete vibrators.
	IS:3370	Code of practice for concrete structures for the storage of liquids (part I to IV)
	IS :3535	Method of sampling hydraulic cement (First revision)
	IS :3558	Code of practice for use of immersion vibrators for consolidating concrete.
	IS	Specification for form vibrators for concrete.

	:4656	
	IS :4925	Specification for concrete batching & mixing plant.
	IS :4990	Specification for plywood for concrete shuttering work (First revision (Amendment No.1)
	IS :5242	Method of taste for determining shear strength of metal (1st revision).
	IS :8112	Specification for 43 grade ordinary Portland cement
	IS :8989	Safety code for erection of concrete frame structures.
	IS :9077	Code of practice for corrosion protection of steel reinforcement in RB and RCC construction.
	IS:1226 9	Specification for 53 grade ordinary Portland cement.
	SP:16 (S& T)	Design aids for reinforced concrete to IS : 456.

Only latest version of I.S. shall be followed.

In addition to above relevant Indian standards referred to section 3 shall also apply.

4.0 Other Technical Publications.

	Indian Road Congress (IRC)	Standard specification and code of practice for Road Bridges. Section – I Section – II Section – III
	The United State Bureau of Reclamation (USBR)	Concrete Manual (Eighth Edition) (Revised– 1981)
	American society for Testing Materials (ASTM)	All relevant codes.

Note: Generally, the Bureau of Indian Standards code will be followed for all items of works wherever this code does not exist the reference will be taken to other technical publications.

5.0 Composition

- Concrete shall be composed of cement, fine aggregates (natural / manufactured sand), 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. The manufactured sand will be allowed after getting the prior approval of the Engineer-in-Charge.
- For all items of concrete in any portion of the structure or its associated works, concrete manufactured by batching and mixing plant/concrete mixers and which shall be termed by controlled concrete shall be used where specified.

6.0 Materials

6.1 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 M-1 for cement shall be apply.

6.2 Sand

The sand to be used in concrete shall be of well graded, hard, durable and as a inert materials. It shall confirm to specification specified in the Para M-2 of Technical Specification of material. The specification specified in I.S 383-1999 shall also apply to sand.

6.3 Water

The mixing water shall be potable confirming to specification prescribed in Para M-3 of Technical Specification of material.

6.4 Coarse Aggregates

The coarse aggregate shall conform to the specification specified in Para M-4 of Technical Specification of material. Specification specified I.S. 383-1999 shall also apply to coarse aggregate.

The coarse 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 finer than 75 micron IS sieve :	3 % 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. 383/1999 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 test 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, Petro graphic examination	Once in concrete working season. Petrography test as directed by the Engineer-in-charge.

6.5 REINFORCEMENT STEEL

The reinforcement (TMT Bar) shall confirming to specification prescribed in Para M-5, Technical Specification of material.

6.6 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.

Air Entraining Agent (AEA) as an admixture shall be added to the concrete batch in solution. It shall be batched by means of mechanical batcher capable of correct measurement and in such a manner as will ensure uniform distribution of the agent throughout the batch during the specified mixing period. The amount of AEA used shall be such as to affect air entrapment from 4 to 6 percent by volume in that portion of the concrete containing aggregate smaller than the 40 mm square mesh sieve after its placement and vibration in the forms. The contractor will be allowed to use admixture, only after prior approval of the Engineer-In-Charge and according to concrete mix design. Cost of such admixture shall be borne by the contractor and shall be deemed to have been included in the unit rates quoted by the contractor for relevant items.

Only approved admixture shall be allowed for use in concrete. All tests for the evaluation and approval of an admixture shall be carried out before use in concrete. The suitability of an air entraining admixture shall be determined as per the requirement of IS: 9103-1979.

7.0 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.

8.0 Concrete for Structures

Controlled concrete shall be used for the Hydraulic structure in grades designated as M-10, M-15, M-20 and M-25 Grade Concrete. M-10 shall be treated as nominal mix concrete as C.C. 1:3:6.

8.1 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 in GERI Laboratory or in Govt. approved laboratory as decided and directed by the Engineer-in-charge.
- 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.

8.2 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/mm ² 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 day's 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 150 mm x 150 mm moulded 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 co-efficient 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.

8.3 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 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. 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.

8.4 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 for the purpose of working out the rates to be quoted in Schedule – B

Table No-1

Sr. No.	Grade of Concrete	Minimum Cement Level required in Kg for one Cubic Meter of Concrete as
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1	2	3
1	1:4:8	170 (Not Applicable for Mix Design), Nominal Mix
2	1:3:6 (MSA 40 mm)	205 (Not Applicable for Mix Design), Nominal Mix
3	1:3:6 (MSA 20 mm)	220 (Not Applicable for Mix Design), Nominal mix
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

However, depending on the technical requirement various size of aggregate may be required to be used in various components of the structure.

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. The contractor shall have to prepare the concrete mix design for a

particular grade of concrete in GERI/ Government Laboratory / Government Approved Laboratory as directed by Engineer-in-charge. 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 No.1, the amount (cost) of quantity of cement used less w.r.t. cement level mentioned in the above table No.1, shall be recovered at the base rate of **Rs.5234 per metric tonne** of cement from the bill / amount to be paid to the contractor.

It shall be Contractor's sole responsibility to carry out the mix designs as directed by the engineer-in-charge. He shall furnish to Engineer-in-charge 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.

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	Retaining Wall/Structure	65 mm to 100 mm

If necessary arise, slump may be changed as directed by the Engineer-in-charge in written and the contractor shall have to carry out the work accordingly.

9.0 Production of Concrete

9.1 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.

9.2 Batching & Mixing plant.

- (a) The Batching and Mixing of concrete shall be done in automatic Operated Batching Plant installed at site of work or Ready-Mix Concrete from such plant or Batching and mixing (On wheel) batching plant (Ajex flori) must be require.**

Concrete materials shall be batched by weight. On wheel batching plant with printer facility available in good working condition (Ajex flori) must be require. Dry weights per unit volume of fine and coarse aggregate shall be determined as per mix design. Water shall be either measured by volume in celebrated tanks or weighed. Whereas cement will be brought by contractor in bags and twenty bags will be treated to weigh one tone, cement shall be actually weighed during batching.

- (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 reweighing.

- (c) 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 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 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.
- (e) Aggregate shall not be batched for concrete or mortar when free water is dripping from the aggregate.
- (f) 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.
- (g) Considering the Quantity of concrete of various grade and time limit for completion of work, if required the contractor shall have to mobilized and install two automatic batching and mixing (On wheel) batching plant (Ajex Flori) must be required.**

9.3 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 25 mm 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.
- (f) 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
- (g) 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.
- (h) 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.

9.4 Temperature of Concrete and Weather Conditions

The temperature of concrete at the time of placement shall not exceed 32°C. Concreting operations shall be temporarily suspended during excessively hot weather when the air temperature exceeds 45°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.

9.5 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 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 metres 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 off outside the forms. Use of chutes shall be allowed in exceptional circumstances and adverse placement condition only.
- (d) Placement of concrete by pumpcrete 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 pumpcrete. 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 pumpcrete 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-crete capable to cover of one monolith shall be allowed to be used for conveying concrete for placement in the structures. Belt-crete 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 metre.

- (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 off outside the forms

10.0 Preparation for Placing Concrete

10.1 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.

10.2 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.

10.3 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 CD 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 2 m^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.

11.0 Placing and Compacting Concrete

- 11.1 The contractor shall keep the Engineer-in-charge 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 three eighths 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.

- (1) So far as it is practicable, concrete shall be placed directly in its final position and shall not be caused to flow in a manner to permit or cause segregation. Method and equipment employed in placing concrete shall ensure that aggregate is not separated from the concrete mass.
- (2) Manual concrete placing by head basket shall be permitted. The concrete shall be used within 30 minutes of mixing. Repairing of concrete shall not be permitted. Any concrete which has become stiff so that proper placing without repairing can not be ensured shall be rejected.
- (3) 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 except foundation concrete shall be compacted by mechanical vibrator.
- (4) Compaction concrete shall wherever practicable be carried out by the use of immersion type vibrators. Vibrators having heads less than 100 mm in diameter shall be operated at speed of at least 7000 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
- (5) 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 vibrate the concrete in the upper portion of the underlying. In the area

where freshly placed concrete in each layer joints with previously placed concrete, more vibration than usual shall be performed with 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.

