GOVERNMENT OF ODISHA

GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES
TENDER DOCUMENT (e - Procurement)

(Technical BID)
(COVER –I)

e-Procurement Notice No. ACE, RBB –04/2026-27

Bid Identification No.: ACE, RBB (BNID) -09/2026-27

FOR THE WORK

Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project.

Additional Chief Engineer
Rushikulya Bahuda Basin,
Brahmapur-4, Ganjam

Contractor

Superintending Engineer

PARTICULARS OF TENDER

1	Name of the work	**Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project.**
2	Estimated Cost	**Rs. 8,19,32,867/-**
3	E.M.D	**Rs. 8,19,400/-**
4	Period of completion	**15 (Fifteen) Calendar months**
5	Class of Contractor	Registered Construction firm of **"A"** & **"Spl"** Class Registered under Govt. of Odisha & other eligible classes registered elsewhere mentioned in Tender call Notice.
6	Cost of Bid Documents	10000/- (Non-refundable) for Technical & Financial Bid Documents
7	Availability of Tender in web site	From **10.09.2026,** 10.00 hours to **25.09.2026,**17.00hours
8	Bidding Period starts from	From **10.09.2026,** 10.00 hours to **25.09.2026,**17.00hours
9	Date of opening of Technical Bid	At **11.30 A.M.** on **28.09.2026 in** the office of the **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur-4, Ganjam.**
10	Date of opening of Financial Bid	Will be intimated to qualified Bidders through web site i.e e-Procurement portal etc. after approval of Technical Bid from competent authority.

Contractor

Superintending Engineer

GOVERNMENT OF ODISHA

BID DOCUMENTS

NAME OF WORK: "Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project."

The bid document contains (i) Technical Bid 207 Pages & (ii) Financial Bid 07 Pages.

Additional Chief Engineer
Rushikulya Bahuda Basin,
Brahmapur, Ganjam

Contractor

Superintending Engineer

C O N T E N T S

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FINANCIAL BID (Cover-II) in separate booklet.		

Contractor

Superintending Engineer

SECTION – 1

NOTICE INVITING TENDER (N.I.T.)

&

DETAILED TENDER CALL NOTICE

GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES
Office of the Additional Chief Engineer,
Rushikulya Bahuda Basin, Brahmapur - 760004

Notice Inviting Tender

e-Procurement Notice No. ACE, RBB – 04/ 2026-27

1. The Additional chief Engineer, Rushikulya Bahuda Basin, Berhampur on behalf of Hon'ble Governor of Odisha invites On-line **percentage rate** tender in **double cover** through e-procurement for execution of the following work. The bid should be submitted by eligible class of contractors on-line in the Govt. website www.tendersodisha.gov.in. The bidders should have necessary portal enrolment with own digital signature certificate. The registered bidders outside of Odisha can also participate in this on-line tender process after necessary portal enrolment but shall have to subsequently undergo registration with the Odisha P.W.D. before signing of the agreement.

Sl No	Bid I.D. No.	Name of Work	Approx. value of work (Rs. in Lakh)	E.M.D/ Bid Security Required (in Rs.)	Cost of Bid Document (Rs.)	Period of completion	Class of Bidder
1	2	3	4	5	6	7	8
1	ACE, RBB (BNID) – 09/2026-27	**Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project**	819.33	Rs. 8,19,400/-	10000/-	15 (Fifteen) calendar months	'A' & 'Spl'

2. The Bidder shall **transfer online the Earnest Money Deposit / Bid Security of the amount** specified for the work in the Column -5 of above table as part of its bid through a process as mentioned under DTCN.

3. The bidder shall **transfer online** the cost of bid document specified for the work in the Column -6 of above table i.e **Rs 10,000/-** through a process as mentioned under DTCN.

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4.	**Procurement Details: -**				
Procurement officer	**Availability of Bid On -line**	**Submission of Bid On-line**	**Period for seeking tender clarification**	**Date & time of opening of tender**	
				Technical Bid	**Financial Bid**
Addl. CE, RB Basin, Brahmapur	From **10.09.2026,** 10.00 A.M. to **25.09.2026,** 5.00 P.M.	From **10.09.2026,** 10.00 A.M. to **25.09.2026,** 5.00 P.M.	From **10.09.2026,** 10.00 A.M. to **22.09.2026,** 5.00 P.M.	**28.09.2026 At 11.30 A.M**	To be intimated later.

5. Tender should be submitted On-line in www.tendersodisha.gov.in. bid document consisting of qualification, information and eligibility criteria of bidders, plans, specification and Bill of quantities of the works are available in web-site www.tendersodisha.gov.in and the set of terms and conditions of contract and other necessary documents can be seen in the web-site till last date of submission of bid.

6 Bid validity period of the tender is for a period of **90** days from the date of opening of technical bid. If any bidder withdraws his bid/tender before the said period or makes any modification in the terms and condition of the bid, he/she will be suspended for the time specified in the tender document.

7 Engineers of Gazetted rank or other Gazetted officer employed in Engineering or Administrative duties in an Engineering Department of the State Government are not allowed to work as a contractor for a period of two years after his retirement from Government service, without Government permission.

8 In pursuance to the Govt. of Odisha Works Dept. **Office Memorandum No. 173 dt: 03.01.2026** Additional Performance Security shall be obtained from the bidder when the bid amount is less than the estimated cost put to tender. In such an event, Additional performance security shall be taken on an incremental basis from the selected bidder for low bid prices in the project works as under:

I. **Where the bid price is below 0% but not below 10% of the project cost put to bid**, no additional performance guarantee/security percentage is required.

II. **Where the bid price is below 10% but not below 20% of the project cost put to bid**, the additional performance guarantee/security percentage shall be incremented by 0.1% for every percentage of bid price below 10% of the project cost put to bid starting at 11% with the additional bid performance guarantee being 0.1% and this additional performance guarantee percentage shall be applied on the bid price;

III. **Where the bid price is 20% or more below of the project cost put to bid**, the additional performance guarantee percentage shall be incremented by 0.2% for every percentage of bid

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price below 20% of the project cost put to bid in addition to 1% of the bid price and this additional performance guarantee percentage shall be applied on the bid price;

IV. The additional performance guarantee percentage shall be rounded off to the next lower percentage based on whether the decimal point of the percentage of bid price is below 0.5% or next higher percentage based on whether the decimal point of the percentage of bid price is 0.5% or more.

V. The additional performance security shall be treated as part of the performance security.

VI. Justification for abnormally low bids shall be scrutinized by the Departmental Technical Committee and recommended to the competent authority of the Administrative Department for the approval of the Additional Performance Security (APS). An abnormally low bid is one in which the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the contract at the offered price. Procuring Entity may, in such cases, seek written clarifications from the Bidder, including detailed price analyses of its Bid price in relation to scope, schedule, resource mobilization, allocation of risks and responsibilities, and any other requirements of the bid document. If, after evaluating the price analyses, the procuring entity determines that the Bidder has substantially failed to demonstrate its capability to deliver the contract at the offered price, the Procuring Entity may reject the Bid/ Proposal. However, it would not be advisable to fix a normative percentage below the estimated cost, which would automatically be considered as an abnormally low bid.

(A) The Office Memorandum No. 632 dt: 09.01.2026 of Works Dept. issued the following clarifications, which are issued on Works Department OM No.173 dtd. 03.01.2026 as follows:

I. If more than one bid is quoted (decimal up to two numbers will be taken for all practical purposes), either at the estimated cost put to tender or less than the estimated cost put to tender, the tender accepting Authority will finalize the tender through a transparent lottery system, where all the concerned bidders/ their authorized representatives, the concerned SE/EE of the concerned Division and Divisional Accounts Officer (DAO) will remain present.

II. If the rate quoted by the SC and ST Category Contractors comes to the rate quoted by the L1 bidder (decimal up to two numbers will be taken for all practical purposes), after availing 10% price preference as per Para 2 of Works Department Resolution No. 27748 dated: 11.10.1977, the tender shall be finalized by the tender accepting authority through a transparent lottery system along with other categories of contractors.

(B) A CORRIGENDUM No. 14560 dt: 11.08.2026 of Works Department is issued on Works Department OM No.173 dtd. 03.01.2026 as follows:

I. The phrase "……**Departmental Technical Committee and recommended to the competent authority of the Administrative Department**……." Appearing in Para-VI of Clause-1 of Works Department OM **No.173 dtd. 03.01.2026 may be read as "…….. Technical Committee and recommended to the Comprtent authority for Acceptance of Tenders as per Para-6.3.15 of OPWD code volume-I……"**

(C) Government have been pleased to make modification to Amendment to Para-3.5.19(a)(b) of the OPWD Code, VoL-I vide Office Memorandum No. 4909 dt: 12.03.2026 of Works Dept as follows:

The Additional Performance Security (APS) shall be furnished in shape of National Saving certificate / Post office savings Bank Account / Post Office Time Deposit Account / Kisan Vikas Patra /Bank Guarantee pledged in favour of **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar , Dist.-Ganjam** from any Nationalized / Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar/**e-Bank Guarantee executed on National e-Governance Services Limited (NeSL) Digital Document Execution Portal/ Insurance surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI) and such instruments shall be accepted towards Earnest Money Deposit (EMD) , Intial Security Deposit(ISD)/ any other security deposit from the contractor or supplier** within 7 days of issue of letter of acceptance (LoA) by the Divisional Officer (By e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled and the Earnest Money Deposit/ Bid Security shall be forfeited. Further, proceeding for blacklisting shall be initiated against the bidder. If the APS is submitted in shape of Bank Guarantee by the bidder, then the validity of the Bank Guarantee should be for a minimum period equal to the period allowed for completion of the work.

9. The bidders are required to upload the documents such as **(i) Valid original Contractor's Registration Certificate (CDMS), (ii) GST Registration Certificate, (iii) Original affidavit regarding authenticity of documents, (iv) No relation certificate, (v) PAN Card, (vi) Online transmission of EMD/ Security Deposit (Vii) All other required documents along with the technical bid, otherwise his / her bid shall be declared as non responsive and shall be rejected**. The lowest successful bidder only is required to produce documents viz Original Contractors Registration Certificate, GST Registration Certificate, Original affidavit regarding authenticity of documents, No relation Certificate, PAN card after opening of Financial Bid for verification purpose within **5 (five)** days from the date of opening of the tender (price bid) or from the date of lottery if lottery has been held.

10 Bids received online shall be opened at **11.30 A.M** on **28.09.2026** in the Office of the **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Dist.-Ganjam, (Odisha)** in the presence of the bidders who wish to attend. Bidders who participated in the bid can also witness the opening of the

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bids after logging on to the site through their DSC. If the office happens to be closed on the date of opening of the bids as specified, the bids will be opened on the next working day at the same time and venue.

11 The bidders should ensure clarity / legibility of the documents uploaded by them to the portal. Non-submission of legible documents may render the bid non-responsive. **Further, the bidders are requested to mention their e-mail ID & mobile phone no. in the Affidavit for correspondence.**

12 Bidders desirous to avail **exemption / relaxation of E.M.D.** as per prevailing rules should upload copies of necessary document and affidavit in support of their claim along with their bid.

Bidders registered as "Engineer Contractor" desirous to avail exemption of EMD for participating in the bid shall have to upload **an affidavit mentioning the number of tendered works already awarded to him/her without EMD during the current financial year**. In case of non-submission of the above affidavit, his/her claim for availing the benefits of Engineer Contractor will not be considered. The successful Engineer Contractor has to produce the original Registration Certificate for recording the fact of availing exemption of E.M.D. for award of the work.

Bidders registered as S.C. & S.T. Contractor up to "B" Class desiring to avail **concession(s)/ price preference** as per prevailing rules should apply for the same in writing **in shape of Affidavit and upload necessary document and affidavit in support of their claim along with their bid**, failing which their case may not be considered for availing price preference as per the rule. No claim in this regard after opening of the bid will be entertained.

13 The addendum/Corrigendum if any will be hoisted in the State e-Procurement Portal i.e www.tendersodisha.gov.in only.

14 Authority reserves the right to reject / cancel any or all the tenders without assigning any reasons thereof.

15 Registration in the Contractor Data Base Management System (CDMS) available at www.cdmsodisha.gov.in by all Contractors are mandatory as per O.M No.12934/W dated 23.08.2018 of Works Department, Govt. of Odisha with insertion of provision in Para-12.4 below Para-12 in Appendix-IX(A) of the OPWD Code, Volume-II. The tender will not be accepted or bid will be rejected if not registered under CDMS portal.

16 In case amount put to tender is 7.00 crore or above **the bidders are requested to submit year wise break up of Satisfactory completion of similar major item of work required as per clause No.4(B) of Information and Instructions to Tenderers vide Section 2 of this DTCN & details of work in hand in Form-I & Form-M (Section-6) of this DTCN ie. Technical Bid.**

17 Other details can be seen in the bidding documents, which are available in web-site www.tendersodisha.gov.in

Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

Additional Chief Engineer
Rushikulya Bahuda Basin, Brahmapur

Office of the Additional Chief Engineer,
Rushikulya Bahuda Basin, Brahmapur – 760004.

DETAILED TENDER CALL NOTICE

1. The **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Ganjam, Odisha,** invites sealed on-line **percentage rate** tender for the work, **''Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project."** through website prescribed form to be eventually drawn on P1 Agreement Form from the Registered contractor of **'A' & 'Spl'** class registered under Water Resources, Works and other Departments of Govt. of Odisha. C.P.W.D., Railway or military Engineering Services, Air and Naval or other State Govt., Govt of India, Central Govt. undertakings are also eligible to tender for the work. This invitation for Bids is open to eligible bidders who are registered in the portal. Successful Bidders registered under other state Govt. / CPWD / MES / Railway, Air & Naval has to register under State PWD before signing of the Agreement.

2. The tender documents may be downloaded from the Govt. website from **10.09.2026**, 10.00 A.M. to **25.09.2026**, 5.00P.M**.** Payment towards cost of tender paper is Rs. **10,000.00 (Rupees Ten thousand)** and is to be remitted online, which is not refundable. Papers will be received through Govt. web site only from **10.09.2026**, 10.00 A.M. to **25.09.2026**, 5.00 P.M**.** The cover-I (Technical bid) will be opened on **28.09.2026** at **11.30AM** in the office of the **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Ganjam, Odisha** in presence of the tenderers or their authorized agents. The bidder shall bear all costs associated with the preparation & submission of bids. Bids will be made available through e-Procurement portal, the cost of bid is **Rs.10000/-.** Documents to be furnished by the bidder in compliance to the requirement as per DTCN & NIT will be prepared by him & furnished. For submission of bids through the e-Procurement portal, all the volumes shall be provided in the portal. The bidders shall prepare the documents & up load the scanned document to the portal in appropriate place. The bidders who participated in the online bidding can witness opening of the bid from any system logging on to the portal away from opening place. The bids can only be opened by the pre-designated officials only after the opening time mentioned in the bid.

3. The approximate value of the work tendered for is **Rs. 8,19,32,867/-**

4. No tenderer will be permitted to furnish their tender in their own manuscript.

5.The bidder shall **transfer online the Earnest Money deposit / Bid Security** @1% of the amount put to tender i.e. **Rs. 8,19,400/-.**

6. The system shall reject submission of any bid through portal after closure of the receipt time. For all purpose the portal time displayed in the system shall be the time to be followed by the bidder.

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7. Deleted

8. For a particular work a bidder can submit only one tender paper. If a bidder submits more than one bid for a particular work through e-Procurement portal the system shall consider only the last bids submitted through portal.

9. The tender is to be submitted in two covers. Cover-I(Technical Bid) which is to contain copy of **(i) Valid Original Contractors Registration Certificate (CDMS), (ii) GST Registration Certificate, (iii) Original affidavit regarding authenticity of documents, (iv) No relation certificate, (v) PAN Card & (vi) Required EMD/Bid Security & Bid cost online (VII)All other required documents along with the technical bid** duly filled-in as per the relevant clauses of this DTCN & NIT and special conditions if any and **cover-II(Financial Bid).**During submission of Bids through the e-Procurement Portal, the bidder shall only submit single copy of the document. He is required to check the documents uploaded with the requirement asked for in the bid. Only after satisfying that all the documents have been uploaded, he should activate submit button. His bids shall not be considered responsive and action as per relevant clause shall be taken if he does not provide the required documents or provided illegible document. Clarity of the document may be ensured by taking out a sample printing.

10. The bidder can seek clarification on the bids as per mentioned date to the deadline for submission of bid from the authority inviting tender (AIT) and **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar Dist.-Ganjam .**The AIT's response will be forwarded through the e-mail ID of the enquirer.

11. Deleted

12. Deleted

13. An applicant or any of its constituent partners of whose contract for any work has been rescinded or who has abandoned any work in the last three years having the contracted work as in-complete prior to the date of the bid, shall be disqualified. The information to this effect and the authentication of tender documents should be furnished in Annexure- 'F' in absence of which will be summarily rejected.

14. **All charges towards quality control test will be borne by the contractor.**

15. The work is to be completed in all respect within **15(Fifteen) Calendar** months from the date of issue of work order.

16. All tenders received will remain valid for **90 days** from the date of opening of the Technical bid and validity of tenders can also be extended if agreed by the tenderer and the Department as per provision in Para – 25 (vi) in Appendix –IX of the OPWD Code, Volume-II.