- (6) 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.

- 11.2 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.
- 11.3 Re-tempering 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.
- 11.4 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 50 cms (20 inches) layers can not 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.
- 11.5 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.

- 11.6 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.
- 11.7 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.

11.8 Compaction:

Concrete shall be compacted to the maximum practicable density so that it is free from pockets of coarse aggregate and entrapped air, and closes snugly 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.

- 11.9 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 re-vibrate 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 contact 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 speding the face with an appropriate flat tool.
- 11.10 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.
- 11.11 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.
- 11.12 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.
- 11.13 Inadvertent or intended re-vibration of some concrete is beneficial provided the concrete become momentarily plastic again during re-vibration. Re-vibration shall be resorted to only after specific instruction are given by the Engineer.

12.0 CURING OF CONCRETE

12.1 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, method 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.

12.2 Water 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 sloping 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 14 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.

13.0 Form work:

13.1 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 within 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 horizontals to one vertical or steeper shall be formed. The Acro Plates (heavy metal plates with heavy stiffeners) shall be used for formwork of mass concrete.
- 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 horizontal to one vertical shall be formed.
- c) Formwork may be of heavy steel plates (Acro plates) or of such other suitable materials or combination of such materials. Ordinary steel plates Formwork/timber plank formwork will not allowed. 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 150 Lbs/cu.ft. (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.

13.2 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	Steel sheathing permitted steel lining not permitted

	required shape without splintering or splitting.	
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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 of 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 spalling 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.

13.3 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 sometime, 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.

13.4 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.

13.5 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.

14.0 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 taking into account 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 t hat 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.

15.0 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, inlet 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 (6 mm).

Special Finish:

This finish shall be applied to star risers, and other important places where specially 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 carborudum 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 1/4 " 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 upto 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 screeding. 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 screeding 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 vibroscreeds 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 other outdoor unformed surface. Floating shall be done either by vibroscreed 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ " (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.

16.0 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.

17.0 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 hour 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.

18.0 Repairs of concrete:

- 18.1 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.
- 18.2 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 rod 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 rods 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 extend completely through a concrete section.

- 18.3 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.
- 18.4 Concrete filling shall be used for holes extending through concrete sections, for holes which are greater in area than one square foot (0.1 Sq.mt) and deeper than 4 inches (0.1m), and for holes, in reinforced concrete, which are greater in area than one half square foot (0.05Sq.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 be 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.
- 18.5 All patching shall be with extreme care, so that patches will not be noticeable from a distance of 75 ft. (25mt). Coloured cement as an ingredient of the patching mortar may be used if necessary, to produce patch of same colour as the adjoining concrete.

19.0 Use of Dry Pack mortar for repairing of concrete:

- 19.1 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.
- 19.2 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.
- 19.3 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).

- 19.4 Dry pack mortar shall be place and packed in layers having a compacted thickness of 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 rubberiness develops, in which case work on the repair shall be delayerd 30 to 40 minutes. Under no circumstances shall alternate layers of wet and dry materials be used.
- 19.5 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.

20.0 Requirement of Concrete Construction.

20.1 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.

20.2 Concrete in various components of [Weir/ barrage/checkdam/Box Culvert](#)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. Pre-molded 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.

20.3 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

20.4 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 be entertained.

21.0 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

22.0 TESTING OF 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 m ³	Number of samples
1 to 5	1 (6 nos)
6 to 15	2 (12 nos)
16 to 30	3 (18 nos)
31 to 50	4 (24 nos)
51 and above	4 Plus one additional sample for Each additional 50 m ³ or part thereof. Each sample have 3 nos. of standard 15 x 15 x15 cm concrete cubes.

Note:- At least one set of cubes in a shift irrespective of quantity of concrete shall be taken.

(c) Test Specimen:

For controlled concrete/ nominal mix 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. 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. Additional cubes may be required for various purposes, such as to determine the strength of concrete at the time of striking formwork. 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 specimens. Individual variation more than 15 percent of the average of the three samples is found than the test result of that sample is invalid and shall be deleted for the purpose of averages.

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 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. The preparation and the testing of the cubes shall be carried out by the Nigam.

(e) 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 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 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. Whenever necessary for the purpose of obtaining economy, workability, density, impermeability, 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 authorized 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 WRD.
- (v) 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 be entitled to any compensation on account of such changes.
- (vi) 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.

23.0 Tolerances in Concrete Construction

23.1 General

- (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.

23.2 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. Variation shall not be cumulative.

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.

Variation in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawing shall be within the tolerance specified in Table below as per relevant IS.

1	Departure from established alignment		25 mm.
2	Departure from established grade		25mm.

3	Variations from plumb as for surfaces of columns, piers and walls when overall length of surface is 3.0 m. or less.	Exposed	10mm.
		Buried	20mm.
	more than 3.0 m.	Exposed	12mm.
		Buried	25mm.
4	Variation in cross sectional dimensions of columns, beams, slabs, walls and similar members of	Minus	6mm.
		Plus	12mm.
5	Variation in location from those specified for slab and wall opening.		12mm.

24.0 Record of concreting operations:

A systematic joint record in the form approved by the Engineer-in-charge 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-in-charge 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.

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(three) months prior to commencement of erection.

Any modification that the Engineer-In-Charge may require shall be made by the contractor. Notwithstanding the approval of 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 till 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, any mishap or accident occur causing damage or injury there to, subject however, to such provisions of the conditions of contract as may be applicable in the case of such damage of injury.

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 deshuttering. 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.

25.0 MEASUREMENT & PAYMENT (Item No.8,9,10):

- 25.1 Measurement and payment of concrete shall be made on the basis of the actual volume of the concrete **(CUBIC METER)** 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.
- 25.2 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.
- 25.3 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.

- 25.4 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. 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.
- 25.5 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 formwork required for the work unless otherwise specified in the contract.
- 25.6 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.
- 25.7 Payment for the various grades of concrete shall be made on the basis of unit rate per cubic meter quoted for relevant items in Schedule-B

Item No.11

Providing and laying plain/reinforced Nominal Mix cement concrete of various grade with cement,sand and coarse aggregates including centering ,shuttering ,batching,mixing,transporting,placing,vibrating,smooth finishing,curingetc.complete for all lead and lift.(Manual with conventional mixer, including dewatering) Piers, abutment, wingwalls, headwall, returnwall etc. (i) M-15 grade

1 Composition

Concrete shall be composed of cement, fineaggregate (Natural and /or crushed sand), coarse aggregates (crushed or natural or otherwise where specificallymentioned in the item in the schedule B of the tender) and water, well mixed in specified proportion

2 MATERIALS:

Water shall confirm to para M - 1 of General specification of material.

Cement shall confirm to para M – 2 of General specification of material. Sand shall confirm to para M -3 of General specification of material.

Coarse aggregate shall confirm to para M -5 of General specification of material.

T.M.T. Steel shall confirm to para M-6 of General specification of material.

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 M-15 with maximum size of aggregate is 20 mm.

4. PROPORTIONING CONCRETE

- (a) Concrete mix shall be designed on the basis of preliminary tests. The proportion of 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.
- (b) Except it can be shown to the satisfaction of the Engineer-in-charge that supply of properly graded aggregate of uniform quality can be maintained till the completion of 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 stock piles Required quantity of material shall be stock piled several hours preferably a day before use. In proportioning concrete the quantity of both cement and aggregate shall be determined by weight water shall either be measured by volume.
- (c) It is most important to keep the specified water cement ratio constant to this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge. The amount of mixing water shall then be adjusted to compensate for any variations needed in the moisture content. For the determination of moisture content in the aggregate IS: 2386-1977 (Part-III) shall be referred to Suitable adjustments shall also be made in the weight of aggregate to allow for variations in weight of aggregates due to variations in their moisture content.
- (d) The cement level for various grades of controlled concrete shall be considered as under for the purpose of working out the rates to be quoted in Schedule-B

Sr.No.	Grade of concrete	Cement level required in Kg per cubic meter of concrete
1	M-15	300
2	M-25	380

- (e) Actual cement level required for the aggregate to be used shall have to 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 reinforcements and completely

fills the formwork. 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 characteristic strength not less than that stipulated in tender specification. 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 for handling of extra cement, however due to change in design mix it is obligatory to use less/more cement per cumt of concrete. Contractor shall do same without claiming extra cost for using cement. In case actual cement use being less then cement level specified in table here in above, the department will deduct the cost of cement from the bill at the base price of star rate and rate analysis per tonne of cement at work site for reduce consumption of cement. In case actual use of cement being more than specified above no extra payment for additional cement level shall be made and contractor shall have to bear addition cost. Design mix and actual cement level required shall be communicated to the Contractor in writing by the Engineer-in-charge.
- (g) The quantity of water shall be just sufficient to produce a dense concrete of required workability 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 at work site, Slumps shall be adopted for different types of works by considering medium type degree of workability as per I.S.456-2000

5 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.

6 Strength Requirement of Concrete

The compressive strength requirements for the various mixes by concrete shall beas follows:

Type of concrete	Minimum Compressive strength in kg/cm ² of 150 mm cubes 28 days
M-15	150
M-25	250

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 4-(h).

6.2 PRODUCTION OF CONCRETE

6.2.1 MIXING

- (a) Concrete shall be mixed in a mechanical mixture and shall be as 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 color 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

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 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 of 25 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 of outside the forms.

8 PREPERATION FORPLACING CONCRETE

8.1 General Requirement

- (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.

8.2 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 from the concrete.

8.3 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
Exterme	75

9 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 practice able 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.

10 Form Work

10.1 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) Form work 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 form work 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.

10.2 Form, Centering and Temporary Works

- (a) All centering, form work 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 form working 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.

10.3 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 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.

10.4 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 to 6 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.

11 Finish and Repairs to 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.

12 Curing of Concrete

12.1 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.

12.2 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.

13 Requirement of Concrete construction

13.1 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 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.

13.2 Concrete in Structures Block outs

- (a) The item of the schedule for concrete in a fore said 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 blocks 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, 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.

13.3 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.

13.4 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 as to be resumed on a surface which has hardened, it shall be thoroughly raked, 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.

14 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+1*

* Plus one additional sample for each additional 50 m³ or part there of However, at least one set of cubes in a week, irrespective of quantity of concrete shall be taken.

(c) Test Specimen

Three test specimen 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 be entitled to any compensation on account of such changes.

15 Steel Reinforcement

Steel shall conform para M-6 & M- 7 of general specification of material.

16 Tolerance 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	10 mm	Buried	20mm
More than 3 m			

Exposed	12 mm	Buried	25mm
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(iv) Variation in cross-sectional dimensions of columns, beams, slabs, walls and similar members of

Minus	6mm
Plus	12 mm

- (v) Variation in location from those specified for slab and wall openings 12mm.

17 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 occurs 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.

18 Measurement and Payment

18.1 General

The prices entered in the Schedule-B for the incorporation of the various classes of concrete, plain and reinforced required by this section shall be inclusive of mobilizing, demobilizing, supplying all equipment's, 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 schedule-B.

- (a) Except or other wise 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. 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 formwork required for the work unless otherwise specified in the contract.
- (f) The unit rate also includes the cost of dewatering, diversion 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 metre quoted for relevant items in schedule-B and relevant item of S.O.R which procedure follow to completed the item.

Mode of Measurement & Payment :-

The concrete work shall be measured in length, breadth and depth as specified in drawing or as directed.

The rates shall be paid for a unit of one CM basis.

Item No: 12

Providing and laying 75 mm wearing coat of ordinary Portland cement concrete M-15 grade including laying on proper camber, temping, screening, finishing, brooming or grooving etc. comp. for all leads and lifts.

Materials :

Water shall confirm to M-1 of specification of material.

Cement shall confirm to M-2 of specification of material.

Sand shall confirm to M-3 of specification of material.

Corase aggregate shall confirm to M-5 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 Sq.mt. basis.

Item No.13

Providing and placing in position reinforcement bars including cutting, bending, welding joints where necessary, hooking etc. comp. as per drawing for all leads and lifts.(b) TMT

Materials: TMT steel shall confirm M- 6 of this specification

M.S. binding wire shall confirm M-7 of this specification.

General

- (a) The TMT Bars be procured by the Contractor from main producer/ authorised dealer. Steel reinforcing bars shall be placed in concrete where 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. 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. At least before 30 days prior to placement of reinforcement the contractor shall submit to the Engineer-in-Charge three prints and reproducible tracings of each of reinforcement detailed working drawings for approval. The contractor's reinforcement detailed drawing for approval shall be prepared in accordance with IS: 456-2000 "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 on 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 conformance with the requirements of these specifications.

- (c) As far as possible Thermo mechanical treated Bars, conforming to IS: 1786-FE 415 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 Schedule-B.
- (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-415

Nominal Size of bar	Quantity	
	Lot below 100 tonne	Lot above 100 tonne
Under 10 mm	1 sample from each 25 tonne	1 Sample from each 40 tonne
10 to 16 mm	1 sample from each 35 tonne	1 sample from each 45 tonne
Over 16 mm	1 sample from each 45 tonne	1 sample from each 50 tonne

Note: The frequency for chemical analysis if required for steel to be decided by the Engineer-in-Charge as per the requirement.

- (e) Stacking of each type of steel shall be made separately at the central place for stacking, if established by the contractor or at each site of work.
- (f) Thermo Mechanically 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 standards

Testing of TMT bars :

- 1.0 The testing of TMT bars for mechanical properties shall have to be done prior to use in the work. The Contractor shall submit the results for chemical properties obtained from the manufacturer.
- 2.0 The steel shall also conform the abovementioned 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 work site. Moreover, the further testing shall be done by approved Laboratory before its use in the work. Testing of steel should be carried in Government laboratory or any other approved laboratory as per instructions of the Engineer-in-charge

- 3.0 The frequency of testing shall be one number per any lot of 50 M.Ton or part thereof.

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 diameter are equal.
 - (ii) Diameter of larger bar if diameter are 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 mild steel and shall conform to IS: 280-1978*. Binding wire shall have a tensile strength of not less than 56 kg/mm². 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.

Care of placed Reinforcement and Concrete

Where reinforcement bars are bent aside at construction joints and afterwards bent back into their original position, care shall be taken to ensure that at no time the radius of the bend is less than 6 times the diameter for deformed such bars, to ensure that the concrete around the bars is not damaged.

MEASUREMENT AND PAYMENT

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 metric tonne quoted for relevant items in schedule-B.

- (i) The weight of reinforcing bars shall be based on following table :

Table : Cross Sectional Area And Mass (IS : 1786-FE-415)

Nominal size mm	Cross-Sectional Area mm ²	Mass per Meter Run kg
1	2	3
8	50.3	0.39
10	78.6	0.62
12	113.1	0.89

16	201.2	1.58
20	314.3	2.46
25	491.1	3.85

* Or its latest edition.

- (ii) The joints or splices shown on the drawings or as directed by the Engineer-in-charge shall be measured as laps. Mechanical couplings and welded joints approved by the Engineer-in-charge, shall be measured for payment, in terms of length of equivalent lap joints. Payment for placing reinforcement bars shall be made at the rate tendered thereof in the Schedule B. The rate shall include the cost of preparing workshop drawings for reinforcement based on the construction drawings, issued by the Engineer-in-charge.
- (iii) Supporting chairs/separators prepared from MS or TMT-CRS Bars reinforcement preferably of equal dia. or as directed by the Engineer-in-charge shall be measured and paid for as per the standard weights on the lines of payment for reinforcing bars.