17. Tenderer, whose Tender is going to be accepted must submit a programme of work to TIA before acceptance of Tender.

18. The date of commencement of the work shall be as notified in work order.

19. The Plans, specifications and scope for the work can be seen from the Govt. website during the sale and received period of tender.

20. The tenderers shall carefully study the tentative drawing and specification applicable to the contract and documents which will form as part of the agreement to be entered into by the accepted tenderers. The detailed standard specifications for Odisha and other said relevant specification and drawings are available for sale. Complain at a future date that plans and specifications have not been seen by the tenderers will not be entertained.

21. Every tenderer is expected before quoting his rates to inspect the site of the proposed work. He should also inspect the quarries and locality of the work and - satisfy himself about the quality and availability of materials including the medical aids, labour and food stuff etc. In every case the materials must comply with the relevant specifications.

The tenderer will be deemed to have Satisfied himself that the Rates quoted by him in the tender will be adequate to complete the work according to the specifications and conditions attached to and that he has taken in to account all conditions, difficulties that may be encountered during its progress and to have quoted labour rates and materials, octroi and other duties, excluding GST but including cess, royalty, DMF.EMF & Additional Charges lead, lifts, de-lifts loading and unloading and freight for materials and all other charges necessary for the completion of the work to the entire satisfaction of the Engineer-in-charge of the work and his authorized subordinates. Complaints at future date that the availability of materials, labour or any other factor have been misjudged cannot be entertained. It should be understood clearly that no claim whatsoever will be entertained after-wards on the plea of non-availability of proper quantity and quality of materials including food stuff or for any other.

22. Each tenderer must quote a definite percentage excess or less up to **two decimal** of the amount of work which will be included in the contract. Tenders containing indefinite terms such as estimated rates or schedules of rates will not be considered. During submission of Bids through the e- Procurement Portal, an intelligent Bill of Quantity in Microsoft Excel format shall be made available to the bidder. The bidder shall fill percentage excess or less of the tender amount and should not leave any cell blank. **The line item total in words and the total amount shall be calculated by the system and shall be visible to the bidder**.

23. Sample of materials such as cement, steel, sand, stone metal and chips etc. to be used, are to be collected and deposited quoting the name of quarry under dated initial of the tenderer and A.E.E in charge in the office of the **Superintending Engineer, Quality Assurance Division, Brahmapur,** before procurement for testing and acceptance. The conveyance along with all testing charges will be borne by the contractor.

24. All rates should be for finished items of work unless otherwise mentioned in the tender schedule.

25. During submission of Bids through the e-Procurement Portal, the bidder can submit the scanned copy of the documents in the designated locations of Technical Bid and Financial Bid. Submission of document shall be affected by using DSC of appropriate class and thus shall be in encrypted form.

26. –Deleted -.

27. The tender containing extraneous condition not covered by the tender call notice are liable for rejection and quotations should be strictly in accordance with the tender call notice, any change in the wording will not be accepted.

28. During submission of Bids through the e-Procurement Portal, it is allowed to modify the bid. The bidder shall have to log on to the system and resubmit the documents as asked for by the system including the price bid. In doing so, the bids already submitted by the bidder will be removed automatically from the system and the latest bid only will be admitted. But the bidder should avoid modification of bid at the last moment to avoid system failure or malfunction of internet or traffic jam. If the bidder fails to submit his modified bids within the designated time of receipt, the bids already in the system shall be taken for evaluation. During submission of Bids through the e-Procurement Portal, withdrawal of bid is allowed. The bidder has to click on the "withdraw" button and record the necessary justification for the same in the space provided. In addition to this, he has to write a letter addressed to the Officer inviting the bid and up load the scanned document to portal in respective bid. The system shall not allow any withdrawal after expiry of the closure time of the bid.

29. Items of work not covered by the tender notice shall be paid at the current schedule of rates of the state and those not covered by the said schedule rates will be paid, on actual analysis approved by the competent authorities.

30. On no account the contract work should be sublet to anybody without the prior approval of the competent authority of the Department. In such an event the contract may be rescinded with penalty as will be deemed proper as per decision of the competent authority.

31. Letters etc, raising and lowering the rates or dealing with any point in connection with the tender will not be considered.

32. Schedule of quantity accompanies tender notice: - It shall be definitely understood that the Government does not accept any responsibility for the correctness and completeness of this schedule and this schedule is liable for alternations or omissions, deductions or additions as set forth in the condition of contract and such omission, deductions additions or alternations shall in no way invalidate the contract and no extra monetary compensation will be entertained.

33. The authority reserves the right to make such increase or decrease in the quantity of items of works mentioned in the schedule attached to the tender notice as may be considered necessary for the satisfactory completion of the contract work. All such increase or decrease shall in no way invalidate the contract rates. The contractor shall not be entitled for any compensation on this account, except extension of time where considered necessary.

34. – Deleted - .

35. All taxes, fees, royalties' payable under the local rule including GST, Income taxes Octroi tax. Entry tax etc. will be borne by the contractor.

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36. Cess @ 1% will be deducted from the work bill of the contractor as per Resolution No. 12653 dtd.15.12.2008 of Govt. of Odisha, Labour& Employment Department.

37.The earnest money will be retained in the case of successful tender and will be dealt with as per the terms and conditions of the O.P.W.D code and will not carry any interest. The earnest money of the unsuccessful tender will be refunded after the tender is finally accepted.

38. The Department reserves the right of authority to reject any or all tenders received without assigning any reason whatsoever.

39. That for the purpose of jurisdiction in the event of any dispute if any the contract would be deemed to have been entered in to within the State of Odisha and it is agreed that neither party to the contract will be competent to bring a suit in regard to the matter by this contract at any place outside the state of Odisha.

40. The tenderer whose tender is selected for acceptance shall within a period of seven days upon intimation being given to him of acceptance of his tender and sign agreement in the P.W.D. **Form No. P1** for the fulfillment of the contract in the office of the **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist: Ganjam** or as directed. During submission of Bids through the e-Procurement Portal, the system shall generate the award of Contract letter and intimate the bidders in his e-mail. The security deposit and the amount withheld according to the provision of P1 agreement shall be retained as security for the due fulfillment of this contract. The written agreement to be entered in to between the contractor and the Govt. shall be the foundation of the rights of both the contractor and the Govt. and the contract shall be deemed to be in-complete until the agreement has first been signed by the contractor and then by the proper officer authorized to enter into the contract on behalf of the Govt. The security deposit will be refunded one year after completion of the work and payment of the final bill and will not carry any interest.

41. Under section 12 of contract labour (Regulation and Abolition Act. 1970) the contractor who undertakes execution of work through labour, should produce valid license from licensing authority of labour department (Labour license).

42. The contractor shall be liable to fully indemnify the department of any compensation under workmen compensation Act VIII of 1993 on account of the workmen employed by the contractor and full amount of compensation paid will be recovered from the contractor.

43. Tenderers are required to abide by the fair wages clause as introduced by Govt, of Odisha and will not pay less than the fair wages fixed by Govt, to the labourers engaged by him for the work.

44. In case of any complaint by the labourers working about the nonpayment of his wages as per latest minimum wages Act, the Superintending Engineer will have the right to investigate and if the contractor is found to be in default he may recover such amount from the contractor's dues and pay such amount to the labourer directly under intimation to the local labour officer to the govt. The decision of the Superintending Engineer is final and binding on the contractor.

45. The contractor will have to submit to the **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist.-Ganjam** monthly return of labourer both skilled and unskilled employed by him on the work.

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46. The contractor should keep himself in touch with the Engineer in charge for smooth execution of the work and arrange adequate labour depending on the workload and working space available. No claim for-detention for labour on any account will be entertained.

47. No compensation will be paid by the department for any damage done by rain, flood, cyclone, tide or by any other natural calamities during the execution of the work.

48. It should be understood clearly that no claim what-so-ever will be entertained in regard to extra. items of work or extra quantity of any item besides estimated amount, unless written order is obtained from the Engineer-in-charge and rates settled before the extra items of work or extra quantity of any item of work is taken up.

49. The tenderers shall have to abide by the C.P.W.D. safety code rules introduced by the Govt. of India, Ministry of works Housing and supply in their standing order no.44150 dt.25.1.1957. which can be seen in the office of the **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist:-Ganjam/ undersigned** on working day, during office hours.

50. The tenderers shall bear various incidentals sundries and contingencies necessitated by the work in full within the following or similar category.

(a) Rent, Royalties and other charges of materials, octroi duty, entry tax and all other taxes including GST, Cess, ferry tolls, conveyance charges and other cost on account of land and building & temporary electric connection to worksite, water charges as well as construction of coffer dam. construction of service road diversion road and its maintenance till completion of work required by the tenderer for collection of materials, storage, housing of staff or other purpose of the work. No tenderer will however be liable to pay for temporary occupation of land owned by Govt. at the site of the work.

(b) Labour camps or huts necessary to a suitable scale including conservancy and sanitary arrangements there in to the satisfaction of the local health authorities.

(c) Suitable water supply including pipe water supply wherever available for the staff and labour as well as for the work.

(d) Fees and duties levied by the municipal canal or water supply authorities.

(e) Suitable equipment and wearing apparatus for the labour engaged in risky operations and medical aid to the labourer engaged for the work.

(f) Suitable fencing. barriers, signals Including paraffin and electric signals where necessary at work and approaches in order to protect public and employees form accident.

(g) Compensation including cost of any suit for injury to persons or property due to neglect of any major precautions also become payable due to operation of the workmen compensation Act.

(h) The contractor has to arrange adequate lighting arrangement for the work wherever necessary at his own cost.

51. All preliminary works such as vats, mixing platforms etc. are to be done by the contractor at his own cost. No payment will be made for bench marks, level pillars, profiles, benching and leveling the ground where

require. The rates to be quoted should before finishing items of work inclusive of carriage of all materials and incidental items of works.

52. After the work is finished all surplus materials, & debris should be removed 100 mtrs clear away from the site of the work. Preliminary work such as vats, mixing platforms etc. should be dismantled and all materials removed from the site and premises left neat and clean and this should be inclusive of the rates,

53. If any further necessary information is required, **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist.- Ganjam,** will furnish such, but it must be clearly understood that the tender must be received in order and according to instruction.

54. The work will be commenced after land acquisition, forest & environment clearance, if required. In case of delay in acquisition of land, forest & environment clearance, no compensation will be admissible but extension of time will be allowed.

55. The department will have the right to supply at any time in the interest of the work any departmental material to be used in the work in addition to those mentioned in clauseNo-54 and the contractor shall use such materials at the stock issue rate fixed by the Department or market rate whichever is higher.

56. Over and above these conditions including the Technical specifications the terms, conditions, rules and regulations and specification laid down in Odisha standard specification code are also binding. on the part of the contractor.

57. During submission of bids though e-Procurement portal, the bidder shall upload the scanned copy/copies of documents as required vide clause No. 9 of NIT. The lowest successful bidder shall have to produce the original documents in support of scanned copies & statements up-loaded in the portal as specified in the NIT.

58.<u>No Relation Certificate</u>

The contractor shall have to furnish certificate along with the tender to the effect that he is not related to any officer in the rank to an Asst. Engineer and above in the state P. W.D., or Under. Secy. and above in the W.R. Department. **In the form specified in Section-6**. If the fact subsequently proved to be false the contract will be rescinded. The earnest money and the total security will be forfeited and shall be liable to make good the loss of damage resulting from such cancellation. The proforma for no relation certificate is contained in a separate sheet of D.T.C.N in **Form-'A'.**

59. The contractor shall sign as a token of final acceptance of the plans, sections and agreements for the work prior to take up the work for execution.

60. The contractor is to supply necessary labour and materials for the purpose of alignment laying whenever required at his own cost.

61. The contractor should arrange necessary tools and plants such as pumps, Road Rollers etc, required for the efficient -execution work at his own cost. The running charges of such plant and cost of consumables and conveyance are to be borne by the contractor.

62. In the event of delay in supply of design reasonable extension of time will be granted on the application of the contractor. But no claim for monetary compensation will be entertained under any circumstance.

63. Under no circumstance, Interest chargeable for the dues to any additional dues, if any payable for the work.

64. Conditional tenders will not be taken into consideration.

65. Deleted

66. Protection against flood: In case of flash and untimely floods in the river during the working season resulting in overtopping of coffer dam and flooding of the work area, the contractor shall make his own arrangement at his cost to shift the machineries, equipments, materials, labour and departmental machineries if hired by the contractor to a safe place. The work shall have to be resumed after resending of floods and necessary strengthening of coffer dam and dewatering will be done by the contractor at his cost. Extension of time for the completion of the work may be considered by the department if the discontinuance of the work is beyond the all reasonable attempts of the contractor to such eventualities. The debris and other materials accumulated in the working area during flash floods or regular floods and necessary strengthening of coffer dam and dewatering will be done by the contractor at his cost.

The debris, and other materials accumulated in the working area during flash floods or regular floods in the monsoon shall be removed by the contractor as required for continuing the work at his own cost. By any chance, if any excavated portion that could not be filled with concrete by the contractor, gets filled up during the monsoon period with earth such removal will not be paid for again. The contractor will have to re excavate the same at his own cost. It shall be distinctly understood that it is entirely the responsibility of the contractor to make such arrangements as may be required from time to time to protect the men, machinery, materials and the work under progress and work for which the measurements were recorded and payment made against damages either during working season or during the flood season. The flood includes the high tides, cyclonic effects and saline ingress which should be clearly understood by the contractor and no extra payment for the damage, re-excavation etc. shall be paid in any circumstance. The department accepts no liability what -so-ever for any damage or loss of men, materials, machinery and work of hindrance caused to the progress of work. The contractor should provide at his own cost adequate protection measures to the completed works at the end of working season or work in progress against the probable flood during monsoon till completion and handling over of the entire work.

67. Dewatering from the foundation for bridges, culverts, building worksites, all canal structures etc. and watering for consolidation in roads embankments when and where necessary during execution will have to be done by the contractor and no extra payment will be made on that account. The term dewatering shall mean the execution or operation of the items due to standing water as well as due to percolation water.

68. The required amount (As fixed by Govt.) of the gross amount of the bill be deducted from the contractor bill towards income tax & cess as amended from time to time.

69.(a) The rates quoted by the contractor should be inclusive of all taxes but exclusive of GST.

(b) Deduction of GST & other taxes at source shall be made as notified by Govt. of Odisha from time to time and no extra claim towards such deduction (GST& other taxes) shall be entertained.

(c) GST on works contract will be deducted from the bill @ as amended from time to time and credited to Govt. account.

70.(a) The contractors are required to pay the Royalty, DMF,EMF & Additional Charges to Govt. as fixed from time to time and produce such authenticated documents in support of their payment as royalty along with their bills. Failing which the amount of royalties of different materials as utilized by them in the work will be recovered from their bills.

(b)1% of the gross amount of bills shall be deducted from the contractor towards **cess or** as amended from time to time.

71.In pursuance to the Govt. of Odisha Works Dept. **Office Memorandum No. 173 dt: 03.01.2026**, Additional Performance Security shall be obtained from the bidder when the bid amount is less than the estimated cost put to tender. In such an event, Additional performance security shall be taken on an incremental basis from the selected bidder for low bid prices in the project works as under:

I. **Where the bid price is below 0% but not below 10% of the project cost put to bid**, no additional performance guarantee/security percentage is required.

II. **Where the bid price is below 10% but not below 20% of the project cost put to bid**, the additional performance guarantee/security percentage shall be incremented by 0.1% for every percentage of bid price below 10% of the project cost put to bid starting at 11% with the additional bid performance guarantee being 0.1% and this additional **performance guarantee percentage shall be applied on the bid price;**

III. **Where the bid price is 20% or more below of the project cost put to bid**, the additional performance guarantee percentage shall be incremented by 0.2% for every percentage of bid price below 20% of the project cost put to bid in addition to 1% of the bid price and this additional performance guarantee percentage shall be applied on the bid price;

IV. The additional performance guarantee percentage shall be rounded off to the next lower percentage based on whether the decimal point of the percentage of bid price is below 0.5% or next higher percentage based on whether the decimal point of the percentage of bid price is 0.5% or more.

V. The additional performance security shall be treated as part of the performance security.

VI. Justification for abnormally low bids shall be scrutinized by the Departmental Technical Committee and recommended to the competent authority of the Administrative Department for the approval of the Additional Performance Security (APS). An abnormally low bid is one in which the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the contract at the offered price. Procuring Entity may, in such cases, seek written clarifications from the Bidder, including detailed price analyses of its Bid price in relation to scope, schedule, resource mobilization, allocation of risks and responsibilities, and any other requirements of the bid document. If, after evaluating the price analyses, the procuring entity determines that the Bidder has substantially failed to demonstrate its capability to deliver the contract at the offered price, the Procuring Entity may reject the Bid/ Proposal. However, it would not be advisable to fix a normative percentage below the estimated cost, which would automatically be considered as an abnormally low bid.

CONTRACTOR **SUPERINTENDING ENGINEER**

The Additional Performance Security (APS) shall be furnished in shape of National Saving certificate / Post office savings Bank Account / Post Office Time Deposit Account / Kisan Vikas Patra /Bank Guarantee pledged in favour of **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar , Dist.-Ganjam** from any Nationalized / Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar/**e-Bank Guarantee executed on National e-Governance Services Limited (NeSL) Digital Document Execution Portal/ Insurance surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI) and such instruments shall be accepted towards Earnest Money Deposit (EMD), Initial Security Deposit(ISD)/ any other security deposit from the contractor or supplier** within 7 days of issue of letter of acceptance (LoA) by the Divisional Officer (By e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled and the Earnest Money Deposit/ Bid Security shall be forfeited. Further, proceeding for blacklisting shall be initiated against the bidder. If the APS is submitted in shape of Bank Guarantee by the bidder, then the validity of the Bank Guarantee should be for a minimum period equal to the period allowed for completion of the work.