MODE OF MEASUREMENTS AND PAYMENTS

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 schedule-B

Item No.14

Providing and fixing in position 110 mm dia PVC pipe weep holes in abutment, wing walls and laying, training etc. comp.

General

The item provides for supplying, laying and jointing of P.V.C. pipe of 110 mm dia pipe and same shall be got approved by Engineer-in-charge. The 110 mm dia P.V.C. pipe shall be laid in alignment with line level and grade as per drawing or as directed by Engineer-in-charge.

The P.V.C. Pipes are placed in the concrete of training wall for draining out of water from the portion of training wall. The pipes are placed on rows as shown in drawing spaced at 1.50 mt. c/c or as directed in both ways. The pipes are laid in slopes as per drawing for drainage out water towards river. The inner end of weep hole pipes shall be in touch with graded filter in the training wall while outer end of pipe shall be flushing with u/s face of the training wall.

Mode of Measurement & Payment

The measurement shall be taken on running meter basis of the complete length of pipe. The rate shall be inclusive of providing fixing P.V.C. pipe as per drawing or as directed by Engineer in charge and payment shall be paid for one running meter basis of completed item.

Item No.15

Providing and fixing marble plate of 2 cm thickness including engraving and filling paints for letters as directed.

The marble plate shall be confirm as per M-8 specification of materials.

1. Marble plate shall be of good quality as approved by engineer-in-charge.
2. Marble plate shall be of 2 cm. in thickness and finishing smooth surface on one side.
3. Engraving and painting of figures shall be done as per instruction of Engineer-in-charge size of letter and matter to be displayed shall be as directed by Engineer-in-charge.
4. Marble plate shall be fixed at appropriate place as directed by Engineer-in-charge.

Contractor shall bear all cost of materials labour& fixing plate in position.

Measurements and Payments

Measurement shall be made on 100 Sq. Centimeter basis and shall be paid accordingly.

Item No.16

Providing and fixing P.V.C. 100 mm dia water spout 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 grating 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.17

Providing inverted filter of 30 cm sand and 30 cm gravel below/behind wall/pitching including laying to correct slopes after necessary trimming of earth work etc.comp.

1. Well graded pebble or metal of 40 mm to 63 mm size shall be used. The grading and tolerances of metal or pebbles shall be as under:-

Sr. No.	No. of Size Range	Sieve designation	Percentage by weight passing through the sieve
1	63 mm to 40 mm	90 mm	100-00
		63 mm	85-100
		50 mm	35-70
		40 mm	00-15
		20 mm	00-05

The size shall be 40 mm to 63 mm where in tolerance limit for over size shall be Upto 15% and that for lower size should be upto 15% and below 20 mm. It shall be Allowable upto 5%. The filter material shall be tightly placed to a thickness of not less than 600 mm and provided over the entire surface behind abutments, wings or return walls to the full height as shown in drawing and as directed.

2. The filter media behind abutment and return wall shall consist of two layers. The first layer of stone aggregate of 40 to 63 mm size and the second layer of coarse sand.
3. The total thickness of the filter media shall not be less than 600 mm as specified in the item.

Mode of measurement and payment:

The measurement for payment shall be made as finished work on sq. mt. basis.

Item No.18

White or colour wash in following coats including scrapping,scaffolding etc.comp. (12-B) For three coats.

Scrope of work

The item include all labour, materials, tools & equipments including scaffolding require for applying three coats of white or colour wash on existing old surface. The item also include repairing the surface required for applying the three coats of white or colour wash.

Materials

The material such as lime, fevicol, blue indigo, brushes, card papers including strainer required shall be brought by contractor and shall be approved priority to use in the item of work.

Preparation of surface

The surface on which the white wash to be applied shall be prepared smooth and even.

Preparation of liquid white wash

The lime shall be dissolved in the water for period not less than 24 hours in a separate container, there after the dissolved lime liquid shall be filtered with cotton cloth in a another container fevicol & stainer shall be dissolved in this liquid filter time in such a way that required colour shall be obtained. If white wash to be prepared than blue indigo shall be dissolved in lime liquid shade, that it will give blue's colour.

Mode of applying

The prepared lime liquid shall be applied on surface with brush in three coats, for first coat the brush shall be applied upward to downward, the second coat shall be applied left to right & final coat shall be applied upward to downward. Each coat shall be applied after the one coat is completely dry. The surface shall be evenly applied with line and no surface shall be remain untouched.

Mode of measurement & payment

The item shall be measured and paid on **square meter basis**.

Item No.19

Earth Work in embankment using soil, soft & Hard murrum excavated from approved borrow area/village tanks rtc. Including breaking clods, dressing to the design section with lead up to 500 mt and all lifts (By JCB-4CX Machinery).

PREPARATION OF SITE**1.0 Clearing the Site**

- (i) This shall include cutting down trees of up to 0.50m girth, removing bushes, stumps, and roots of trees up to 30cm depth, stacking and disposing off the excavated stuff as directed by the Engineer-in-Charge.
- (ii) The ownership of all the useful materials encountered in the clearing of site and/or in excavation shall be the property of the Govt.of Gujarat.
- (iii) The roots of trees etc shall be removed up to a depth of 30cm. All ant-hills shall be completely dug out and queen ants destroyed before the earthwork is started. The

contractor shall dispose off all such materials which are not required to be kept at site, as directed by the Engineer-in-Charge. No separate payment shall be made to the Contractor for complying the requirements outlined in forgoing paragraphs.

2.0 Materials to be used in the embankment.

The excavated usable stuff obtained from the borrow area up to specified lead, after stripping.

3.0 Borrow area stripping and operating

- (a) Earth shall be obtained from the designated borrow area which include drains, village tanks and any other places designated. The cut shall be made to such designed depth only. Shallow cut will be permitted in the borrow areas if unstratified materials with uniform moisture contents are encountered. Each designated borrow area shall be fully exploited before switching over to the next designated borrow areas.
- (b) Haphazard excavation will not be permitted. The type of equipment used and the operations in the excavation of materials in borrow areas shall be such as to produce the required uniform materials for the embankment.
- (c) Borrow pits shall be operated so as not to impair the usefulness or spoil the appearance of any part of the work or any other property. The surfaces of wasted materials shall be left in a reasonably level and even condition.
- (d) Borrow area shall be stripped off the top soil and any other objectionable materials to the required depth. The minimum depth of stripping shall be 15cm. Stripping operations shall be limited only to the designated borrow areas. Materials from stripping shall be disposed off in exhausted borrow areas or in the approved adjacent areas. No separate payment shall be made for stripping.
- (e) The agreed rate for the earthwork in the embankment shall be deemed to have included the cost of stripping of the borrow area.

4.0 Conveyance of Borrow Area Material

The borrow area/borrow pits material shall be conveyed up to a maximum lead of 2.0 km and for all the lifts involved at borrow areas/ borrow pits and at the placement site. The material shall be available within 2.0 km lead, however contractor shall survey for availability of soil before submit their bid for this work & at the time of execution of work if soil shall be not available within 1.00 km, the contractor shall be bound to complete the work from any lead wherever the good soil available. No extra payment shall be made for any extra i.e. more lead.

5.0 Spreading, watering and compacting the Material in Embankment

Embankment materials in general shall be spread in successive horizontal layers of 15cm to 23 cm thickness extending to the full width of the embankment in proper gradient.

- (a) After spreading the excavated materials, surface shall be wetted by sprinkling water uniformly and thereafter compacting the leveled/sloped surface with hand rammer or suitable light weight roller or suitable light weight pipe roller.

- (b) Thickness of layers shall be adjusted by the Contractor to satisfy the Engineer-in-Charge that the particular type of above compactors used by him shall give the proper compaction and also maintaining the gradient as directed by the Engineer-in-Charge.
- (c) No fresh layer shall be laid until the previous layer is properly watered and compacted.
- (d) The Embankment shall be carried out as directed by Engineer in charge and at road portion i.e. up to road width minimum 30 cm. box cutting shall be carried out to proper construction of road and to avoid the spreading of road material. No extra payment shall be made for box cutting. The top level surface payment before laying of metal shall be taken & consider in final payment of earth work, Also on both side of road the earthwork top surface levels shall be taken & paid minimum 30 cm from bottom level of metal surface.
- (e) Embankment shall be ensured that the methods of dumping, spreading, watering and compacting are such as, it will result in reducing segregation.

Mode of measurement and payment:

- (a) **The payment shall be made for quantity in cubic meter** at the rate quoted under relevant items of work.
- (b) No extra payment shall be made for borrow area stripping, removing the black cotton soil and for the material wasted on this account, "No extra payment shall be made for earthwork & watering, rolling done during preparation of seat under embankment or for scarifying. The labour and implements required for the work as well as for the incidentals are also not payable. The rates quoted for relevant items is deemed to cover such costs.
- (c) The rates quoted cover all the activities specified for relevant items of work.
- (d) The cross section shall be taken before starting the earth work & also final cross section shall be taken after completion of earth work.
- (e) The payment shall be made after completion of embankment. The defect liability for earth work shall includes minimum one monsoon in addition to clause no. 17-A, after monsoon the top levels of earthwork shall be taken & the contractor shall be bound to rectify/maintain the levels as per final levels, which are taken before monsoon after completion of earthwork & the work after monsoon shall be also carried out as per the technical specification of this item.

Item No.20

Compaction of selected soil / hard murrum / soft murrum in even thickness of 15 to 20 cms including watering rolling of suitable capacity etc. complete as directed.

Scope:

Item involves the compaction of earth work in embankment in existing canal to bring the section to the designed section as shown in the drawing. As the work is required to make the base for lining work, compaction to the required degree is highly essential. It should be borne in mind that rolling width for vibratory roller would not be available everywhere,

hence suitable equipment for rolling, especially in canal slope shall have to be deployed to achieve required degree of compaction.

Technical Specification:

1 Spreading the Material in Embankment

- (a) Embankment materials after approval of Engineer- in-Charge shall be spreaded in successive horizontal layers of 15 cm to 20 cm thickness. Construction of embankment shall begin at the toe of the fill and in no case shall embankments be widened by dumping material from the top. To achieve adequate compaction at the outer edges, sufficient proud of not less than 30 cm shall be kept.
- (b) Thickness of layers shall be adjusted by the Contractor to satisfy the Engineer-in-Charge that the particular type of compactors/ roller / hand rammer used by him shall give the required density.
- (c) No fresh layer shall be laid until the previous layer is properly watered and compacted as per requirement. The work of spreading and compaction shall be so adjusted as not to interfere with each other.

2 Mode of Measurement and payment:

The rate is inclusive of trimming & all labour & charges for tools, machine etc. The measurement for this item shall be paid on "Cubic meter" basis.

Item No.21

Supplying of graded stone aggregate of following sizes (for W.B.M. Road)(2) Hand broken stone aggregate 40 mm to 63 mm size

The stone metal shall be obtained from quarries approved by the Executive Engineer prior to collection. The metal shall be of approved quality with all leads and lift. The metal shall be obtained from hard tough, sound durable, stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round, elongated or flocky material shall be allowed. The size of metal shall be 40mm to 63mm and shall be hand broken. All unsound weathered or disintegrated stone obtained from the upper surface layer of the quarry or other layers of boulders shall be rejected.

1. The samples of metal collected from approved quarries shall be got tested at Government recognized laboratory as may be directed to the contractor at his own cost. The test results shall conform the standard requirement laid down for metal to be used for W.B.M. work.
2. The physical requirement for standard size metal shall conform to the test results indicated in the Table below

Type of Const.	Test	Test Method	Requirement
Base	(A) Los	IS 2386 Part IV	50% (Maximum)
	Abrasion Value	IS 2386 Part IV or	40% (Maximum)
	Aggregate Impact Value	IS 5640	15% (Maximum)

		IS 2386 Part-I	
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Frequency of test shall be as per Ministry of Surface Transport Specification.

3. The grading requirement of the metal to be used for W.B.M. shall be as under.

Sr. No.	Size Range	Sieve designation	Percentage by weight Passing through the sieve
1	40 mm to 63 mm	75mm	100-100
		63 mm	90-100
		50 mm	60-80
		40 mm	0-15
		25 mm	0- 5

The size of metal for W.B.M. shall be 40 mm to 63 mm wherein tolerance limit for oversize shall be 10 percent and that for lower size should be up to 15 percent and below 25 mm it shall be up to 5 percent.

4. Where any doubt exists as to whether the above requirements are satisfied, in whole or any part of the collection, metal shall be got screened by the contractor at his own cost, if so ordered by Engineer-in-charge.
5. Stacking shall be done by filling in the in the standard steel boxes of 2 m x 1.5 x 0.5m size which shall be supplied by the Department if available on rent. Otherwise contractor shall make his own arrangements. No deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quality of stacks of metal in any hectometer is not confirming is not confirming with the cubical content of the standard Pharr as (2m x 1.5m x 0.5m) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of metal in any stack in a particular Hectometer shall be paid on the basis of the quantity so found. Regular stack shall be done by the contractor on a fairly level ground Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge. Collection metal shall be completed in two hectometer wise as per the final requirement and measurement shall be recorded two hectometer wise. Measurement shall not be recorded and payments shall not be done.
6. For road work complete stacking of metal as per requirement shall be carried out in 2 Km Length before spreading. The metal stacks shall be measured and recorded and go cross checked by other deputy Executive Engineer as per rules before spreading. The collection on shall always commence at one end of the Km and be carried continuously towards the other end unless the Engineer-in-charge shall directed otherwise.
7. The payment shall be on cubic meter basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials shall not measure and finally accepted by the Department. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise.

8. The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses. The rates quoted are inclusive of all such tools, duties, free, royalties taxes etc.
9. Standard for acceptance at reduced rate rejection shall be as under:-
 - (a) Retained on 63 mm Square mesh sieve.
Not more than 30%
 - (b) Retained on 75 mm square mesh sieve.
Nothing will be retained & 100% metal shall be pass through the sieve. For the over size metal, payment at reduced Rates should be made as under.
 - (c) 90% of accepted tender rate for the metal retained between 10% and 20% square mesh Sieve of 63 mm gauges.
 - (d) 75% of accepted tender rates for the metal retained more than 20% and up to 30% on square mesh sieve of 63 gauges.
If more than 30% of metal is retained on specified sieve, (i.e. 63 mm Square sieve) The stack shall be rejected. Also stone aggregate retained on 75mm. Sieve the stack shall be rejected.
The quality for which reduced rate will be applicable is the quantity retained on the above mentioned square mesh sieve and not the whole quantity.
For example in a stack of 1.5 cu.m. Metal if 18% is retained on square mesh sieve of the prescribed size (i.e. 63mm) the reduced rate of 90% will be applicable to 0.27 cu.m. Only and the balance quantity size shall be paid for the accepted rates for standard size metal.
Before any secured advance for metal is paid to the contractor, the metal shall have to be tested for its quality in the laboratory. Contractor's request for such secured advance will be considered only after test results of metals are received and results are satisfactory. {As per Government circular No.SSR 1070-7B-191-22-S of 5/3/92}

Mode of measurement and payment:

The measurements shall be recorded in on CM Basis & shall be paid accordingly.

Item No.22

Spreading the stone aggregate for rolling and W.B.M. including filling the interstices to required camber and gradient (excluding spreading of Blindage)(ii) 40mm to 63mm size aggregates (H.B.)

The stone aggregate/ base material shall be spread in proper gradient on the prepared surface as directed by the Engineer in charge.

1. Metal should be spread under careful supervision by trained coolies. Contractor shall see that uniform spreading as per collection of metal is done. The contractor shall spread the metal fully from the stacks without keeping any balance unless directed by the Engineer-in-charge to keep some stock in balance for making good unevenness or depression during rolling works. To ensure that the material is spread to the required thickness, the road surface shall be marked out in to length over which the contents of heaps are to be spread. The bounds of earth or murrum (one on either side) shall be laid with a distance between them equal to the width of

road to be metaled and shall be enough to prevent the loose metal from spreading during consolidation as well as to retain water used for consolidation.