72. Deleted

73. Providing facilities to the Engineer Contractor:
As per works Dept. No. FR11/2001/1 0003/00 BBSR 24.5.2001, **5% price preference** allowed to the **Engineer contractor** in the tender rates has been **withdrawn**.

74. On no account of the contracted work should be sublet to anybody without the prior approval of the tender accepting authority of the Department. In such an event the contract may be rescinded with penalty as will be deemed proper by the competent authority.

75. Miscellaneous:

(a) The department will have the right to inspect the scaffolding and centering made for the work and reject partly or fully such structures if found defective in their opinion.

(b) Shuttering and centering shall be made with seasoned sal wood planks the inside of which shall be lined with suitable sheeting and make leak proof and water tight or alternatively steel shuttering and centering may be used.

76. Tenderers are also required to go through each clause of P.W.D. Form P1 carefully in addition to the clause mentioned herein before tendering.

77. The contractor shall have to submit an affidavit **as in Annexure-E of Section-6** about authentication of tender documents, while submitting tender.(As per **Form-J**)

78. All the forms and Annexure and check list attached to section 2 of this DTCN may be filled in properly along with the authenticated documentary evidence if any required therein.

79.Bidders desirous to avail exemption / relaxation of E.M.D. as per prevailing rules should upload copies of necessary document and affidavit in support of their claim along with their bid.

Bidders registered as "Engineer Contractor" desirous to avail exemption of EMD for participating in the bid shall have to upload an affidavit mentioning the number of tendered works already awarded to

him/her without EMD during the current financial year. In case of non-submission of the above affidavit, his/her claim for availing the benefits of Engineer Contractor will not be considered. The successful Engineer Contractor has to produce the original Registration Certificate for recording the fact of availing exemption of E.M.D. for award of the work.

Bidders registered as S.C. & S.T. Contractor up to "B" Class desiring to avail concession(s)/ price preference as per prevailing rules should apply for the same in writing in shape of Affidavit and upload necessary document and affidavit in support of their claim along with their bid, failing which their case may not be considered for availing price preference as per the rule. No claim in this regard after opening of the bid will be entertained.

80. The Govt. of Odisha Works Dept. the following clarifications are issued on Works Department OM No.173 dtd. 03.01.2026 vide Office Memorandum No. 632 dt: 09.01.2026.

a. If more than one bid is quoted (decimal up to two numbers will be taken for all practical purposes), either at the estimated cost put to tender or less than the estimated cost put to tender, the tender accepting Authority will finalize the tender through a transparent lottery system, where all the concerned bidders/ their authorized representatives, the concerned SE/EE of the concerned Division and Divisional Accounts Officer (DAO) will remain present.

b. If the rate quoted by the SC and ST Category Contractors comes to the rate quoted by the L1 bidder (decimal up to two numbers will be taken for all practical purposes), after availing 10% price preference as per Para 2 of Works Department Resolution No. 27748 dated: 11.10.1977, the tender shall be finalized by the tender accepting authority through a transparent lottery system along with other categories of contractors.

81. The contractor will submit invoice towards payment of GST to appropriate authority and claim for reimbursement of the same separately, which will be dealt with as per prevailing rules.

82. All correspondence with the tenderer will be made through e-mail in the e-mail address given by the tenderer. The tenderer must mention in the tender, his correct e-mail address where letters can be delivered to him. The department will not held responsible for non-receipt of any letter/massage by the tenderer either for wrong e-mail address given by him or for his negligence in seeing e-mail.

83. The bidders are requested to mention their e-mail address, phone Number and Address for correspondence in the furnished Affidavit or in a separate sheet.

84. Registration in the Contractor Data Base Management System (CDMS) available in www.cdmsodisha.gov.in by all Contractors is mandatory (As per O.M. No. 12934/W dated 23.08.2018 of Works Department, Govt. of Odisha with insertion of provision in Para – 12.4 below Para -12 in Appendix – IX(A) of the OPWD Code, Volume-II. The tender will not be accepted or bid will be rejected if not registered under CDMS portal.

85. THE CONTRACTOR HAS TO MENTION PERCENTAGE EXCESS OR LESS OVER THE AMOUNT PUT TO TENDER.

86. The contractor will write percentage excess or less up to two decimal point only if he writes the percentage excess or less up to more than two decimal point, the two decimal point shall only be considered without rounding up.

87. A bidder can submit only one tender paper for a particular work, submission of more than one tender paper by a bidder for a particular tender will liable for rejection of all such tender papers as per Works Department Letter No.4985/W dt.28.03.2007.

88.The single tender received in the first call shall be cancelled without opening of the bid. The acceptance of a single tender received, even after retendering should have prior approval of the next

higher authority as per Works Department Memorandum No.16 dt.01.01.2015 and letter No.3570 dtd.08.02.2018 of DoWR Department, Odisha.

89. The bidders are requested to submit year wise break up of Satisfactory completion of similar major item of work required as per clause No.4 (B) of Information and Instructions to Tenderers vide Section 2 of this DTCN & details of work in hand in Form-I & Form-M (Section-6) of this DTCN i.e Technical Bid.

90. Joint Venture is not allowed for this contract.

91. The bidder shall have to upload the forms provided in Section-6 of the Bid Document duly filled and signed by him. The certificates from the concerned Superintending Engineer / Competent Officer In-charge of execution regarding the facts mentioned in the forms to be uploaded during submission of tender failing which his tender will be rejected.

Superintending Engineer
Bhanjanagar Irrigation Division,
Bhanjanagar

Additional Chief Engineer
Rushikulya Bahuda Basin,
Brahmapur

SECTION – 2

INFORMATION
AND
INSTRUCTION TO TENDERERS

SECTION-2

1. Preparation of Tender Documents

The intending tenderer shall submit tender documents duly filled in and signed, in on-line through Govt. web-site. The forms attached with the documents are to be filled in completely. All the information are called for should be furnished may be provided in the specified format annexed in **Section-6** to the bid document **failing which his bid will be rejected**. *No change to the forms will be accepted*. All pages including additional pages of the tender document must be signed at the bottom of the page by the contractor and **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist.-Ganjam.**

2. Method of submission of Tender Documents

2.1 The tender documents duly filled in and signed by the intending tenderer should be submitted in on-line through prescribed website only.

2.2 If the intending tenderer is an individual, the documents shall be signed by the individual above his full type written name and current address.

2.3 If the intending tender is a proprietary firm it shall be signed by the proprietor above his full name and with his current address.

2.4 If the intending tenderer is a firm in partnership it shall be signed by a partner holding the power of attorney for the firm in partnership in which case a certified copy of power of attorney shall accompany in the pre-qualification documents.

2.5 If the intending tenderer is a limited company or Corporation, it shall be signed by a duly authorized person holding the power of attorney in which case certified copy of power of attorney shall accompany.

2.6 All witness and sureties shall be of person of status and probity and their full names, occupation and address shall be stated below their signatures.

2.7 The agency will install display board mentioning information about the work at worksite after drawl of the agreement at his own cost.

3. **Opening of Tender Documents.**

The tender documents (Technical Bid) will be **opened on 28.09.2026 at 11.30A.M.** in the office of the **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Ganjam, Odisha** in the presence of tenderers or their authorized representative, who wish to be present.

4. **Eligibility Criteria for Bidders**

To eligible for award of the contract, each bidder shall satisfy the following criteria's.

. **A. BID CAPACITY**

Applicants will be qualified only if their available bid capacity at the time of bidding is more than the total estimated cost of the work. The available bid capacity will be calculated as under:

Assessed Available Bid Capacity =A x N x 2 - B, where

A = Maximum value of works executed in any one financial year during the last five years (updated to the current price level). The rate of inflation may be taken as 10% per year (escalation factor) which will take into account the completed as well as works in progress.

B = Value of current price level of the existing commitments and ongoing works to be completed during the next **15 months** (Period of completion of works for which bids are invited).

N =Number of years prescribed for completion of work for which the bid is invited.

Note (i):- In case a joint venture, if permissible as per DTCN, the available bid capacity will be applied for each partner to the extent of his proposed participation in the execution of the works. In case the extent of participation is not mentioned, the proposed participation in the execution of work shall be considered as equal for all the partners.

The statement showing the value of existing commitments & ongoing works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer-in -Charge not below the rank of Executive Engineer.

Note (ii):- The bidder should upload the authentic documents towards his Annual turnover i.e. value of 'A' (in all classes of Civil Engineering construction works only) for the last five years i.e. **2021-22 to 2025-26 (Certificate of authenticity is to be furnished from the appropriate authority).**

B) Satisfactory completion of similar major items of work:

The bidder should have executed minimum quantities of important & critical items of works as follows.

Executed in any one year (financial year) the following minimum quantities of work. (**The detailed correspondence address / Fax number/Mail Id of the authority issuing certificate shall be furnished.)**

(i) Earthwork in Excavation = 6844.00 Cum

(ii) Cement Concrete for Lining by Paver Finish = 1571.00 Cum

(iii) CNS for C.C Lining (Moorum and sand) = 3973.00 Cum

* (i) This is sum total of similar items in all the works executed **in one financial year**.

(ii) These items might have been executed in different years separately, in last 5 years including the FY of invitation of tender.

The bidder should submit the attested copy of certificate of authenticity in the enclosed bidding document from the concerned Superintending Engineer/Executive Engineer/ Competent Officer in-charge of execution regarding execution of major items of works during the last 5 years. **Last 5 years means:** 5 years prior to the financial year of invitation of tender and current financial year.

N.B- The bidder should obtain the certificates regarding physical achievement of quantities as per IIT 4(B) from the concerned Superintending Engineer / Competent Officer In-charge of execution. No further clarification will be obtained from the certificate issuing authority in this regard. Only authenticity of documents may be sought for in case of benefit of doubt.

C) Combined Evaluation :-

If the bid has been invited in a common tender call notice for a number of works, the order of opening of the bids shall be that in which they appear in the "Invitation of Bids". Further the bidders must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts for value above **Rs. 7.00 crores.**

D) Sub-Contractor's experience :-

Experience Certificates issued by the Executive Engineer/Superintending Engineer to State PSUs and experience certificates issued by State PSUs to their Sub-Contractors, shall be taken into consideration, while examining qualifying criteria. The experience certificate issued by the State PSUs must carry the counter signature of the concerned Engineer-In-charge not below the rank of Executive Engineer. In that case, both the original State PSU and the authorized Sub-contractor will be treated at par as prime contractor.

5.Final Decision-making authority

The competent authority reserves the right to accept or reject or disqualify any of the tender of pre-qualification without assigning any reasons and its decision shall be final.

6.Further Clarification

The **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist.-Ganjam/ Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Ganjam, Odisha** may be contacted during office hours on any working days for any further clarification. Online clarification may also be obtained as per the dateline mentioned in the NIT.

7.Sample of all material:

The Contractor shall supply sample of all materials fully before procurement for the work for testing and acceptance at his own cost as may be requiring by the concerned Superintending Engineer.

8. From the commencement of the works to the completion of the same, they are to be under the contractors charge. The contractor is to be held responsible to make good all injuries, damages and repairs occasioned or rendered necessary to the same by fire or other causes and they hold the Govt. of Odisha harmless for any claims for injuries to person or structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor or any one in his employment during the execution of the work. Also no claim shall be entertained for loss due to earth quake, flood, cyclone, epidemic, riot or any other calamity whether natural or incidental damages so caused will have to be made good by the contractor at his own cost.

9. Where it will be found necessary by the Department, the Officer-in-Charge of the work shall issue an order book to the contractor to be kept at the site of the work with pages serially numbered. Orders regarding the work whenever necessary are to be entered in his book by the PWD Officer-in-Charge with their dated signatures and duly noted by the contractor or his authorized agents with their dated signature. Orders entered in his book and noted by the contractor's agent shall be considered to have been duly given to the contractor for following the instructions of the Department. The order book shall be the property of the Department and shall not be removed from the site of work without written permission of the Engineer (Superintending Engineer) and to be submitted to the Engineer-in-Charge every month.

10. Guidelines/ instructions regarding calling for and acceptance of tenders in e-Procurement.

(As per Works Department Office Memorandum File No. 07556900042015(Pt-II)-7885/W, dtd.2307.2015)

1. This office memorandum consists of the procedural requirement of e-procurement and shall be made part of the Detailed Tender Call Notice or Instruction to Bidder for all "works" tenders hoisted in the portal.
2. The e-procurement portal of Government of Odisha is "https:// tendersodisha.gov.in".
3. Use of valid Digital Signature Certificate of appropriate class (class II or class III) issued from registered certifying authorities (CA) as stipulated by Controller of Certifying Authorities (CCA), Government of India such as n-Code, Sify, TCS, MTNL, e-Mudhra is mandatory for all users.
4. The DSC issued to the Department users is valid for the period of two years only. All the Department users are responsible to revalidate their DSC prior to expiry.
5. For all purpose, the server time displayed in the e-procurement portal shall be the time to be followed by all the users.
6. Government after careful consideration have decided to hoist all tenders costing 10 lakhs or above in the e-procurement portal. This will be applicable across all Engineering Departments such as Works Department, Department of Water Resources, Rural Development and Housing & Urban Development Department. Government of Odisha also welcomes hoisting of tenders by any other departments, authority, corporations, local bodies etc. of the State with prior approval from Works Department. Works Department is the Nodal Department for the implementation of e-procurement in the State.
7. The e-procurement shall be operated compliant to relevant provisions of OGFR/OPWD code / Accounts code / Government statues including any amendments brought from time to time to suit to the requirement of the best national practice.
8. Registration in the e-procurement portal is without levy of any charges but Government reserves the right to levy any charges for such value-added services in future.

9. Contractor not registered with Government of Odisha, can participate in the e-Procurement after necessary enrolment in the portal but have to subsequently register themselves with the appropriate registering authority of the State Government before award of the work as per prevalent registration norms of the State.

10. For the role management "Department" is the Administrative Department, Organization or wing is the Chief Engineer or highest tender accepting authority or equivalent officer, Division is the Executive Engineer or equivalent officer and Subdivision is the Assistance Engineer or equivalent officer.

11. The e-Procurement software assigns roles for operation of the module for specific function. The terminologies used in the portal and their respective functions in the software are as follows.

11.1 Application Administrator (NIC & State Procurement Cell)

i. Master Management
ii. Nodal Officer Creation
iii. Report Generation
iv. Transfer of Officer's login ID.
v. Blocking & unblocking of officer's and bidder's login ID.

11.2 Nodal Officer (At organization level not below the Superintending Engineer or equivalent rank)

i. Creation of Users
ii. Role Assignment
iii. Report Generation
iv. Transfer of Officer's login ID.
v. Blocking & unblocking of officer's Login ID

11.3 Procurement Officer-Publisher (Officer having tender inviting power at any level)

i. Publishing of Tender
ii. Publishing of Corrigendum / addendum / cancellation of Tender
iii. Bid Clarification
iv. Uploading of Pre-Bid minutes.
v. Report generation.

11.4 Procurement Officer-Administrator (Generally sub-ordinate officer to Officer Inviting Tender)

i. Creation of Tender
ii. Creation of Corrigendum / addendum / cancellation of Tender
iii. Report generation.

11.5 Procurement Officer Opener (Generally sub-ordinate officer to Officer Inviting Tender)

i. Opening of Bid

11.6 Procurement Officer Evaluator (Generally Sub-Ordinate Officer to Officer Inviting Tender)

i. Evaluating Bid

11.7 Procurement Officer-Auditor (Procurement Officer Publisher and / or Accounts Officer / Finance Officer)

i. To take up auditing

12. NOTICE INVITING BID (NIB) or INVITATION FOR BID (IFB) :

12.1 The Notice Inviting Bids (NIB) and Bid documents etc., shall be in the Standard formats as applicable to conventional Bids and will be finalized / approved by the officers competent as in the case of conventional Bids.

12.2 The officers competent to publish NIB in case of conventional Bids will host the NIB in portal. Simultaneously, a notification should also be published in the newspapers, as per existing rules preferably, in the following format, to effect economy:-

26.General Instructions to Contractors

1) Any Agency or Contractor executing a work should be aware about the local festivals like Makar Sankranti, Raja Sankrati, Chaitra Parba, Danda Nata or any such festivals which may affect the work schedule. Therefore, the Contractor should engage more work forces during working period available at his disposal to complete the work as per schedule.

2) In the peak summer season, working hour is curtailed by the Labour Department to avoid exposure to personnel to the scorching sun and heat. It is the duty of the agency to increase the number of workforce and to employ the existing workforce during morning and afternoon hours as per Government orders.

3) Rainfall is normal occurrence during monsoon in Odisha. So, unless there is unusually heavy rainfall resulting in a declared calamity, the Contractor is not eligible for any extension of time. The Contractor should plan the deployment of workforce and machinery, so as to complete the work as per schedule considering ordinary vagaries of the nature.

   The same applies for borrow areas ponding also. The Contractor should foresee possible ponding of borrow area in monsoon and likewise lift more quantity of soil/ other materials during dry period, so as to complete the work as per schedule.