2. The metal (including old metal) shall be screened and rubbish, dust, grass shall be removed and spread evenly on the prepared surface in grade and camber by using camber board etc. So as to ensure that the surface is true to camber and grade. At least two cambers by using camber boards shall be in use at site. The surface shall be checked at every 50 ft. By means of template while the correctness of the camber in between shall be tested by string and corrected as required. Between the straight lengths and the curves in camber of road to super Elevation shall be made very gradually as may be directed by the Engineer-in-charge. After spreading stone aggregate, compacting the leveled/sloped surface with hand rammer or suitable light weight roller or suitable light weight pipe roller and maintain the proper gradient & proper care shall be taken in compaction of stone aggregate layer.
3. The spreading of metal shall proceed only 200 mt (Max.) advance of the rolling operations. The collection and spreading of the metal shall not be carried out in one and the same kilometer. The rate for this item shall be paid on cu.m. Basis and includes all the above operations with all lead and lift.
4. The metal shall be stacked in a rectangular stack (2.0mt x 2.0 mt 0.50 mt size) for cross checking of material required for the surface according to thickness.

Mode of measurement and payment:

The measurement and payment shall be given on CM basis.

The measurement shall be paid in CM. and the basis of the measurement of the Stone Aggregate which are previously measured before spreading to ensure the required quantity.

Item No.23

Supplying and spreading of Granular Sub Base (GSB) by providing Well graded material of grading-II, spreading in uniform layers on prepared surface, mixing, watering and compacting etc complete as per specification or as directed.

GRANULAR SUB-BASE

1.1. Scope

This work shall consist of Supplying, laying, watering and compacting with hand rammer or suitable light weight roller or suitable light weight pipe making roller to well-graded material on prepared surface in accordance with the requirements of these Specifications. The material shall be laid in two layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer in charge.

1.2. Materials

- 1.2.1. The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination thereof depending upon the grading required. Materials like crushed slag, crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer in charge. The material shall be free from organic or other deleterious constituents and conform to grading - II, one of the three gradings given in Table -1.

The grading to be adopted for a project shall be as specified in the Item or as directed by the Engineer in charge.

Table-1. grading for Well graded granular sub-base material

Sieve Designation	Per cent passing by IS sieve		
	Grading I	Grading II	Grading III
75.0 mm	100	--	--
53.0 mm	80-100	100	--
26.5 mm	55-90	70-100	100
9.50 mm	35-65	50-80	65-95
4.75 mm	25-55	40-65	50-80
2.36 mm	20-40	30-50	40-65
0.425 mm	10-25	15-25	20-35
0.075 mm	3-10	3-10	3-10

1.3. Spreading, watering and compacting:

The sub-base/ upper sub base material of grading specified in the Item shall be spread in proper gradient on the prepared subgrade as directed by the Engineer in charge.

After spreading GSB, surface shall be wetted by sprinkling water uniformly and thereafter compacting the leveled/sloped surface of GSB with hand rammer or suitable light weight roller or suitable light weight pipe roller and maintain the proper gradient. To avoid spreading of upper sub base of GSB proper care shall be taken in compaction of GSB layers.

Mode of measurement and payment:

- (1) Granular sub-base (GSB) shall be measured as finished work in position in CM.
- (2) The initial & final levels shall be taken in both layers & payment shall be made in CM basic.
- (3) The payment of GSB shall be made after completion of work. After one monsoon the top levels of GSB shall be taken & the contractor shall be bound to rectify / maintain the levels as per final levels, which are taken before monsoon i.e. at the time of completion of work. The work after monsoon shall be also carried-out as per the technical specification of this item.
- (4) In the completed work during monsoon or after monsoon the GSB settled down in any patch or in any length and width the contractor shall be bound to complete the work immediately by himself or after instruction of Engineer-in-charge as per this item technical specification, otherwise the penalized action shall be taken against contractor & the remaining S.D. to the department shall be forfeited. Also the contractor shall be complete the rectification work otherwise the work shall be completed by department by market rate for the rectification work as well as penalized action shall be taken as mention in this Para.

Item No.24

Excavation of canal/drain in all sorts of soils (including wet and slushy condition of soils) including depositing the excavated stuff in uniform layers in canal banks or in spoil banks or as and where directed including dressing the canal section upto lead of 50mt.and all lift including clearing the site etc. comp.(By machinery for canal drain maintenance) (Upto 1.5 cumecs capacity of canal/drain)

Specification :-

Centre line of drainage or banks and its edges (toe) shall be marked correctly and neatly by ranging out lines of borrow pits shall also be marked or the ground formation pillars of masonry shall be constructed @ suitable points as directed by the Engineer in charge to serve as bench marks.

Cross section shall be taken at an interval of 30 m. or / lesser interval as per site condition and maximum 1.50 m contour height similar for initial levels as well as final levels as directed by Engineer - in -charge. Drain shall be desilted / Excavated as per drawing (required depth) i.e. formation design level & width and satisfying all hydraulic / design section and as per direction given by Engineer-in-charge.

The whole area under cutting or filling (Banking) shall be cleared /cleaned of all jungle vegetation, rubbishes, loose-stones & other material.

In cutting side slope of 1:1shall be given or as specified by Engineer - in - charge depending on the nature of soil.In case of drain in cutting the excavated stuff/debris shall be utilised for banks and side bank as directed by Engineer-in-charge. No extra payment shall be made.

Surface and side slopes shall be well dressed and finished neatly. The excavated material from khadi shall be dumped in spoil Banks as directed by Engineer-in-charge

As far as possible the cutting should be carried out as per designed / required section. Excavation can be carried out in sequence given by the Engineer- in - charge depending upon the site condition.

During execution the contractor shall be careful, "No" damage occur to any public or private property in the vicinity of the work and if such thing or accident occurs, contractor shall be fully responsible for payment of losses or damages.

The excavation shall be carried out in all type of soil including slushy and muddy soil and / or in shallow/full depth of flowing water.

Mode of Measurement and payment:-

The measurement and payment shall be made on actual work done on as per cross section on cubic meter basis derived from cross section and payment shall be made on CM basis

Deputy Executive Engineer
Damanganga Quality Controll Sub Dn.
Dharampur

Executive Engineer
Damanganga Canal Disty Dn. No.3
Balitha-Vapi

SECTION - 6
FORM OF BID

FORM OF BID

Description of the Works:

----- BID

To :

Address :

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

(-----)

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 this ----- day of 20

Signature ----- in the capacity of -----

duly authorized to sign bids for and on behalf of -----

(in block capitals or typed)

Address

Witness

Address

Occupation

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 NWRWSK Department. For building works specifications for building and Road Department 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.)

Qty.	Unit	Description of Item	Rate	Per	Amount
		Item No:01			
207.96	cum.	Dismantalling the existing foundation concrete including disposing the dismantalled stuff including sorting out and stacking the useful materials and removing the debries and making good the damage etc. complete as directed.(b) In cement mortar	1165.20	Cum.	242314.99
		Item No:02			
55.00	Rmt.	Dismantalling the existing R.C.C. pipes of the following diameter including sorting out and stacking of the useful materials including refilling the trenches etc. comp. as directed. (NP-2 Pipe) (c) 650 mm to 900 mm dia.)	873.90	Rmt.	48064.50
		Item No:03			
6.00	Job	Providing temporary all weather and fair weather diversion of road suitable for traffic during the construction period of the strcture including providing necessary drains and all safety measures including sign boards on both the sides, red lamps, signals at night for traffic etc. comp.(I) O.D.R. / V.R.B. (Job Work)	10000.00	Job	60000.00
		Item No:04			
1062.25	Cum .	Excavation for foundation in all sorts of soil including yellow,sandy,gravelly soil,soft & hard murrum,etc.dryc ondition 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)(a) Above water table.	81.50	Cum.	86573.38
		Item No:05			
72.60	Cum .	Providing and laying rubble including hand packing and filling interstices with quarry spall behind abutments and between returns as directed. (up to 10 ton)	1064.80	Cum.	77304.48
		Item No:06			
15.00	Cum .	Providing and filling sand below R.C.C. Raft in Layers including ramming watering complete.	480.40	Cum.	7206.00
		Item No:07			
207.70	Cum .	Providing and laying plain/reinforced Nominal Mix cement concrete of various grade with cement,sand and coarse aggregates including centering ,shuttering ,batching ,mixing,transporting,placing,vibrating,smoot h finishing,curingetc.complete for all lead and lift.(Manual with conventional mixer, including dewatering) (For Raft , bottom	4479.80	Cum.	930454.46