4) The Contractor should take up the work with due diligence in the acquired land without waiting for acquisition of the entire land. This should be completed in proportionally less period depending on the quantum of available work front.

5) The Agency should plan his work programme and mobilize men and machineries considering the canal closure programme of a particular system or area. Khariff / Rabi closure can't be imposed arbitrarily on the farmers as per the convenience of the agency. Closure of canal for the interest

of work will be solely at the discretion of the Engineer-in-Charge and can't be claimed as a matter of right.

6) There will always be standing crop before harvesting season as per crop schedule and this fact has to be clearly understood by the agency. Extension of time on this ground may not be considered by Divisional Officers.

7) Only the day(s) of elections to the Local Bodies / Assembly / Parliament will be treated as a non-working days(s).

8) Imposition of penalty in **EOT / Deviation**
The basis of Imposition of penalty in **EOT / Deviation** will be as per guideline and Codal procedure.

CONTRACTOR **SUPERINTENDING ENGINEER**

SECTION – 3

GENERAL RULES & DIRECTIONS

ODISHA PUBLIC WORKS DEPARTMENT
(FORM P-1)
PERCENTAGE RATETENDER AND CONTRACT FOR WORKS
GENERAL RULES & DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS

1. The work proposed for execution by contract will be notified in a form of invitation to tender pasted through the Govt. web-site **www.tendersodisha.gov.in**

This notice will state the work to be carried out, the items and approximate quantities thereof as well as the date for submitting and opening tenders also the amount of earnest money to be deposited and the amount of the security deposit by the successful tenderer and the percentage if any to be deducted from bills. Copies of the specifications, designs and drawings and any other documents required in connection with the submission of tender signed for the purpose of identification by the Sub-divisional Officer/Superintending Engineer shall also be open for inspection by the contractor at the office of the Sub-Divisional Officer/Superintending Engineer during office hours.

2. In the event of the tender being submitted by a firm it must be signed separately by each member thereof, or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so.

3. Receipts for payment made on accounts of works, when executed by a firm must also be signed by the several partners, except where the contractors are described in their tender as a firm in which case the receipts must be signed in the name of the firm by one of the partners, or by some other person having authority to give effectual receipts for the firm.

4. The memorandum of work tendered for and the memorandum of materials to be supplied by the Public Works Departments and their issue rates shall be filled in and completed in the office of the Sub-Divisional Officer/Superintending Engineer before the tender from is issued if a from is issued to an intending tender without having been so filled in and completed, he shall requested the office to have this done before he completes and delivers his tender.

5. The amount of earnest money to be deposited will be 1% of the estimated cost.

6. Any person who submits a tender shall fill up the usual printed form stating at what rate he willing to undertake each item of the work. Incomplete tender and tender rate he willing to undertake each item of the work specified in the said form of invitation to tender or which the contain any other conditions of any sort, or omit to note the time within which the work can be finished or which are not accompanied for the required earnest money will be liable to rejection. No single tender shall include more than one work but contractors who wish to tender for two or more work shall submit a separate tender for each tender. Tender shall bear the name of the work two which they refer written outside the envelope.

7. The Engineer or his duly authorized assistant will open the tenders in the presence of any intending contractors who may be present at the time and will enter the amounts of the several tenders in a comparative statement in a suitable form.

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8. The Engineer shall have the right of rejecting all or any of the tenders.

9. In the event of a tender being selected for acceptance the Engineer who opened the tenders will, if he is competent to accept the tender, inform the tenderer of the selected tender who shall there upon sign copies of the specification and other documents with the tender. The tenders to the selected tender shall also deposited the required amount of the security money within the prescribed time. If the tenderer fails to deposit the required amount of the security money within the prescribed time the Engineer may reject the tender.

If the Engineer is not competent to accept the tender himself, he will inform the tenderer of the tender which he decides to recommended for acceptance, such tender shall thereupon sign forthwith copies of the specification and other documents mentioned in rules 1 and 4 and shall deposit the required amount of the security money within the prescribed time. The tender with the specification and other documents signed by the tenderer will then be forwarded for acceptance to the Engineer who is competent to accept the same. If the said Engineer rejects the tender the security money deposited shall be refunded to the tenderer.

10. When a tender is selected for acceptance, the tenderer shall deposit the required amount of the security money in cash in any treasury and shall forward the Challan to the Superintending Engineer. Government securities may be endorsed to the Superintending Engineer in lieu of cash deposit of the required amount of the security money No tender shall be finally accepted until the required amount of the security money has been deposited.

11. The amount of security money to be deposited by the tenderer whose tender is selected for acceptance shall be **2%** of the estimated value of the work and towards this amount the earnest money already deposited by him shall be credited. At least half of this security inclusive of the earnest money shall be deposited the tenderer within such time as may be notified to him in writing by the officer opening the tender, failing which tender shall be liable to rejection. Any balance of the security money outstanding after completion of the contract with the tenderer may be made up by deduction of **5%** of the amount of each payment to be made to him under clause 6 & 7 of the condition of contract for work done under the contract. Taxes as per provisions of Government shall be deducted from the bills of tenderer.

12. When tender has been selected for acceptance and the required amount of the security money has been deposited the Engineer shall scrutinize a pages of the form of item, Rate Tendered and Contract for works to see that the form has been properly filled up and signed by the contractor and the signature witnessed. He shall then, if he is competent to accept the tender, sign the acceptance of the tenders or if he is not so competent to, shall send the form for signature of the acceptance to the officer competent to accept it.

13. **All tenderers are required to submit a list of works, which are in hand in Form-I & Form-M (Section-6) of this DTCN at the time of submitting their tenders. The list of works is required to be submitted in the proforma by the Superintending Engineer under whom he has executed the work in order to judge their past performance .**

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14. Deleted

15. T.D.S (Tax Deducted at Source) towards GST will be deducted at the rate prescribed as per rule.

16. Deleted

CONTRACTOR **SUPERINTENDING ENGINEER**

TENDER FOR WORKS

I / We hereby tender for the execution for the Government of Odisha for the work specified in the underwritten memorandum at the rates specified therein a period of **15(Fifteen)calendar months** from the date of written order to commence and in accordance in all respects with the specifications designs and other documents referred to in rule. I here of and subject to the annexed conditions of contract and with such materials as are provided for by and in all other respects in accordance with such condition so far as applicable.

MEMORANDUM

(a) If several sub-works are included they should be detailed in a separate list	a.	Name of work:	**Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project.**
	b.	Amount put to tender:	**Rs. 8,19,32,867/-**
	c.	Agreement Amount:	
	d.	Earnest Money Deposit :	**Rs. 8,19,400/-**
(e) This deposit will be 2 % of the Agreement	e.	Initial Security Deposit (including earnest money to be deposited before the commencement of the work)	
percentage deduction from bills be credited to the contractor's security	f.	Percentage to be deducted from bill (As Security Deposit) :	**5%**
	g.	Time required for the work from date of written order to commence :	
	h.	Date of written order to commence work :	
	i.	Actual date of commencement :	
	j	Stipulated date of completion:	
	k.	Number of items of works tendered for :	
	l.	Income Tax :	
	m.	GST :	
	n.	Royalty, DMF.EMF & Additional Charges of construction materials :	
	o.	Building and other construction Workers Welfare Cess :	

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Signature of contractor before submission of tender.

Should this tender be accepted, I/We hereby agree to abide by and fulfill all the terms and provisions of the said conditions of contract annexed here to so far as applicable or in default thereof to forfeit and pay to the Governor of Odisha or his successors in office the sum of money mentioned in said conditions.

Dated the ..... day of .....20 .....

Signature of the Witness to tender Signature

Signature of Contractor

Address

Address

Signature of officer by whom accepted.

The above tender is hereby accepted by me on behalf of the Government of Odisha.

Dated..... day of .....20 .....

Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar, Ganjam

Agreement No ..... P1/..... Certified that this agreement contains .....pages only.

Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar, Ganjam

SECTION – 4

CONDITION OF CONTRACT

CONTRACTOR SUPERINTENDING ENGINEER

CONDITION OF CONTRACT

Clause 1- All compensation or other sum of money payable by the contractor to Government under the terms of his contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due or may become due to the contractor by Government on any account what so ever and in the event of his security deposit being reduced by reason of any such deduction or sale as aforesaid, the contractor shall within ten days thereafter make good in cash or Government securities endorsed as aforesaid any sum or sums which may have been deducted from or raised by, sale of the security deposit or any part thereof.

Compensation for delay

Clause 2 (a) The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor and shall be reckoned from the date on which the written order to commence work is given to the contractor, The work shall throughout the stipulated period of the contract be carried on with all due diligence (time being deemed to be of the essence of the contract on the part of the contractor) and the contractor shall pay as compensation an amount equal to ½ % on the amount of the estimated cost if the whole work as shown by the tender for every day that the work remains uncommenced, or unfinished after the proper dates (The work should not be considered finished until such date as the Superintending Engineer shall certify as the date on which the work is finished after necessary rectification of defects as pointed out by the Superintending Engineer, or his authorized agents are fully complied with by the contractor to the Superintending Engineer's satisfaction). And further to ensure good progress during execution of the work the contractor shall be bound, in all cases in which the time allowed for any work exceeds one month, to complete one fourth of the whole work before one fourth of the whole time allowed under contract has elapsed one half of the work, before one half of such time has elapsed and three-fourth of the work before three-fourth of such time has elapsed. In the events of the contractor failing to comply with the condition, he shall be liable to pay as compensation an amount equal to one third percent on the said estimated cost of the whole work for every day that the due quantity of work remains incomplete, provided always that the entire amount of compensation to be paid under the provision of this clause shall not exceed 10% on estimated cost of the work as shown in the tender.

The work should not be considered finished until such date as the S.E. shall certify as the date on which the work is finished after necessary rectification of defects as pointed out by S.E. or his authorized agents are fully complied with by the contractor to the S.Es satisfaction.

(b) If there are possibilities of exceeding this compensation amount as mentioned in clause (a) 10% of the estimated cost or in any case in which under any clause or clauses of this contract the contractor shall have tendered himself liable to pay compensation amounting to the whole of his security deposit in the hands of Govt. (whether paid in one sum or deducted by installments) the Superintending Engineer on behalf of the Governor of Odisha, shall have power to adopt any of the following courses as he may deem best suited to the interest of Government.

Action when whole security deposit is forfeited

(i) To rescind the contract (of which rescission notice in writing to the contractor under the hand of the Superintending Engineer shall be conclusive evidence) 20% of the value of left-over work will be realized from the contractor as penalty.

In the event of any of the above courses being adopted by the Superintending Engineer the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials, or entered into any engagements or made any advances on account of or with a view to, the execution of the work or the performance

of the contract. And in case the contract shall be rescinded under the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereto for actually performed under this contract, unless and until the Superintending Engineer shall have certified in writing the performance of such work and the value payable in-respect thereof and he shall only be entitled to be paid the value so certified.

Amendment to clause 2(b) of item rate F2 Agreement vide Works Department order no.10639 dt. 27.05.2005

(ii) Security deposit of contractor for each work will be refunded only **twelve month** after the date of completion of work provided the final bill has been paid and defects if any rectified.

Clause-3 In any case in which any of the powers, conferred upon the Superintending Engineer by clause 3 thereof, shall become exercisable and the same shall not be exercised the non exercise thereof shall not constitute a waiver of the conditions here of and such powers shall not withstanding be exercisable in the event of any clause or clauses thereof he is declared liable to pay compensation amounting to the whole of his security

Contractor remain liable to pay compensation if action not taken under clause-5

deposit, and the liability of the contractor for past and future compensation shall remain unaffected in the event of the Superintending Engineer putting in force the powers vested in him under the preceding clause he may if he so desire, take possession of all or any tools, plants, materials & stores, in or upon the works or the site thereof or belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof paying or all wing for the same in the account at the contract, rates, or in case of these not being applicable ; at current

market rates to be certified by the Superintending Engineer whose certificate thereof shall be final; otherwise the Superintending Engineer may give notice in writing to the contractor or his clerk of the works, foreman or other authorized agent required him to remove such tools, plants, materials or stores from the premises (within a time to be specified in such notice) and in the event of the contractor failing to comply with any requisition to the Superintending Engineer may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificate of the Superintending Engineer as to the expense of removal and the amount of proceeds and expense of any such sale shall be final and conclusive against the contractor.

Power to take possession of or require removal of or sell contractor plants

Clause – 4 If the contractor shall desire on extension of time for completion of the work, on the ground of his having been unavoidable hindrances in its execution or any other ground he shall apply in writing to the Superintending Engineer within 30 days of the date of the hindrance on account of which he desires such extension as aforesaid and the Superintending Engineer shall, if in his opinion (which shall be final) reasonable be shown therefore, authorize such extension of time if any, as may in his opinion, be necessary or proper. The Superintending Engineer shall at the same time inform the contractor whether he claims compensation for delay.

Extension of time

Clause – 5 On completion of the work, the contractor shall be furnished with a certificate by the Superintending Engineer (here-in-after called the Engineer-in-charge) of such completion, but no such certificate be given, nor shall the work be considered to be complete until the contractor shall have removed from the area of premises (to be distinctly marked by the Superintending Engineer in the site plan) on which the work shall be executed, all scaffolding surplus materials and rubbish and cleaned off the dirt from all wood work doors, windows, walls, floors or other parts of any building in upon or about which the work is to be executed,

Final Certificate

or of which he may have had possession for the purpose of the execution thereof nor until the work shall have been measured by the officer of the PWD in accordance with the rules of the department whose measurements shall be binding and conclusive against the contractor the contractor shall fail to comply with the requirements of this clause as removal of scaffolding surplus materials and rubbish and cleaning of dirt on or before the date fixed for the completion of the work the Engineer-in-charge may at the expenses of the contractor, remove such scaffolding surplus materials and rubbish and dispose of the same as he thinks fit and clean off such dirts as aforesaid and the contractor shall forth with pay the amount of all expenses incurred and shall have no claim in respect of any such scaffolding, or surplus materials as aforesaid except for any sum actually realized by the sale thereof

Sub clause – 5 "If in the opinion of the Engineer-in-charge which shall be final and binding on the contractor occupation or utilization of a portion of the work completed in no way interferers with the progress for rest of the work, the same may be occupied or utilized by or on behalf of the Govt. under the written order of the Engineer-in-charge to get the defects of any rectified by the contractor at his (Contractor) own cost within six months from the date of completion of the whole work provided that the contractor will not be allowed any other concession either in the shape of extensions of stipulated period or any other monetary compensation on account of such occupation or use.

Clause – 6 A bill shall be submitted by the contractor each month on or before the date fixed by the Engineer-in-charge for all works executed in the previous month, and the Engineer-in-charge or his subordinate shall take the requisite measurement for the purpose of having the same verified and the claim as far as admissible' adjusted if possible before the expiry of ten day from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer-in-charge or his subordinate shall measure up the said work in the presence of the contractor whose countersignature to the measurement list will be sufficient warrant and the Engineer-in-charge or his subordinate shall prepare a bill from such list which shall be binding on the contractor in all respects.

Payment on intermediate certificate be regarded as advance & bill to be submitted monthly

Provided that, if any balance of the 7% security is outstanding from each such payment shall be deducted so much, not exceeding 5% as may be necessary to make up the balance of the security. All such intermediate payments shall be regarded as payment by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskillful work to be removed and taken away and requiring or re-erected, or be considered as an admission of the due performance of the contract, or any part thereof in any respect, or the actual of any claim nor shall it conclude, determine or effect in any way the powers of the Engineer-in-charge under these conditions or any of them as the final settlement or adjustment of the accounts or otherwise, or in any other way vary or effect the contract.

Clause – 7 The final bill shall be prepared by the offices of the P.W.D. in accordance with the rules of department in the presence of the contractor within one month of the date fixed for completion of the work.

Clause – 8 **Deleted.**

Clause - 8(a) "If a contractor removes any materials or stock so supplied to him from the site of the work in contravention of the provision of this clause with a view to dispose of the same dishonestly, he shall in addition to any other liability, civil or criminal, arising out of this contract be liable to pay a penalty equivalent to five times the price of the said materials or stock according to the stipulated rate. The penalty so imposed shall be recoverable from any sum, that may be then, or at any time there after may become due to the contractor; or from his security deposit, or the proceeds of sale thereof".

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Clause - 8 (b) Owing to difficulty in obtaining certain materials in the open market the Government have undertaken to supply materials specified in the schedule here to annexed. There may be delay in obtaining materials by the Department and the contractor is therefore required to keep himself in touch with day position regarding the supply of materials from the Engineer-in-charge and to so adjust the progress of the work that their labour may not remain idle nor may there be any other claim due to or arising from delay in obtaining the materials. It should be clearly understood that no monetary claim whatsoever shall be entertained by the Government on account of delay in supplying materials. However extension of time for the completion of work can be granted on timely application by the contractor vide clause 4.

Clause - 9 The contractor shall execute the whole and every part of the work in the most substantial and workman like manner and both as regards materials and otherwise in every respect in strict accordance with the specification. The contractor shall also confirm exactly fully and faithful to the design, drawings & instructions in writing relating to the work signed by the Engineer-in-charge and lodged in his office and to which the contractor shall be entitled to have access at such office for the purpose of inspection during office hours and the contractor shall, if he so require be entitle at his own expense to make or cause to make copies of the specifications and of all such designs, drawings and instructions as aforesaid.

Works to be executed in accordance with specification drawing & orders etc.

Sub clause – 9 The work should be done strictly in accordance with the relevant specifications of the I.S.I. Codes. If the work is not covered by the specification of I.S.I. it should be done in accordance with the provision in the Odisha Detailed Standard Specifications (O.D.S.S). In case, the work is not covered by O.D.S.S. the work should be executed as per the instruction of the Engineer-in-charge.

Clause – 10 The Engineer-in-charge shall have power to make any alterations in or additions to the original specifications, drawing, designs and instruction that may appear to him to be necessary advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instruction which may be given to him in writing signed by the Engineer-in-charge and such alteration shall not invalidate the contract and at 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 respect on which he agreed to do the main work, and at the same time rates as are specified in the tender for the main work., The time for the completion of the work shall be extended in the proportion that the additional work includes bears to the original contract work and the certificate of the Engineer-in-charge shall be conclusive as to such proportions. And if the additional work includes any class of work for which on rate is specified in this contract then such class of work shall be carried out at the on rates specified on this contract than such class of work shall be carried out at the rates entered in the sanctioned schedule by rates of the locality during the period when the work being carried on and if such the district then the contractor shall within seven days of the date of his receipt of the order to carry out the work inform the Engineer-in-charge of the rate which is it his intention to charge for such class of work, and if the Engineer-in-charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order to carry out such class or work and arrange to carry it out in such manner as he may consider advisable.

Alteration in specification and designs

Extension of time in consequence of alterations

Do not invalidate contract

No deviations from the specification stipulated in the contract or additional items of work shall ordinarily be carried out by contractor nor shall any altered. Additional or substituted work to be carried out by him unless the rates on the substituted altered of additional items have been approved and fixed in writing by the Engineer-in-charge.

Rates of works not in estimate of schedule or rate of the district.

The contractor shall be bound to submit his claim for any additional work done during any month on or before the 5th days of the following month accompanied by copy of the order in writing of the Engineer-in-charge for the additional work and that the contractor shall not be

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entitled to any payment in respect of such additional work if he fails to submit his claim within the aforesaid period.

Provided always that if the contractor shall commence work incur any expenditure in regards thereof before the rates shall have been determined as lastly herein before mentioned, then and in such case he shall only be paid in respect of the work carried out or expenditure incurred by him prior to the determination of the rates as aforesaid according to such rates as shall be fixed by the Engineer-in-charge. In the event of dispute the decision of the Superintending Engineer of the circle will be final.

Clause – 11 If at any time after the commencement of the work the Government of Odisha shall for any reason whatsoever not require the whole thereof as specified in the tender to be carried out the Engineer-in-charge shall give notice in writing of the fact to contractor who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage, which he might have derived from the execution of the work in full but which he did not derive in consequence of the full amount of the work not having been carried out, neither shall he have any claim for compensation by reason of any alternations having been made in the original specification, drawing, designs and instruction which shall involve any curtailment of the work as originally contemplated.

No compensation for alteration in or restriction of work to be carried out.

Clause – 12 If it shall appear to the Engineer-in-charge or his subordinate in charge of the work that any work has been executed with unsound, imperfect or unskillful workmanship or with materials of any inferior description, or that any materials or articles provided by him for or execution of the work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the contract. The contractor shall on demand in writing from the Engineer-in-charge specifying the work materials or articles complained of notwithstanding that the same may have been inadvertently passed, certified and paid forth with rectify or remove and reconstruct the work so specified in whole or part, as the case may require or as the case may be remove the materials or articles so specified and provided other proper and suitable materials or articles at his own proper charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in his demand aforesaid then the contractor shall be liable to pay compensation at the rate of one percent on the amount of the estimate for every day not exceeding the days his failure to do shall continue and in the case of any such failure the Engineer-in-charge may rectify or remove and re-execute the work or remove and replace with other the materials or articles complained of as the case may be at the risk and the expense in all respects of the contractor.

Action and compensations payable in case of inferior / unsound work.

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Clause – 13 All work under or in course of execution or executed in pursuance of the contract shall at all times be open to the inspections and supervision of the Engineer-in-charge and his subordinates and the contractor shall at all times during the usual working hours, and at all other times at which reasonable notice of intention of Engineer-in-charge his subordinates to visit the works shall have been given to the contractor either himself be presented to receive orders and instructions, or have a responsible agent duly accredited in writing present for that purpose, Orders given to the contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.

Works to be open to inspection

Contractor or responsible agents to be present

Clause – 14 The contractor shall give not less than five day's notice in writing to the Engineer-in-charge or his subordinate in-charge of the work before covering up or otherwise placing beyond the reach of measurement of any work in order that the same may be measured and correct dimensions thereof be taken before the same is so covered up

Notice to be given before work is covered up

or placed beyond the reach of measurement and shall not cover up or placed beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in charge of work and if any work shall be cover up or placed beyond the reach of measurement without such notice having been given or consent obtained, the same shall be uncovered at the contractor's expense, or in default thereof no payments or allowance shall be made for such work or the materials with which the same was executed.

Contractor liable for damage done and for imperfections for 6 months after certificate

Clause – 15 If the contractor or his work people or servants shall break, deface, injure or destroy any part of a building, in which they may be working or any building, road, enclosure or grass land, or cultivated ground continuous to the premises on the premises on which work or any part of it being executed, or if any damage shall happen to the work while in progress from any cause whatever or any imperfection become apparent in it within six Months from the date of final certificate of its completion shall have been given by the Engineer-in-charge, as aforesaid the contractor shall make the same good at his own expense, or in default the Engineer-in-charge may cause the same to be made good by other workmen, and deduct the expense(of which the certificate of the Engineer-in-charge shall be final) from any sums that may be then or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof and the contractor shall be liable to pay any part of the expenses not so recovered by the Engineer-in-charge.

Clause – 16 The contractor shall supply at his own cost all materials (except such special materials if any as may in accordance with the contract be supplied from the Engineer-in-charge's stores) plant, tools, appliances, implements, ladders, cordage, tackle scaffolding and temporary works requisite or proper for the proper execution of the work whether original altered or substituted and whether included in the specification or other documents forming Part of the contract or referred to in these conditions or not or which may be necessary for the purpose of satisfying or complying with the requirement of the Engineer-in-charge as to any matter as to which under this conditions he is entitled to be satisfied which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out work and counting, weighing and assisting in the measurement of examination at any time and from time to time the work or materials, failing him so doing the same may be provided by the Engineer-in-charge at the expenses of the contractor and the expenses may be deducted from any money due to the contractor under the contract or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof. The contractor shall also provide all necessary fencing and lights required to protect the public from accident and shall be bound to bear the expenses of defense to every suit, action or other proceeding at law that may be brought by any persons for injury sustained owing to the above precautions, and to pay any damages and cost which may be awarded in any such suit action or proceeding to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.

Clause – 17 No Female labour shall be employed within the limits of a cantonment. The contractor shall not employ for the purpose of this contract any labour below the age of legal employment as per Government norm, and shall pay to each labour; for the work done by such labour, wages not less than the wage paid for similar work in the neighborhood.

Explanation : Fair wages means wages whether for time or piece work prescribed by State P.W.D. provided that where higher rates have been prescribed under the minimum wages Act 1948 wages at such higher rates would constitute "Fair wages" [W/D No.22059 dated 16.8.77.

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The Superintending Engineer shall have the right to enquire into and decide any complaints alleging that the wages paid by the contractor to any labourer for the work done by such labourer is less than the wages paid for similar work in the neighborhood.

The officer in charge of the work shall have the right to decide whether labourer employed by the contractor is below the age of legal employment as per Government norm and to refuse to allow any labourer whom he decides to be below that age.

Clause – 17 (a) The contractor shall, if so required by the Engineer-in-charge employ one more Engineering Graduate or Diploma holder as apprentices at his own cost if the cost of work as shown in the tender exceeds Rs.2,50,000/- The apprentices will be selected by the Chief Engineer. The period of employment will commence within one month after the date of work order and would last till the date when 90% of work is completed. The stipend to be paid to the apprentices, should not be less than Rs.200/- per day in case of graduate Engineers and not less than Rs.150/- per day in case of Diploma holders. The number of apprentices to be employed should be fixed by the Chief Engineer in a manner so that total expenditure does not exceed 1% of the tender cost of the work.

Clause – 17 (b) Special class Contractor shall employ under him one Graduate Engineer and Two Diploma Holders belonging to the State of Odisha. Likewise, 'A' class contractor shall employ under him one Graduate Engineer or Two Diploma holders under the contractor shall be full time & continuous and they should not be superannuated, retired, dismissed or removed personnel from any State Govt. or Central Govt. service/public Sector undertakings, private companies and firms or be ineligible for appointment to Government service. The contractor shall pay them monthly emoluments which shall not be less than the emoluments of the personnel of equivalent qualification employed under the State Government of Odisha. The Chief Engineer, Roads Odisha may however, assist the contractor with names of such unemployed Graduate Engineer and Diploma holders if such help is sought for by the contractor. The names of such Engineering personnel appointed by the contractor should be intimated to the tender receiving authority along with the tender.

Employment of Graduate Engineers & Diploma Holders

Each bill of the Special Class or 'A' class contractor shall be accompanied by an employment Roll of the Engineering personnel together with a certificate of the Graduate Engineer or Diploma holder is employed by the contractor to the effect that the work executed as per the bill has been supervised by him.

Each bill of the Special Class or 'A' class contractor shall be accompanied by an employment Roll of the Engineering personnel together with a certificate of the Graduate Engineer or Diploma holder is employed by the contractor to the effect that the work executed as per the bill has been supervised by him.

Clause – 18 The contract shall not be assigned or sublet without the written approval of the Engineer-in-charge and if the contractor shall assign or sublet his contract or attempt so to do, or become insolvent or commence any insolvency proceedings or make any composition with

Work not to be subleted.

his creditor or attempt so to do, or if any bride gratuity, gift loan, perquisite reward or advantage pecuniary otherwise shall either directly or indirectly be given, promised or offered by the contractor or any of his servants to agents to any public officer or person in the employee of Government in any way relating to his office of employment or if any such officer or person shall become in any way directly or indirectly in the contract, the Superintending Engineer may thereupon by notice in writing rescind the contract and the security deposit of the contractor shall there upon stand forfeited and be absolutely at disposal of Government and the same consequences shall ensure as if

Contractor may be rescinded and security deposit forfeited subletting bribing or if contractor become in solvent

the contract had been rescinded under clause 3 hereof and in addition the contractor, shall not be entitled to recover or be paid for any work therefore actually performed under the contract.

Clause – 19 All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of Government without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

Sum payable by way of compensation to be considered as reasonable compensation without reference to actual loss

Clause – 20 In the case of a tender by partners any changes in the constitution of the firm shall be forthwith notified by the contractor to the Engineer-in-charge for his information.

In case of failure to notify the change in the constitution within fifteen days the Engineer-in-charge may be noticed in writing rescind the contract and the security deposit of the contractor shall there upon stand forfeited and be absolutely at the deposal of Government and the same consequences shall ensure as if the contract had been rescind under clause 3 hereof and in addition the contractor shall not be entitled to recover or be paid for any works therefore actually performed under the contract.

Changes in constitution of firm

Clause – 21 All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects by Superintending Engineer of the circle for the time being who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

Clause – 22 DELETED

Clause – 23 When the estimate on which a tender is made includes lump sums in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-charge capable of measurement, the Engineer-in- charge may by his discretion pay the lump sum amounts entered in the estimate, and the certificate in writing of the Engineer-in-charge shall be final and conclusive against the contractor with regard to any sums payable to him under the provisions of this clause.

Lump sums in estimates

Clause – 24 In the case of any class of work for which there is no such specification as is mentioned in rule, such work shall be carried out in accordance with the circle specification and in the event of there being no circle specification, then in such case the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-charge.

Action where no specification

Clause – 25 The expression 'work' or 'works' where used in these conditions shall unless there be something either in the subject or context repugnant to such construction be construed & taken to mean the works by or by virtue of contract to be executed whether temporary or permanent, and whether original altered, substituted, or additional.

Definition of works

Clause – 26 Government shall be entitled to recover in full from the contractor any amount that the Government may be liable to pay under workmen compensation Act. VIII of 1923, to any workmen employed in course of execution of any part of the work covered by this contract.

Clause – 27 That for the purpose of jurisdiction in the event of dispute if any, the contract should be deemed to have been entered into within the State of Odisha and it is agreed that neither party to the contract or agreement will be competent to bring a suit in regard to the matters covered by this contract at any place outside the State of Odisha.

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Clause – 28 The Department will have the right to inspect the scaffolding and centering made for the work and can reject partly or fully such structure if found defective in their opinion.

Clause – 29 Sanitary arrangements will be made by the contractor at his own cost for his labour camp.

Clause – 30 The contractor shall bear all taxes including sales tax, income tax, royalty, DMF, EMF & Additional Charges, fair weather charges and tollage, where necessary.

Clause-31 : -Price Adjustment

ANNEXURE-A

31.1: 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 following Paras.

(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 following Paras

(c) Following expressions and meanings are assigned to the work done during each month:

R= Total value of work done during the month. It would include the amount of secured advance granted, if any, during the month, less the amount of secured advance recovered, if any during the month. It will exclude value for works executed for extra items under variations.

31.2: 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 clauses in the contract, the unit rates and prices included in the contract shall be deemed to include amounts to cover the contingency of such other rise or fall in costs

The formula (e) for adjustment of prices are:

31(a)(i): **Adjustment of Other Materials Component**

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

Vm= 0.85 x Pm/100 x R x (M1-M0)/M0

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

M0= The all India wholesale price index (all commodities) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

M1= The all India wholesale price index (all commodities) for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

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

31(a)(ii): Adjustment for Cement Component

Price adjustment for increase or decrease in the cost of cement procured by the contractor shall be paid in accordance with the following formula.

Vc= 0.85 x Pc/100 x R x (C1-C0)/C0

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

C0= The all India wholesale price index for Ordinary Portland Cement (OPC) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and industry, Government of India, New Delhi.

C1= The all India wholesale price index for Ordinary Portland Cement (OPC) For the month under consideration as published by the Ministry of Commerce and industry, Government of India, New Delhi.

Pc= Percentage of Cement component of the work.

31(a)(iii): 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.

Vs= 0.85 x Ps/100 x R x (S1-S0)/S0

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

S0= The all India wholesale price index for steel (mild Steel long products) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and industry, Government of India, New Delhi.

S1= The all India wholesale price index for steel (mild Steel long products) for the month under consideration as published by the Ministry of Commerce and industry, Government of India, New Delhi.

Ps= Percentage of steel component of the work.

Note: For the application of this clause, index of (Mile Steel long products) has been chosen to represent steel group.

31(a)(iv): Adjustment of Bitumen Component

Price adjustment for increase or decrease in the cost of bitumen shall be paid in accordance with the following formula.

Vb= 0.85 x Pb/100 x R x (B1-B0)/B0

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

B0= The official retail price of bulk bitumen IOC/BPCL depot at nearest center on the day 28 days prior to date of opening of Bids.

B1= The official retail price of bulk bitumen at IOC/BPCL depot at nearest center for the 15th day of the month under consideration.

Pb= Percentage of bitumen component of the work

31(a)(v): Adjustment towards differential cost of Pipes.

Price adjustment for increase or decrease in the cost of pipe shall be paid in accordance with the following formula.

Vpi= 0.85 x Ppi/100 x R x (Pi1-Pi0)/Pi0

Vpi= Differential cost of pipe i.e. amount of increase or decrease in rupees to be paid or recovered during the month under consideration.

Ppi= Percentage of pipe component of the work

Pi1= AII India Whole sale price index of pipe for the period under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

Pi0= All India Whole sale price index of pipe on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

31(b): Adjustment of Labour Component

Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the fallowing formula:

VL= 0.85 x P1/100 x R x (L1-L0)/L0

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

L0= the minimum wages for unskilled labour as Notified by Government of Odisha as prevailed on the last stipulated date of receipt of tender including extension, if any.

L1= The minimum wages for unskilled labour as Notified by Government of Odisha as prevailed on the last date of the Month previous to the one under consideration.

P1= Percentage of labour component of the work

31(c): Adjustment of POL (fuel and lubricant) Component

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

Vf= 0.85 x Pf/100 x R x (F1-F0)/F0

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

F0= the official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC / BPCL/ HPCL at nearest center on the day 28 days prior to the date of opening of Bids.

F1= The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC / BPCL/ HPCL at nearest center for the 15thday of the month under consideration.

Pf= Percentage of fuel and lubricant component of the work

Note:-for the application of this clause, the price of High Speed Diesel oil has been chosen to represent fuel and lubricants group

31(d): Adjustment for Plant and Machinery Spares Component

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

Vp= 0.85 x Pp/100 x R x (P1-P0)/P0

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

P0= The all India wholesale price index for manufacture of machinery for mining, quarrying and construction on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and Industry , Government of India, New Delhi.

P1= The all India wholesale price index for manufacture of machinery for mining, quarrying and construction for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

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

Note: For the application of this clause, index of manufacturing of machinery for mining, quarrying and construction has been chosen to represent the Plant and machinery Spares group.