		slab of barel, footing of column ,piers , abutment and bottom slab of sump etc.) (i) M-15 grade			
		Item No:08			
91.95	Cum .	Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all leads and lifts. (Batching Plant Based, Including dewatering) (For Raft, bottom slab of barel, footing of column , piers , abutment and bottom slab of sump etc.) (iii) M-25 grade	4844.70	Cum.	445470.17
		Item No:09			
63.20	Cum .	Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all leads and lifts.(Batching Plant Based, Including dewatering) (For walls of barels,brestwall, staunching rings, pedestals of bearing, stoplog piers, well staining, transition wall etc.) (iii) M-25 grade	5753.60	Cum.	363627.52
		Item No:10			
270.50	Cum .	Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all leads and lifts.(Batching Plant Based, Including dewatering) (For Roadway slab, approach slab, chute floor slab, kerb, pier cap, abutment cap, hoisting platform,top slab of barel etc.) (iii) M-25 grade	5206.30	Cum.	1408304.15
		Item No:11			
1873.95	Cum .	Providing and laying plain/reinforced Nominal Mix cement concrete of various grade with cement, sand and coarse aggregates including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all lead and lift.(Manual with conventional mixer, including dewatering) Piers, abutment, wing walls , headwall, return wall etc. (i) M-15 grade	4692.90	Cum.	8794259.96
		Item No:12			
138.80	Sqm .	Providing and laying 75 mm wearing coat of ordinary portland cement concrete M-15 grade including laying on proper camber, temping, screening, finishing, brooming or	282.30	Sqm.	39183.24

		grooving etc. comp. for all leads and lifts.			
		Item No:13			
326.50	Qtl.	Providing and placing in position reinforcement bars including cutting, bending, welding joints where necessary, hooking etc. comp. as per drawing for all leads and lifts.(b) TMT	7194.00	Qtl.	2348841.00
		Item No:14			
228.00	Rmt.	Providing and fixing in position 110 mm dia PVC pipe weep holes in abutment, wingwalls and laying, training etc. comp.	263.70	Rmt.	60123.60
		Item No:15			
72.00	100 Sqc m.	Providing and fixing marble plate of 2 cm thickness including engraving and filling paints for letters as directed	250.60	100 Sqc m.	18043.20
		Item No:16			
24.00	Eac h.	Providing P.V.C. 100 mm diameter water spouts including necessary iron gratings as per drawings.	159.37	No.	3824.88
		Item No:17			
361.25	Sqm .	Providing inverted filter of 30cm.Sand and 30 cm. gravel below / behind wall / Pitching including laying to correct slopes after neccesary trimming of earth work etc. comp.	550.74	Sqm.	198954.83
		Item No:18			
870.00	Sqm .	White or colour wash in following coats including scrapping, scaffolding etc. comp. (12-B) For three coats.	21.80	Sqm.	18966.00
		Item No:19			
555.50	Cum .	Earthwork in embankment using soil, soft & hard murrum excavated from approved borrow area /village tanks etc. including breaking clods, dressing to the design section with lead up to 500 meter and all lifts.(By JCB-4CX machinary)	148.40	Cum.	82436.20
		Item No:20			
555.50	Cum .	Compaction of selected soil / hard murrum / soft murrum in even thickness of 15 to 20 cms including watering rolling of suitable capacity etc. complete as directed.	10.40	Cum.	5777.20
		Item No:21			
134.00	Cum .	Supplying of graded stone aggregate of following sizes (for W.B.M. Road)(2) Hand broken stone aggregate 40 mm to 63 mm size.	292.17	Cum.	39150.78
		Item No:22			
134.50	Cum .	Spreading the stone aggregate for rolling and W.B.M. including filling the interstices to required camber and gradient (excluding spreading of Blindage)(ii) 40mm to 63mm size aggregates (H.B.)	256.11	Cum.	34446.80
		Item No:23			

130.00	Cum .	Supplying and spreading of Granular Sub Base (GSB) by providing Well graded material of grading-II, spreading in uniform layers on prepared surface, mixing, watering and compacting etc complete as per specification or as directed.	778.20	Cum.	101166.00
		Item No:24			
793.00	Cum .	Excavation of canal/drain in all sorts of soils(including wet and slushy condition of soils) including depositing the excavated stuff in uniform layers in canal banks or in spoil banks or as and where directed including dressing the canal section upto lead of 50 mt and all lift including clearing the site etc. comp. (By machinery for canal/drain maintenance) (Upto 1.5 cumecs capacity of canal/drain)	82.40	Cum.	65343.20
		Total Rs.		=	15479836.54

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

Deduct.....% below

Net

In words

Estimated amount put to tender

Add.....% Above

Net

In words

Deputy Executive Engineer
D'ganga Quality Control Sub Dn,
Dharampur

Executive Engineer
D'ganga Canal Disty Dn No.3,
Balitha(Vapi)

(B) — For Item Rate Tender (For above INR 50 Cr.):

Item No	Description of Item (with brief specification and reference to book of specifications)	Quantity	Unit	Rate		Amount
				In 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 detailed specification and 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.: PRC-10/2017 Cement Consumption/16/C Date:11/05/2017 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 mentioned in all the tender.

CEMENT CONSUMPTION STATEMENT

Name Of Work:-Construction of Box Type RCC Culverts at Panava (Khorifaliyu,Pipal Faliyu-1,Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4,Mokas faliyu) on Local Kotar at Village Panava,Ta. Dharampur, Dist. Valsad.						
Item No.	DISCRIPTION OF ITEMS	QUANTITY	Unit	CEMENT BAG REQUIRED AS PER THEORETICAL CONSUMPTION	Units Rate	CEMENT BAG REQUIRED AS PER THEORETICAL CONSUMPTION (Bag)
1	2	3	4	5	6	7
7	Providing and laying plain/reinforced Nominal Mix cement concrete of various grade with cement,sand and coarse aggregates including centering ,shuttering ,batching,mixing,transporting,placing,vibrating,smooth finishing,curingetc.complete for all lead and lift.(Manual with conventional mixer, including dewatering) (For Raft, bottom slab of barrel, footing of column ,piers , abutment and bottom slab) (i) M-15 grade	207.70	Cum.	6.00	Bags/ m ³	1246.20
8	Providing and laying plain/ reinforced design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. comp. for all lead and lift.(Batching Plant Based, Including dewatering) (For Raft, bottom slab of barrel, footing of columns,piers,abutment and bottom slab of sump etc.) (iii) M-25 grade	91.95	Cum.	7.60	Bags/ m ³	698.82
9	Providing and laying plain/ reinforced Design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all lead and lift. (Batching plant based, including dewatering) (Walls of barrels, breast wall, staunching rings, pedestals of bearing, stop log piers, wall staining, transition wall etc.) (iii) M-25 grade	63.20	Cum.	7.60	Bags/ m ³	480.32

10	Providing and laying plain/ reinforced Design mix cement concrete of various grade with cement, sand and coarse aggregate including centering, shuttering, batching, mixing, transporting, placing, vibrating, smooth finishing, curing etc. complete for all lead and lift. (Batching plant based, including dewatering) (Roadway slab, approach slab, chute floor slab, kerb, pier cap, abutment cap, hoisting platform, top slab of barrel etc.) (iii) M-25 grade	270.50	Cu m.	7.60	Bags/ m ³	2055.80
11	Providing and laying plain/reinforced Nominal Mix cement concrete of various grade with cement,sand and coarse aggregates including centering ,shuttering ,batching,mixing,transporting,placing,vibrating,smooth finishing,curingetc.complete for all lead and lift.(Manual with conventional mixer, including dewatering) Piers, abutment, wingwalls, headwall, returnwall etc. (i) M-15 grade	1873.95	Cu m.	6.00	Bags/ m ³	11243.70
12	Providing and laying 75 mm wearing coat of ordinary portland cement concrete M-15 grade including laying on proper camber, temping, screening, finishing, brooming or grooving etc. comp. for all leads and lifts.	10.41	Cu m.	6.00	Bags/ m ³	62.46
				Total in Bags		15785.14
				Say		15786.00
				Total in MT		789.30

Deputy Executive Engineer
Damanganga Quality Control sub Division
Dharampur

Executive Engineer
Damanganga Canal Disty Dn.No.3
Balitha(Vapi)

Steel Consumption Statement

Name Of Work:-Construction of Box Type RCC Culverts at Panava (Khorifaliyu, Pipal Faliyu-1, Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4, Mokas faliyu) on Local Kotar at Village Panava, Ta. Dharampur, Dist. Valsad.