Regarding wholesale price Index (WPI) for appropriate commodity for payment of price adjustment, due to change of base year of WPI from 1993-94 to 2004-05 & 2011-12, it is observed that, the commodity 'Bars and Rod', 'Cement', 'Heavy machinery and parts' included in the list of

WPI 1993-94 series are not mentioned as such in the WPI 2004-05 & 2011-12 series. Therefore, the following items in the WPI 2004-05 & 2011-12 series shall be considered corresponding to items in WPI 1993-94series:

Sl. No	Item in WPI 1993-94 series	Item in WPI 2004-05 series	Item in WPI 2011-12 series
1.	Cement	Grey Cement	Ordinary Portland cement
2	Bars & rods	Rebars	Mild steel long products
3.	Heavy Machinery & parts	Construction Machinery	Manufacture of Machinery for mining, quarrying &construction.

31(e):APPLICATION OF ESCALATION CLAUSE:

The contractor shall for the purpose of availing reimbursement/refund of differential cost of steel, bitumen, cement, Pipe, ,POL and wages,, keep such books of account and other documents as are necessary to show that the amount of increase claimed or reduction available and shall allow inspection of the same by a duly authorized representative of Government and further ,shall at the request of the Engineer-in-Charge, furnish documents to be verified in such a manner as the Engineer-in-Charge may require any document and information kept. The contractor shall within a reasonable time of15days of his becoming aware of any alteration in the price of such material, wages of labourand/or price of P.O.L. give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition along with information relating to there to which he may be in a position to supply.

Percentage Table

Sl. No	Category of work	% Component (cost wise		
		Labour (P1)	POL (Pf)	Steel (Ps +Cement (Pc) +Bitumen (Pb)+ Pipe (Ppi)+Plant & Machinery Spare & Component (Pp) + other Materials*
1	R & B Road Works	5	5	90

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		Bridge Works	5	5	90
		Building Works	5	5	90
2	Irrigation Works (% of component)	Structural Work	5	5	90
		Earth, Canal & Embankment work	5	5	90
3	P.H. Work	Structural Work	5	5	90
		Pipeline work	5	5	Pipe-70% *Machinery +Other material-20%
		Sewer Line	5	5	Pipe-70% *Machinery +Other material-20%

Note:-Further break up may be worked out considering the consumption of Cement, Steel, Bitumen, pipe and Plant &Machinery Spare Component in the concerned works and shall be provided in the bid document in shape of "Schedule **of Adjustment Data"** as an **"Appendix to Bid".**(enclosed herewith**)**

Appendix to Bid
Schedule of Adjustment Data

[For all works, adjustment factor for Labour and POL shall be considered @ 5% each. Steel, Cement, Pipes, other Materials and Machinery shall contribute to 90% of Price Adjustment and shall be calculated for each work separately during preparation of estimate, shall be approved by the authority during technical sanction as a "**Schedule of Adjustment Data**" and shall form part of the Bid Document. The cases where the original technically sanctioned estimate gets revised, the technical sanction to the revised estimate will be obtained from the competent authority as provided under para 3.11.2 (b) of OPWD Code, Volume-I. Based on the revised technically sanctioned estimate, the Labour& POL component shall be given the weightage of 5% each as provided in **OM No. 15847/WE dated 19.11.2019 of Works Department** and the weightage of 90% on steel, cement, bitumen, pipes, other materials and plant and machinery spare component shall be given as per the technically sanctioned revised estimate excluding the extra items. The revised weightage of **"Scheduled of Adjustment Data"** based on revised technically sanctioned estimate shall be included as an **addendum** to the agreement. The technical sanctioning authority shall be the competent authority for this purpose.]

Cl. No-31 of F2/P1 Contracts Sl. No	Index description	Source of index	Base value*	Base Date*	Weightage of item**
31 (a) (i)	Other Materials	All India whole sale price index (all commodities) as published by the Economic Advisor to the Govt. of India, Ministry of Commerce and industry.			60.17%
31 (a) (ii)	Cement	Whole sale price index for Cement (Ordinary Portland Cement) as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			16.18%
31 (a) (iii)	Steel	Whole sale price index for Steel (Mild Steel-Long Products) as published by the			5.64%

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		office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			
31 (a) (iv)	Bitumen (VG-30)	Official retail price of bulk bitumen at the nearest IOC/HPCL depot			0.00%
31 (a) (v)	Pipes	Whole sale price index for the type of Pipe under consideration, as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and industry.			-
31 (b)	Labour	Minimum Wage notified by the Labour and Employees State Insurance Department of Government of Odisha, India			5%
31 (c)	POL	Official retail price of HSD at nearest IOCL/ HPCL/ BPCL Consumer pump depot			5%
31 (d)	Plant and Machinery	Whole sale price index for Manufacture of Machinery for Mining, Quarrying and Construction as published by the office the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			8.01%
			Total		100%

*Values to be filled up at the time of drawl of contract
**Values to be filled up in the bid document.

Clause –32 After the work is finished all surplus material and debris are to be removed by the contractor and preliminary works such as vats, mixing platforms etc. are to be dismantled and all materials removed from site. The ground up to 100'-0" wide from the building should be cleared and dressed.

FAIR WAGE CLAUSE

Clause – 33(a) The contractor shall pay not less than fair wage to labourers engaged by him on the work.

Explanation: "Fair wages" means wages, whether for time or price work prescribed by the State Public works Department provided that where higher rates have been prescribed under the Minimum Wages Act. 1948 wages at such higher rates would constitute "Fair wages" (W.D. No.22059 dt.16.8.77)

(b) The contractor shall, notwithstanding the provisions of any contract to contrary cause to be paid a fair wage to labourers indirectly engaged on the work including any labour engaged by his sub contractors in connection with the said work, as if the labours had been immediately employed by him.

(c) In respect of all labour directly or indirectly employed in the works for the performance of the contractor's part of this agreement, the contractor shall comply with or cause to be complied with all regulation made by Government in regard to payment of wages, wage period deductions from wages, recovery of wages not paid and deductions unauthorized made, maintenance of wages register, wage cards, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of a like nature.

(d) The Superintending Engineer or Sub-Divisional Officer concerned shall have the right to deduct, from the money due to contractor, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract for the benefit of workers nonpayment of wages or of deductions

made from his or their wages, which are not justified by their terms of the contract'" or non-observance of the regulations, money so deducted should be transferred to the workers concerned.

(e) Vis-à-vis the Government of Odisha, the contractor shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his sub-contractor.

(f) The regulations aforesaid shall be deemed to be part of this contract and any breach there of shall be breach of this contract.

(g) Under the provision of the Minimum Wages Act, 1948 & minimum wages (Central Rules, 1950) the contractor is bound to allow or cause, to allow to the labourers directly or indirectly employed in the works one day rest for six days continuous work and pay wages at the same rate as for duty, in the event of default. The Superintending Engineer or Sub-Divisional Officer concerned shall have the right to deduct the sum not paid on account of wages for weekly holiday to labourers and pay the same to the persons entitled there to from any money due to the contractor.

(h) The contractor shall at his own expense provide or arrange for the provision of foot wear for any labour doing cement mixing work and black topping of roads (The contractor has undertaken to execute under this contract) to the satisfaction of the Engineer-in-charge and on his failure to do so Government shall be entitled to provide the same and recover the cost from the contractor.

(i) The contractor shall submit by the 4th& 10th of every month, to the Engineer-in-charge a true statement showing in respect of the Second half of the preceding month and the first half to the current month respectively (1) the number of labours employed by him on the work (2) their working hours (3) the wages paid to them (4) the accident that occurred during the said fortnight showing the circumstances under which they happened and the contend of damage and injure caused by them and (5) the number of female workers who have been allowed maternity benefit according the clause [K] and the amount paid to the Government a sum not exceeding for each default of materially incorrect statement. The amount levied as fine decision of the Superintending Engineer shall be final in deducting from any bill due to contractor.

(j) In respect of all labour directly employed in the works for the performance of the contractor's part of this agreement, the contractor shall comply with a cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangement for workers employed by the Odisha Public Works Department and its contractor. This will apply to work places having 50 or more workers.

(k) Maternity benefit rules for female worker employed by contractor, Leave and pay during leave shall be regulated as follows.

1- Leave : (i) **In case of Delivery:-** Maternity leave not exceeding 8 weeks, 4 weeks up to including the day of delivery or 4th weeks following that day.

(ii) **In case of Miscarriage: -** Up to 3 weeks from the date of miscarriage.

2. Pay (i) **In case of Delivery: -** Leave pay during maternity leave will be at the rate of women's average daily earnings calculated on the total wages earned on the days when full time work was done during a period of three months immediately preceding the date of which she gives notice that she expects to be confined or at the rate of **Rs.472.00** a day whichever is greater.

(ii) **In case of Miscarriage:** Leave pay at the rate of average daily earnings calculated on the total wages earned on the days when full time work was done during a period 3 months immediately preceding the date of such miscarriage,

Conditions of grant of Maternity Leave: No maternity leave benefit shall be admissible to a women unless she has been employed for a total period not less than 6 months immediately preceding the date on which she proceeds on leave.

MODEL RULES FOR HEALTH & SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY ODISHA P.W.D. OR IT'S CONTRACTORS

1. **Application:** These rules shall apply to all construction work in charge of Odisha Public Works Department which is expected to continue for a year or more.

2. **Definitions**:

   (i) "Work Place" means a place at which an average of fifty or more workers are employed in connection with construction work

   (ii) Large work place means a place at which averages of 500 or more workers are employed in connection with construction work.

3. **First Aid:**

   (a) At every work place there shall be maintained in a readily accessible place first aid appliances including an adequate supply or sterilizer dressing and sterilized cotton wool. The appliances shall be kept in good order and in large work places they shall be readily available during working hours.

   (b) At large work places where hospital facilities are not available within easy distance of the workers, first aid posts shall be established and run by a trained compounder.

   (c) Where large work places are remote from regular hospitals an indoor ward shall be provided with one bed for every 250 employees.

   (d) Where large work places are situated in cities towns or in their suburbs and no beds are considered necessary owing to the proximity of city, town hospitals, and an ambulance shall be provided to facilitate removal of urgent cases to these hospitals. At the work place some conveyance facilities such as a car shall be kept readily available to take injured persons or person to the nearest hospitals.

4. **Drinking Water:**

   (a) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of water fit for drinking.

   (b) Where drinking water is obtained from an intermittent public water supply each work place shall be provided with storage where such drinking water shall be stored.

   (c) Every water supply of storage shall be at a distance of not less than 50 feet from any latrine, drain or other sources of pollution where water to be drawn from an existing well which is within such proximity of latrine drain or any other sources of pollution the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with tray door which shall be dust and water proof.

   (d) A reliable pump shall be fitted to each covered well the tray door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

   (e) The temperature of drinking water supplied to workers shall not exceed 90^0 F.

5. **Washing and Bathing Place:**

   (i) Adequate washing and bathing places shall be provided separately for men and women.

   (ii) Such places shall be kept in clean and drained condition

6. **Scale of Accommodation in Latrines and Urinals: -** There shall be provided within the premises of every work place latrines and urinals in an accessible place; and the accommodation, separately for each of them shall not be less than the following.

(a) Where the number of persons employed does not exceed 50. No. of seats 1

(b) Where the number of persons employed exceeds 50 but does not exceed 100 No. of Seats 3

(c) For every additional 100 No. of seats 3 per 100
(in particulars cases the Superintending Engineer shall have the power to vary the scale where necessary)

7. **Latrine and Urinals for Women:** If women are employees, separate latrines and urinals separate from that for women and marked in the vernacular in conspicuous letter "for women only" shall be provided on the scale laid in rule.

Those for men shall be similarly marked "for men only" A poster showing the figure of a men and women and shall also be exhibited at the entrance of Latrines for each sex. There shall be adequate supply of water close to the urinals and latrines.

8. Latrines and Urinals: Except in work places provided with water flushed latrines connected with a water borne sewerage system, all latrines shall be provided with receipt able on dry-earthen system which shall be cleaned at least four times daily and at least twice during working hours and kept in a strictly sanitary condition. The receiptables shall be tarred inside and outside at least once a year.

9. **Construction of Latrines:** The inside wall shall be constructed of masonry or stone materials and shall be cement washed inside and outside at least once a year. The dates of cement washing shall be noted in register maintained for this purpose, and kept available for inspection.

10. **Disposal of excreta:** Unless otherwise arranged for by the local sanitary authorities arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator approved by as, Director of Public Health of Municipal Medical Officer or Health at the case may be, whose jurisdiction the work place is situated. Alternatively, excreta may be disposed off by putting a laver of night soil at the bottom of pucca tank prepared for the purpose and covering it with 6' layer of waste or refuse and then covering it up with a layer of earth for a fortnight (when it will turn in to manure).

11. **Provision of shelters during rest:** At every work place, there shall be provided free of cost two suitable sheds one for females and the other for rest for the use of labourers. The height of the shelter shall be less than 11 feet from the floor level the lowest part of the roof.

12. **Crèches:** At every work place at which more than 50 women workers are employed, there shall be provided only one hut for the use of children under the age of 6 year, belonging to such women and shall be used for infant's games and play and their bed room. The huts shall not be constructed on a lower standard than the following.

i. Thatched huts
ii. Mud floors and walls.
iii. Planks spared over the mud floor and covered with matting.

The hut shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision for sweepers to keep the place clean. There shall be two dhai in attendance. Sanitary utensil shall be provided to the satisfaction of the Health Officer of the area concerned. The use of the hut shall be restricted to Children, their attendants and mothers of the children.

b) Where the number of women workers is more than 50 the contractor shall provide one hut and Dhai to look after the Children of women workers.

c) The size of crèche shall vary according to the number of women workers.

d) The crèche shall be properly maintained and necessary equipments like toys etc. shall be provided.

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13. **Canteen: A** cooked food canteen on a moderate scale shall be provided for the benefit of workers whenever it is considered expedient.

CONTRACTOR'S LABOUR REGULATIONS

1. **Short title**: -These regulations may be called "The Odisha Public Works Department / Electricity Department Contractor's Regulations".

2. **Definition:** In these Regulations, unless otherwise expressed or indicated the following words and expressing shall have the meaning hereby assigned to them respectively,

that is say:

(a) "Labour" mean workers employed by a contractor for work directly or indirectly through a sub-contractor or other person, by an agent on his behalf.

(b) Fair wages means wages whether for time or piece work prescribed by the **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Ganjam** provided that where high rates have been prescribed under the minimum wages Act 1948 wages at such higher rates would constitute fair wages (W.D. No.22059 dt,16.8.77)

(c) "Contractor" shall include every person whether a sub-contractor or headman or agent employing labour on the work taken on contract.

(d) "Wages" shall have the same meaning as defined in the payment of wages Act. And include time and piece rate wages if any.

3. **Display of notices regarding ways, etc.:-**

The contractor shall:-

(a) Before he commences his work on contract display, and correctly maintain and continue to display and correctly maintain, in a clean and legible condition in a conspicuous place on the work, notice in English and in the local Indian language spoken by the majority of the workers giving the rate of wage prescribed by State Public Works Department/ **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Ganjam** the district in which the work is done.

(b) Send a copy of such notices to Engineer-in-charge of the work.

4. Payment of Wages :-

(a) Wages due to every worker shall be paid to him direct.

(b) All wages shall have to be paid in cash in current coin or currency or in both.

5. Fixation of wages periods :-

(a) The contractor shall fix the wage period in respect of which the wages be payable.

(b) No wage period shall exceed one month.

(c) Wage of every workman employed on the contract shall be paid before the expiry of ten days, after the last day of the wage period in respect of which the wages are payable.

(d) When the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the day succeeding the one on which his employment is terminated.

(e) All payment of wages shall be made on a working days.

6. Wage book and wage cards etc.

1) The contractor shall maintain a wage book of each worker in such forms as may be convenient, but the same shall include the following particulars:-

a) Rate of daily or monthly wages.

b) Nature of work on which employed.

c) Total number of days worked during each wage period.

d) Total amount payable for the work during each wage period.

e) All deductions made from the wages with an indication in each of the ground for which the deduction is made.

f) Wage actually paid for each wage period.

2) The contractor shall also maintain a wage card for each worker employed on the work.

3) The Superintending Engineer may grant an exemption from the maintenance of wage bond, wages cards to a contractor who, in his opinion may not directly or indirectly employ more than 100 persons on the work

7. Fines and deduction, which may be made from wages.

1) The wages of a worker shall be paid to him without any deductions of any kind except the following.

a) Fines.

b) Deduction for absence from duty, i.e. from the place or places where by terms of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent.

c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody' or for loss on money for which he is required to encount where such damage or loss is directly attributable to his neglect or default.

d) Any other deduction which the Odisha Government may from time to time allow.

2) No fines shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing abuse against such fines or deduction.

3) The total amount of fines which may be imposed in any one wage period on a works shall not exceed an amount equal to Five paise in a rupee of the wages payable to him in respect of that wage period.

4) No fine imposed on any worker shall be recovered from him by installments after the expiry of 60 days from the date on which it was imposed.

8. Register of fines, etc.

1) The contractor shall maintain a register of fines and of all deduction for damage or loss. Such register shall mention the reason for which fine was imposed or deduction for damage or loss was made.

2) The contractor shall maintain a list in English and in the local Indian language clearly defining acts and omissions for which penalty of fine can be imposed. It shall display such list and maintain it in a clean and legible condition in conspicuous place on the work.

Preservation of register:

The wage register, the wage cards and the register of fines, deduction required to be maintained under these regulations shall be preserved for 12 months after date of the last entry made in them.

10 **Powers of Labour Welfare Officers to make investigation or enquiry**

The labour Welfare Officers or any other persons authorized by the Government of Odisha on their behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the fair wage clauses and the provision of these regulations. He shall investigate into any complaint regarding default made by the contractor, sub contractor in regard to such provisions.

11. **Report of Labour Welfare Officers:**

The Labour Welfare Officers or others authorized as aforesaid shall submit a report of the results of his investigation of enquiry to the Superintending Engineer concerned indicating the extent, if any, to which the default has been committed with a note that necessary deductions from the contractor's bill be made and the wages and other dues be paid to the labourers concerned.

12. Appeal against the decision of Labour Welfare Officers.

Any persons aggrieved by the decision and recommendation of the Labour Welfare Officer or other person so authorized may appeal against such decision to the Labour Commissioner within 30 days from the date of decision forwarding simultaneously a copy of this appeal to the Superintending Engineer concerned but subject to such appeal, the decision of the officer shall be final and binding upon the contractor.

13. Inspection of registers:

The contractor shall allow inspection of wage book, card to any of his worker or his agent at a convenient time and place after due notice is received, or to the Labour Commissioner or any other person authorized by the Government of Odisha on his behalf.

14. Submission of return:

The contractor shall submit periodical returns as may be specified from time to time.

15. Amendment

The Government of Odisha may from, time to time add to or amend these regulations and on any question as to the application interpretation of effect of the regulations the decision of the Labour Commissioner or any other persons authorized by the Government of Odisha in that behalf shall be final.

Clause 34 The incentive for timely completion should be on a graduated scale of 1(One) percent to 5 (Five) percent of the contract value. Assessment of incentives may be worked out for earlier completion in all respect in the following scale.

Before 30% of the contract period = 5% Contract value

Before 20 to 30% of the contract period = 4% Contract value

Before 10 to 20% of the contract period = 3% Contract value

Before 5 to 10% of the contract period = 2% Contract value

Before 5% of the contract period = 1% Contract value

Clause – 35 The **royalty, DMF, EMF & Additional Charges** of materials will be recovered from the work bill in case failure of production of proper receipt from quarry holder or Revenue Department after proper verification from concerned Tahasildar

Clause - 36 - - Deleted.

Clause - 37 The terms and conditions of the agreements have been read/ explained to me and certify that I/We clearly understand them.

1. ADDENDUM TO CONDITION OF CONTRACT:

1.1. The bidder / Tender whose bid has been accepted will be notified of the award by the Engineer-in-Charge prior to expiration of the validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the conditions of contract called the ("Letter of Acceptance") will state the sum that the Engineer-in-Charge 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").

1.2 The notification of award will constitute the formation of the contract, subject only to the furnishing of a performance security (ISD) and additional performance security in accordance with the provisions of the agreement.

1.3 The agreement will incorporate all agreements between the officer inviting the bid/Engineer-in-Charge and the successful bidder. **Within 15** days following the notification of award along with the letter of acceptance, the successful bidder will sign the agreement and deliver it to the Engineer-in-Charge. Following documents shall form part of the agreement.

a) The notice inviting bid, all the documents including additional conditions specifications and drawing, if any, forming the bid as issued at the time of invitation of bid and acceptance thereof together with any correspondence leading thereto & required amount of performance security including additional performance security.

b) Standard P.W.D. Form P_1.

2. TIME CONTROL

2.1 Progress of work and Re-scheduling programme

2.1.1. The Superintending Engineer / Engineer-in-Charge shall issue the letter of acceptance to the successful contractor. The issue of the letter of acceptance shall be treated as closure of the bid process and commencement of the contract.

2.1.2. Before acceptance of tender successful bidder shall submit to the Engineer-in-Charge for approval and programme commensurate to clause no 3 showing the general methods, arrangements, and timing for all the activities in the works along with monthly cash flow forecast.

2.1.3. To ensure good progress during the execution of the work the contractors shall be bound in all cases in which the time allowed for any work exceeds one month to complete, 1/4th of the whole of the work before 1/4th of the whole time allowed under the contract has elapsed, ½ of the whole of the work before ½ of the whole time allowed under the contract has elapsed, 3/4th of the whole of the work before 3/4th of the whole time allowed under the contract has elapsed.

2.1.4. If at any time it should appear to the Engineer-in-Charge that the actual progress of the works does not conform to the programme to which consent has been given, the contractor shall produce, at the request of to such programme necessary to ensure completion of the works within the time for completion. If the contractor does not submit an updated programme within this period, the Engineer-in-Charge may withhold the amount of 1% of the contract value from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue programme has been submitted.

2.1.5. An update of the programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

2.1.6. The Engineer-in-Charge's approval of the programme shall not after the contractor's obligations. The contractor may revise the programme and submit it to the Engineer-in-Charge again at any time. A revised programme is to show the effect of variations and compensation events.

2.2. Extension of the completion date.

2.2.1. The time allowed for execution of the work as specified in the contract data shall be the essence of the contract. The execution of the works shall commence from the 15th Day or such time period as mentioned in letter of award after the date on which the Engineer-in-Charge issues written orders to commence the work or from the date of handing over of the site whichever is later. If the contractor commits default in commencing the execution of the work as aforesaid, Government shall without

prejudice to any other right or remedy available in law, be at liberty to forfeit the earnest money and performance guarantee / security deposit absolutely.

2.2.2. As soon as possible after the contract is concluded the contractor shall submit a Time & Progress Chart for each milestone and get it approved by the Department. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works, it shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the contract documents and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate programme has been agreed upon) complete the work as per milestone given in Clause – 2.1.3 above.

2.2.3. In case of delay occurred due to any of the reasons mentioned below, the contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

For

i. Abnormally bad weather, or

ii. Serious loss or damage by fire, or

iii. Civil commotion, local commotion of workmen, strike or lockout, bx officers any of the heads employed on the work, or

iv. Delay on the part of other contractors or tradesmen engaged by Engineer-in-Chief, in executing work not forming part of the contract.

v. Incase of variation is issued which makes it impossible for completion to be achieved by the Intended Completion Data without the Contractor taking steps to accelerates the remaining work and which would cause the contractor to incur additional cost, or.

vi. Any other cause, which in the absolute discretion of the authority mentioned, in contract data is beyond the contractor's control.

2.2.4 Request for re-schedule and extension of time, to be eligible for consideration shall be made by the contractor in writing fourteen days of the happening of the event causing delay. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired.

2.2.5 In any such case a fair and reasonable extension of time for completion of work may be given. Such extension shall be communicated to the Contractor by the Engineer-in-Charge in writing. Within 3 months of the date of receipt of such request, Non-application by the contractor for extension of time shall not be a bar for giving a fair and reasonable extension by the Engineer-in-Charge and this shall be binding on the contractor.

2.3 Compensation for delay.

2.3.1 If the contractor fails to maintain the required progress in terms of clause 2 or to complete the work and clear the site on or before the contract or extended date of completion he shall without prejudice

to any other right or remedy available under the law to the Government on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the Superintending Engineer (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clause 2 or that the work remains incomplete.

This will also apply to items or group of items for which a separate period completion has been specified Compensation @ 1.5% per month or for delay of work, delay to be computed on per day basis.

The existing relevant provision in the original documents shall stand modified accordingly. Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the Tendered Value of work or to the Tendered Value of the item or group of items of work for which separate period of completion is originally given.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case the contractor does not achieve a particular milestone mentioned in Cl 2 (a) of P1 contract. The amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time. Withholding of this amount on failure to achieve a milestone, shall be automatic without any notice the contract. However, if the Contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor files to make up for the delay in subsequent milestone(s) amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest whatsoever, shall be payable on such withheld amount.

2.4 Management Meetings

2.4.1 Either the Engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

2.4.2. The Engineer shall record the business of management meetings and 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 the management meeting or after the management meeting and stated in waiting to all who attended the meeting.

CONTRACTOR **SUPERINTENDING ENGINEER**

Percentage rate Contract

(i) In percentage rate contract the schedule of quantities shall mention estimated rate of such item and amount thereof. The contractor has to mention the percentage excess or less over the estimated cost (in figures as well as words) in the prescribed format appended to the tender document.

(**ii)** The percentage rate contract may be named as **P-1**. In this form **time is the essence**.

(iii) The contractor is required to maintain a certain rate of progress specified in the contract. The contract can also be terminated with penalty when the progress of work is not as per the condition of contract. **The quantity mentioned can be increased or reduced to the extent of 10% for individual items, subject to a maximum of 5% over the estimated cost. If it exceeds the limit stated above prior approval of competent authority is mandatory before making any payment.** The period of completion is fixed and cannot be altered except in case of exceptional circumstances with due approval of next higher authority.

(iv) In this form of tender, only percentage quoted by the contractor shall be considered. Percentage quoted by the contractor shall be accurately filled in figures and words, so that there is no discrepancy. If any discrepancy is found in the percentage quoted in words and figures, then the percentage quoted by the contractor in words shall be taken as correct. If any discrepancy is found in the percentage quoted in percentage excess/less and total rate quoted by the contractor, then percentage will be taken as correct. The percentage quoted in the tender without mentioning excess or less and not supported with the corresponding amount will be treated as excess. The contractor will write **percentage excess/less upto two decimal points only**. If he writes percentage excess/less upto two or more decimal points, the first decimal point shall only be considered without rounding off. Where the contractor has omitted to quote the rates either in figures and words, the officer opening the tender should record the omission.

(**v)** Bills for the percentage rate tender s shall be prepared at the estimated rates for individual items only and the percentage excess or less shall be added or subtracted from the gross amount of the bill.

RELEVANT PROVISION IN THIS CONRACT STANDS MODIFIED ACCORDINGLY.

CONTRACTOR **SUPERINTENDING ENGINEER**

SPECIAL CONDITION OF CONTRACT

1. DEFINITIONS

In the Contract (as hereinafter defined) the following words and expressions will have the meanings here by assigned to them:

a) **Approved/Approval-** Means approved in writing.

b) **Construction Plant-** Means all equipments, appliances or things of whatsoever nature required for the executing, or completion, maintenance of the works or temporary works but does not include materials or other things intended to form or forming part of the permanent work.

c) **Contract -** Means the instruction and information for tenderers General and Special conditions of the contract, Technical specification, drawings, tender (including the schedule of quantities and tender prices) the formal agreement and all agenda and attachment related to the above.

d) **Contractor-** Means the particular person, firm or Corporation with whom the contract has been made for executing the work.

e) **Drawing -** Means the drawings referred to in the specifications, any modifications of such drawings approved in writing by the Engineer–in - charge and such other drawings as may from time to time be furnished or approved in writing by the Engineer-in-charge.

f) **Engineer-in-charge** - Means the Superintending Engineer, in-charge of the work specified or parts of the works under the contract, or such other departmental assistants or sub-ordinates to whom the Superintending Engineer, in-charge may have delegated certain duties, acting separately within the scope of the particular duties entrusted to them.

g) **Government -** Means Government of Odisha, Department of Water Resources.

h) **I.S.S./B.I.S.** - Means Indian Standard Specifications/Bureau of Indian Standard.

i) **Temporary works -** Means all temporary works of every kind required for the performance of the contract.

j) **Specification** - Whenever the terms " Specification " is used, apart from a specified standard specification, it shall mean the specification or plan prepared for a particular site as instructed to the contractor in executing that item of work.

2. EARNEST MONEY DEPOSIT.

i) **Tenderers including Govt. undertakings are required to deposit earnest money online @ 1% of the amount put to tender**.

ii) The earnest money to be pledged in favour of the **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist.-Ganjam** and may be in the following shape or as amended.

a) Bank Guarantee of any Nationalized / Schedule Bank.

b) National Savings Certificate.

c) Kisan Vikash Patra

d)Post Office Time Deposit Account

e) Post Office Saving Bank Account

f) Insurance surety Bond issued by an Insurance Company authorized by the Insurance Regulatory and Development Authority of India (IRDAI)

iii) **No Cash / Cheque payments are accepted.**

iv**) Earnest money given with one tender previously and submitted with other tender is not to be entertained**.

3 TAX CERTIFICATES:

The tenderers are also required to furnish Xerox/attested copy of the valid PAN CARD, ITCC (if any), GST registration certificate along with tender documents failing which the tender may not be considered. The original is to be shown as mentioned in the NIT. The bidders registered outside the State are required to submit an undertaking in the form of an affidavit that they are not registered under the GST Act in the state of Odisha as they have not started any business in the state and they have no liability under the act. But Bidder has to produce GST registration certificate before signing of the agreement.

4 TIME OF COMPLETION:

The work is to be completed within **15(Fifteen)** calendar months including monsoon commencing from the date of issue of order to proceed with the work.

5. PRE BID INSPECTION BY CONTRACTORS:

The tenderers are required to go through each clause of PWD Form carefully in addition to clause mentioned herein before tendering. In any case the tenderer shall be deemed to have carefully examined the tender documents visited the site of work and it's surroundings and satisfied himself as the form and nature of the site approach roads, haul roads, local conditions in general and particularly about the availability of the construction materials, electricity supply, water supply, storage and handling of materials, road communication etc. including requirement and availability of labour and materials needed from complete execution of the work and made an inventory of such information as to the risks, contingencies and other circumstances which would influence or effect his tender before tendering. He should also satisfy himself about the sufficiency of availability of materials in quarry and borrow area. The Department will not be responsible for any misjudgment of the tender on the account for any future claims.

6. VALIDITY OF TENDER:

6.1 The tenderer must furnish copy of Registration Certificate, GST Regd. Certificate, PAN Card, Affidavit EMD/Bid Security& Bid cost, No-Relation Certificate and the TIA as specified in NIT, otherwise his/her bid shall be declared as non-responsible & shall be liable for rejection.

6.2 The rates quoted shall remain valid for a period of 90 (ninety) days from the last date prescribed for opening of Technical Bid of tenders as per provision in Para – 25 (vi) in Appendix –IX of the OPWD Code, Volume-II.

6.3 The tender which is not in the prescribed proforma and is not strictly in accordance with the terms and conditions of the tender call notice is liable for rejection.

6.4 Alternate tenders, conditional tenders and tenders containing indefinite terms will not be entertained. The tenders will be considered given special emphasis on the capability of the tenderer and the implements and earth moving machinery at his disposal for the work.

6.5 The percentage rate quoted should be for finished items of work and for sufficiency as per the description of the schedule of quantity and specification and shall include all taxes including rent, but excluding GST on works contract, but including royalty, DMF, EMF & Additional Charges cess and general and incidental charges pertinent to the work, other charges of materials, octroi duty, ferry tolls, conveyance charges and other costs on account of land and building including temporary building required by the tenderer for collection of materials storage, housing of staff or other purpose for the work. The tenderer must quote the percentage rate for the contract and tenders containing indefinite terms such as estimate rate, schedule of rate shall not be considered. The rates must be for finished items of work unless otherwise mentioned in the tender schedule.

6.6 The rates should be quoted in percentage less or excess up to two decimals only.

i) The tenderer shall bear cost of various incidental sundries and contingencies needed by the work of all within the following or similar category.

ii) Labour camps and hutments necessary to a suitable scale including contingency and sanitary arrangements medical aids thereon to the satisfaction of the health authorities.

iii) Water arrangements for laborer as well as for the works. No claim for carriage for water whatsoever will be entertained.

iv) Fees and dues levied by the Municipal and water supply Authorities.

v) Suitable equipment and wearing apparatus for the labors engaged in risky operation.

iv) Suitable fencing, barriers, signals, including parapet and electrical signal where necessary at works and approaches in order to protect the public and employees from accidents.

vii) No compensation for any damage done by rain or by similarly action during execution of the works shall be paid.

6.7 The tender is to be decided as per prevailing codal provisions taking into consideration the capacity of the tenderer and equipment available with him for the work. The authority reserves the right to reject any or all tenders without assigning any reason thereto.

6.8 In order to qualify f or consideration for award of the contract the tenderer should satisfy the Bid criteria as stipulated in the technical Bid. To substantiate the tenderer is required to submit authentic records duly certified by the Superintending Engineer of the Department in support of such experience.

6.9 Rate to be quoted by the contractor for various items of work should be consistent and rational. Tenders with in consistent rates and / or speculative rates shall be liable for rejection.

CONTRACTOR **SUPERINTENDING ENGINEER**

6.10 The payment for RA bill will be made in level section measurement and no string section measurement will be considered.

6.11 All the tenderer are required to submit along with their tenders declaration about the names of their relatives employed in Water Resources Department in the prescribed proforma appended. In case they have no relation in Water Resources Department a certificate to that effect shall have to be furnished.

6.12 An affidavit shall be furnished by the contractor at the time of submission of tender paper about the authentication of tender documents.

6.13 The conditions in this detailed tender call notice will form part of the agreement to be drawn by the contractor.

7. AWARD OF CONTRACT

7.1 The tenderer whose tender is selected for sign the agreement in the PWD Form for fulfillment of the contract in the office of the Engineer-in-charge. The amount of **5%** deduction from each running bill as per the agreement shall be retained as security deposit for the fulfillment of this contract. This security deposit will carry no interest. Failure to enter into the required agreement and to pay the security deposit as above within the specified period shall entail forfeiture of the earnest money. No tender shall be finally accepted until the required amount of security money is deposited. The written agreement to be entered into between the Contractor and the Govt. shall be the foundation of the rights of both the parties and the contract shall be deemed to be incomplete until the agreement is first signed by the Contractor and then by the Superintending Engineer, the department will accept the initial security deposit in the accepted from prescribed in clauses as above pledged in favor of the Engineer-in -Charge and in no other form. The Security deposit deducted from each running bill will be **5%**. If the contractor express his request in writing he will be permitted to convert the security deposit of **5%** into interest bearing securities (for an amount not less than Rs. 10.00 lakh in each case which will be pledged in favour of the Superintending Engineer) Successful bidder registered under other state government/MES/Railways/CPWD has to register under the State PWD before signing of the agreement.