Item No.	Description of Item	Qty.	Unit
13	Providing and placing in position reinforcement bars including cutting, bending, welding, joints where necessary, hooking etc. complete as per drawing for all lead and lift. (b) TMT	326.50	Qtl
	Total in Qtl	326.50	Qtl
	Total in MT	32.65	MT

Deputy Executive Engineer
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Dharampur

Executive Engineer
Damanganga Canal Disty Dn.No.3
Balitha(Vapi)

~~(A) For Item Rate Tender (For above INR 50 Cr.):~~

Item No	Description of Item (with brief specification and reference to book of specifications)	Quantity	Unit	Rate		Amount
				In 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 detailed specification and 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 as 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.: PRC-10/2017 Cement Consumption/16/CD Date: 11/05/2017 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 mentioned in all the tender.

Name Of Work:-Construction of Box Type RCC Culverts at Panava (Khorifaliyu,Pipal Faliyu-1,Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4,Mokas faliyu) on Local Kotar at Village Panava,Ta. Dharampur, Dist. Valsad.

<u>Details of Labour, Material & P.O.L component</u>						
[A]	Estimated Amount put to Tender				Rs.	15479836.54
[B]	Cost of cement				Rs.	4131196.20
[B]	Cost of Steel				Rs.	1444347.85
[B]	Cost of Asphalt				Rs.	0.00
[C]	Cost of Materials Other than cement & Asphalt				Rs.	320470.00
[D]	Cost of P.O.L.				Rs.	70970.00
[E]	Cost of Labour = [A] - [B] - [C] - [D] (35%)				Rs.	3329498.37
[E]	Cost of plant machinaries = [A] - [B] - [C] - [D] (65%)				Rs.	6183354.12
	Percentage of Labour component					
	=	3329498.37	x	100	=	21.51 %
		15479836.54				
	Percentage of Cement component					
	=	4131196.20	x	100	=	26.69 %
		15479836.54				
	Percentage of Steel component					
	=	1444347.85	x	100	=	9.33 %
		15479836.54				
	Percentage of Bitumen component					
	=	0.00	x	100	=	0.00 %
		15479836.54				
	Percentage of P.O.L. component					
	=	70970.00	x	100	=	0.46 %
		15479836.54				
	Percentage of Material component					
	=	320470.00	x	100	=	2.07 %
		15479836.54				

	Percentage of plant machinaries component							
	=	6183354.12	x	100	=	39.94	%	
		15479836.54						
						100.00		

Deputy Executive Engineer
Damanganga Quality Control sub Division
Dharampur

Executive Engineer
Damanganga Canal Distry Dn.No.3
Balitha(Vapi)

Name Of Work:-Construction of Box Type RCC Culverts at Panava (Khorifaliyu,Pipal Faliyu-1,Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4,Mokas faliyu) on Local Kotar at Village Panava,Ta. Dharampur, Dist. Valsad.

Cost of Materials

Sr.No.	Details of Material	Qty.	Input Rate	Per	Amount
A	Steel,Cement& Asphalt				
1	Cement	746.10	5234.00	M.T.	4131196.20
2	TMT Steel (FE 500 D)	33.75	44237.30	M.T.	1444347.85
3	Emulsion RS1	0.000	0.00	M.T.	0.00
4	Asphalt VG-30	0.000	0.00	M.T.	0.00
Total					5575544.05
Say					5575540.00
B	Material Other than Steel, Cement & Asphalt				
1	Geo Fabric Filter Roller	0.00	96.00	Sq.mt.	0.00
2	Sand	1032.78	279.00	Cum	32031.99
	Metal (40 - 20 mm)	1239.34	455.00	Cum	54340.65
	Metal (20 - 10 mm)	619.67	520.00	Cum	45047.60
	Metal (10 - 4.75 mm)	206.56	530.00	Cum	179744.20
3	Rubble	72.60	211.00	Cum	9305.10
4	Vinyl sheet pile	0.00	0.00	M	0.00
5	Gabion (2mx1mx1m)	0.00	0.00	Nos.	0.00
6	Gabion (2mx1mx0.3m)	0.00	00.00	Nos.	0.00
Total					320469.54
Say					320470.00

Grand Total 5896010.00

**Deputy Executive Engineer
Damanganga Quality Control sub Division
Dharampur**

**Executive Engineer
Damanganga Canal Distry Dn.No.3
Balitha(Vapi)**

Name Of Work:-Construction of Box Type RCC Culverts at Panava (Khorifaliyu,Pipal Faliyu-1,Pipal Faliyu-2, Pipal Faliyu-3, Pipal Faliyu-4,Mokas faliyu) on Local Kotar at Village Panava,Ta. Dharampur, Dist. Valsad.

Details of P.O.L.

Sr.No.	Details of Material	Qty.	Unit	Qty per trip	No.of trip	Av. lead	Total K.M.
A	Steel,Cement& Asphalt						
1	Cement	789.30	M.T.	20.0	38	20	760.00
2	TMT Steel (FE 500 D)	32.65	M.T.	20.0	4	20	80.00
3	Emulsion RS1	0.00	M.T.	20.0	0	0	0.00
4	Asphalt VG-30	0.00	M.T.	20.0	0	0	0.00
B	Material Other than Steel, Cement & Asphalt						
1	Geo Fabric Filter Roller	0.00	Sq.mt.	100000.00	0	105	0.0
2	Sand	1032.78	Cum	14.00	74	34	2516.00
	Metal (40 - 20 mm)	1239.34	Cum	14.00	89	40	3560.00
	Metal (20 - 10 mm)	619.67	Cum	14.00	45	40	1800.00
	Metal (10 - 4.75 mm)	206.56	Cum	14.00	15	40	600.00
3	Rubble	72.60	Cum	14.00	6	40	240.00
4	Vinyl sheet pile	0.00	M	10.00	0.00	13482	0.00
5	Gabion (2mx1mx1m)	00.00	Nos.	14.00	40	40	00.00
6	Gabion (2mx1mx0.3m)	00.00	Nos.	14.00	138	40	00.00

Total 9556.00

Say 9556.00 Km

[A] Qty. of Diesel required @ 4.0 Km./Litre 9556.00 = 2389.00 Ltr.

4

Qty. of oil required @3% of Diesel = 71.67 Ltr.

	Total Qtys				
Cost of Diesel @ Rs. 90.86/Ltr.	2389.0	x	90.86	=	217064.54
Cost of Oil @ Rs. 183.00 /Ltr	71.7	x	183.00	=	13115.61
				Total Rs.	230180.15
				Say Rs.	230190.00

**Deputy Executive Engineer
Damanganga Quality Control sub Division
Dharampur**

**Executive Engineer
Damanganga Canal Distry Dn.No.3
Balitha(Vapi)**

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 -----

Addres -----

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)

We further agree that no change or addition to or other modifications of the terms of the Contractor or Works to be performed thereunder or of any of the Contract documents which may be made between _____ (name of Employer) and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or 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

Employer) (name and address of Employer) (Hereinafter called "the
contractor) and _____ (name and address of
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