7.2. In case of delay in acquisition of land no compensation will be admissible but extension of time will be granted.

7.3. Deleted

7.4 Super/Special Class contractors shall employ under him one Graduate Engineer and two Diploma holders belonging to the State of Odisha. Likewise, an 'A' Class contractor shall employ under him one Graduate Engineer or two Diploma holders belonging to state of Odisha. The employment of such graduate Engineer and Diploma holders under the Contractor shall be full time and continuous and they shall not be superannuated, retired, dismissed or removed personnel from any State Government/Central Government Service / Public Sector Undertakings /Private companies and firm or be ineligible for appointment to Govt. service. The contractor shall pay them monthly emoluments, which shall not be less than the emoluments of the personnel of equivalent qualification employed under the State Govt. of Odisha.

The Chief Engineer Roads, Odisha may however assist the contractor with names of such unemployed Graduate Engineers and Diploma holders if the contractor seeks for such help. The name of such Engineering personnel appointed by the contractor who would be supervising the works should be intimated to the tender receiving authority along with each tender. Each bill of the contractor shall be accompanied by an employment roll of engineering personnel together with certificate of the Graduate Engineer or Diploma holder employed by the contractor to the effect that the work executed as per the bill has been supervised by him.

7.5. No part of the contract shall be sublet without written permission of the Engineer-in-charge or any transfer be made by power of attorney authorizing others to receive payment on behalf of the contractor.

7.6. No tenderer is permitted to furnish their tender in his own manuscript paper.

8. OBSERVATIONS OF LAWS AND LOCAL REGULATIONS ACCIDENTS AND SAFETY MEASURES:

The Contractor shall observe all State and Local rules and regulations so far as they are relevant in controlling the operations involved carrying out the work and indemnify the Govt and employees of the Govt. against all suite losses, demands, actions, judgments and cost of every kind resulting from the commissions and omissions of the contractor and his employees in violation of the said rules and regulations.

8.1 Department for payment of the compensation under workmen's compensation act VI of 1923 on account of the workmen being employed by him and the full amount of compensation of awarded by any competent court of law to the workmen will be recovered from the contractor and will be paid to the workmen as per direction of the court.

8.2 The contractor shall have to abide by the Labour Laws and Rules in vogue and shall provide at his own cost housing, watering supply, sanitation, medical aid and other facilities to the labours engaged in the work as required under Labour Laws and Regulations. The Contractor shall not employ labour of minor age group.

8.3 The contractor shall have to abide by the safety code introduced by the Govt. of India, Ministry of works. Housing and supply in their standing order No.44 to 50 dated 25.11.57.

8.4 Blasting where required shall be taken up only when proper precaution have been taken for the protection of lives and property in accordance with I.S. 4081 – 1967 safety code for blasting and related drilling operations. Only persons licensed for and thoroughly conversant with the working methods and precaution to be observed in using explosives shall carry out blasting. To avoid the danger of injury from flaying debris, all personnel in a blasting area shall retreat to an adequate cover. While carrying out excavation adequate precautions in accordance with I.S. 3764 – 1966. Safety code for excavation works shall be taken for the safety of workers. The contractor shall have to abide by the blasting rules & regulations.

8.5 In case of any damage to Govt. or public property or to the property owned to any persons of firms or bodies due to negligence or any such action of the contractor resulting in damage or stoppage or work

thereby, the contractor shall be liable to be penalized to the extent of the assessed value of the damage or the out turn lost.

9. CHANGE OF ADDRESS OF CONTRACTOR:

The Contractor shall inform the Engineer and the Department any change of his postal address from time to time from the one given in the tender paper and authorize any person with due intimation to the Engineer-in-charge and the Department to receive instruction or communication from the Department on his behalf, failing which the said undelivered instructions and communications published in the notice board of the Engineer-in-charge shall be treated to be intimation to the Contractor and the same shall be binding on him. All the correspondence should be made in English.

10 ARCHAEOLOGICAL FINDINGS

The contractor shall deliver to the Engineer-in-charge all articles of archaeological importance as and when those are found in course of execution.

11. CONTEMPORARY CONTRACTORS

The contractor shall take into consideration the needs and requirements of the other contractors if any, working in the vicinity during the tenure of his contact and shall neither take nor cause to be taken any steps or actions that may cause disruption disturbance to their work, labour or arrangements etc. Any action by the contractor that the Engineer-in-charge in his unquestioned direction may consider as infringement of the above would be considered as a breach of contract and he may take such action against the contractor as deemed fit.

12. TAXES:

a. The rates quoted by the Contractor shall be deemed to include all other taxes including royalties of all materials that the contractor will have to purchase for performances of this contract but excluding GST.

b. During the course of contract period deductions of GST on works contract turn over at the source, shall be made from each bill at such rate and conditions as may be required under the provision of Odisha GST Act and Rules.

c. Sales Tax / GST:

GST on works contract will be deducted from each RA bill of the contractor @ as amended from time to time and will be credited to the Govt. account. In case any amendment to the existing provisions is made during the tenure of the contracts, the same will be applicable to this contract.

d. Income Tax:

1% or 2% as applicable under Govt. Rules of each ongoing account will be recovered from the contractor towards Income Tax (Provisional or as advised by Income Tax Department)

a. **1**% of the gross amount of each R/A bills of the contractor will be deducted towards cess on works as amended from time to time

13. INTEREST:

Under no circumstances interest is payable for dues of the Contractor if any lying unpaid or payable for the work.

14. PLANS AND DRAWINGS:

The work has to be carried out in accordance with the Odisha detailed standard specification and relevant I.S. specification pertaining to the tendered items of work and specifications and special conditions appended here to Drawings will be supplied to the contractor to execute the work in general conformity therewith. These drawings will be supplemented by such additional, general and detail drawings or directions as may be considered necessary or desirable as the work progress. No claim will be entertained due to change of drawing. Where details shown on those drawings differ from the requirement of the specifications, the requirement of the specifications shall govern and the contractor shall not work without proper drawings, direction and instructions. He shall check all drawings carefully and bring to the notice of the Engineer-in-charge any error and omissions and discovered, where upon the Engineer-in-charge shall prepare revised additional drawings and specifications as may be required. All such additional general and detailed drawings will be binding on the Contractor under the same terms and conditions as provided in clauses of P1 Agreement. The decision of the Engineer-in-charge with regards to specification is final, for which no compensation or claim will be entertained.

15. CONSTRUCTION PROGRAMME:

i) The contractor shall have to submit the construction programme i.e. the plan and programme of execution for completion of the work at the time of agreement to the Engineer-in-charge. The Engineer-in charge shall have to approve the said construction programme by fixing a pragmatic mile stone with reference to the provisions laid down under clause 2(a) of the condition of the contract, for timely completion of the work and accordingly the work is required to be executed.

ii) If the revised construction programme is required on account of non-completion of work for which Extension of Time is required or for disruption of the execution in the stipulated period, the contractor shall have to submit the same to the Engineer-in-charge along with the Extension of Time application, if extension of time is prayed for or immediately after disruption of the execution mentioning the clear reasons as the case may be, for revision of work programme. The decision of the Engineer-in-charge is final and binding on the contractor. The contractor shall arrange for additional shifts whenever necessary to suit the revised construction programme. No extra payment on this account is admissible. B. The contractor has to make adequate lighting arrangements for night works wherever necessary in fulfillment of the construction programme at his own cost and no extra payment on this account is admissible.

16. AVAILABILITY OF LABOUR:

Labour required for the work may not be available to the full extent in the locality. The contractor may have to import labour from outside. He shall arrange and regulate the labour strength according to necessity. The Department shall not entertain the claim for any idle labour whether or not at the fault of the contractor or due to any other reasons whatsoever. The contractor's item / Percentage ratein the tendered are deemed to have adequate coverage on account of import and employment of required labours and providing facilities and amenities to them.

17. SUSPENSION OF WORK:

The Engineer-in-charge may from time to time by written orders without in any way deviating the contract, direct the contractor to suspend the work or any part thereof at such time and the contractor shall not after receiving such written order proceed with the work or items thereof ordered to be suspended until he shall have received a written notice from the Engineer-in-charge to proceed with the work again. Should the work be ordered to be suspended directly in the interest of safety of the work due to acts of God or major war or indirectly as a result of the contractor not complying with any of the provisions of the contract in respect of the quality of the materials, workmanship programmed of execution he shall not be entitled to claim any compensation for any loss he may be put to directly or indirectly for such suspension of work.

During the period of suspension of the work the contractor shall properly protect and secure the works as necessary in the opinion of the Engineer-in-charge.

18. ITEMS NOT COVERED IN THE SCHEDULE:

The items of work not covered in the agreement shall be paid in the current schedule of rate of the State and those not covered by the said schedule of rates will be paid on actual analysis approved by competent authority.

19. FORCE MAJOR:

The contractor shall take all precautions to protect the work from damages due to rains, flood, cyclones, fire or by any other natural calamity, public agitation or riots etc and also make good such damage if any at his own cost during the period of execution and till the work is taken over by the Department. No compensation will be paid to the contractor on account of idle laborers due to above reason.

20. **TOOLS AND PLANT**:

The contractor should arrange necessary tools, plant and machineries for the efficient execution of work at his own cost and the rates quoted should be inclusive of such charges. The department may lend on hire some machinery for use in the work subject to their availability on terms and condition as shall be specified by the Department from time to time and after execution of necessary agreement. But on the plea of non supply of machineries by the Department, the works should not be delayed nor any compensation on such account is tenable nor will the contractor be eligible for any time extension on that score.

21. HAUL ROADS:

All haul roads to Borrow areas and quarries will be constructed and maintained by the contractor at his own cost. The roads so constructed shall be allowed to be used free of cost by agencies working in other reaches including Govt. Department unless otherwise restricted by the Engineer-in-charge.

22.a. DEPARTMENTAL STOCK MATERIALS: - DELETED-

22.b. MATERIALS SUPPLIED BY THE DEPARTMENT:

No material can be supplied to the contractor as a principle as per the current policy of Govt. of Odisha vide G.O. No. 48443 / F dt. 11.12.95 effective from 01.04.96. The contractor shall be responsible for procurement of all materials at his own cost and got it tested and approved as per the relevant clauses of the contract before use.

23. CONSTRUCTION SHEDS:

Temporary structures may be erected by the contractor at his expenses for storage sheds, office, residence, labour hutments etc. on the land available with the Department with the permission of the Engineer-in-charge. On completion of the work these structures should be dismantled and the site cleared and handed over to the Department.

23.1. In the event of delay in supply of departmental materials or supply of detailed structural designs for unavoidable reasons, reasonable extension of time will be granted on the application of the contractor. But no claim for monetary compensation will be entertained under any circumstances.

23.2. Any slip debris and other foreign materials deposited on the working region on account of rains, flood or any other cause prior to and during the course of execution and till the work is completely taken over the department have to be cleared by the contractor at his cost. The rates quoted by the contractor shall be inclusive of all such contingencies.

23.3. The contractor shall not interfere with the execution of water supply or electrical arrangements or any other works entrusted to any other agency by the Department at any time during progress of work.

23.4. It shall be the responsibility of the contractor to make such arrangements as may be required from time to time to protect men, machinery and the works against damage due to flood and the department accepts no liability whatsoever for damage or loss on this context.

24. SITE CLEARANCE:

Such portion of the site of work as may be considered necessary for the purpose of alignment and demarcation shall be cleared of jungle, if any by the contractor at his own cost. The limits of the structure within which work will be carried out within the scope of the contractor shall be suitably demarcated by the Department. The contractor has to supply necessary labour at his own cost fixing benchmark pillars/alignment pillars / alignment and pegs and also for layout, leveling and profiling and maintaining the same till completion of the work. The contractor at his own cost will supply cement concrete pillars required for layout. The generally layout and Bench mark pillars already laid out by the Department is to indicate generally this alignment of Canal in the field. The contractor while taking up excavation works will preserve original pillars.

24.1. The contractor should keep himself in touch with the Engineer-in-charge for smooth execution of work and arrange adequate labour depending upon the work load and working space available. No claim whatsoever for detention / idle of labour will be entertained.

25. OTHER CONTRACTORS:

Contractor's operations shall be so planned as to prevent water from his work flowing or finding way in to the neighboring reaches. In the event of water from his reach flowing of finding way into the neighboring or subsequent reaches, the respective contractor shall be liable to pay compensation towards any expenditure incurred and loss or damage sustained by the concerned contractor(s) on account of the said reasons unless they otherwise mutually settle the issue amongst themselves. Provided that if there, by any dispute among the contractors on the account of such compensation arises, the decision of the Engineer-in-charge shall be final and conclusive and binding on concerned contractor.

26. ORDER BOOK:

An order book with pages serially numbered will be issued by the Superintending Engineer shall be maintained by the Sectional Officer systematically till completion of the work and there after surrender it, to the Engineer-in-charge for record. The order book shall be available at the site during work hours for recording instructions relating to the work. Order regarding the work as and when necessary shall be entered in this book by the Superintending Engineer or his superiors in office with their dated signature in exercise of statutory power vested on them which shall be duly noted by the contractor or his authorized agent with his dated signature. The Executive Sub-ordinate, the in charge of work shall also record his observation of defective work and such orders / observation entered in this book, and noted by the contractor agent shall be considered to have been duly given to the contractor, similarly orders entered by the Superintending Engineer and Chief Engineer shall be deemed to have been duly issued by the Engineer - in - charge for the contract.

27. CLAIM BOOK:

A claim book of pages serially numbered shall be issued by the Superintending Engineer to the contractor who shall maintain it systematically and securely, and shall record in it such items as are not covered by his contract and or claimable as extra claim shall be entered in this book under the dated signature of the contractor or his duly authorized agent at the end of each month.

A certificate should be furnished by him along with those claims to the effect that beyond the claims entered in the book, the contractor has no other claims up-to-date. If in any month there are no claims, a recorded a certificate to that effect should be furnished by the contractor in the claim book. Each claim must be definite and should give also as far as possible the quantities as well as the total amount claimed. The claim book must be submitted regularly by the contractor to the Engineer-in-charge by the 10th day of each month for his orders. Claims not made in this manner are liable to be summarily rejected. The claim book shall be finally surrendered by the contractor to the Engineer-in-charge for record.

28. RULE TO VERBAL ORDER:

It shall be the contractors responsibility to get any verbal orders, instructions or directions confirmed in writing without which no cognizance will be taken of such verbal orders, instructions or directions for settlement of any claim arising thereof.

29. STATUTORY OBLIGATIONS OF CONTRACTOR:

The contractor shall have to arrange water required for the work at his own cost.

29.1. The contractor shall have to construct and maintain coffer dam as required for the work during execution at his own cost.

29.2. Bailing out water from foundation, construction of cross bund dewatering wherever necessary during execution of the work shall have to be done by the contractor at his own cost.

29.3. Gangway, scaffolding or any such arrangements required for the work are to be provided by the contractor at his own cost as per direction of the Engineer-in-charge. The Department will have the right to inspect such arrangement made for the work and reject partly or fully such structures found defective in opinion of the Engineer-In-Charge.

29.4. Department shall not pay compensation to the contractor for the damage occurred to the materials and work entrusted to his due to natural calamities.

30 DEPARTMENTAL RIGHT FOR DEVIATION IN QUANTITIES:

Right is reserved to make such increase or decrease in quantity or item of work mentioned in the schedule attached to the tender notice as may be considered necessary for satisfactory completion of the work and such increase or decrease shall in no way invalidate by the contractor.

31. SAFETY OF MACHINERIES:

Unusual flood may occur during the working season. In the event of overtopping or breach in the cofferdam/embankment due to such flood in the working season resulting in flooding of the working area or outside the working area, the contractor shall make his own arrangement to shift the machineries and equipments, materials etc. to a safe place at his own cost. The work shall be resumed after the floods. Necessary reconstruction of the cofferdam / embankment clearing the working area of debris and silt shall have to be done by the contractor at his own cost. Suitable extension of time may however be granted in such eventualities at the request of the contractor, but no compensation whatsoever shall be paid in this regard.

32. CONTRACTOR DYING, BECOMING INSOLVENT, INSANE OR IMPRISONED:

(a) In the event of the death, insanity, insolvency and imprisonment of the contractor or the contractor being a partnership or firm becomes dissolved or being a corporation goes into the liquidation, the contract may be terminated by notice in writing posted at the site of work and advertised in one issue of the local

newspaper and all acceptable works shall be paid for after recovering all the contractors due to Govt. there from at appropriate rates to the person or persons entitled to receive and given dishonor-age for the payment.
(b) If the contractor becomes bankrupt or has a receiving order made against him or compound with his creditor or being a Corporation commence to be would up not being a voluntary winding up for the purpose only an amalgamation or reconstruction or carry on its business under a receiver for the benefit of the creditors of any of them, the Department shall be at liberty.

i) To give such liquidator receiver, or other person the option of carrying out the contract subject to his providing a guarantee for the due, faithful performance of the contract up to an amount to be determined by the Department.

ii) To terminate the contract forthwith by notice in writing to the contractor or to the liquidator or receiver or to any person in whom the contract may become vested and to act in the manner as per prevalent clauses of P1 contract.

33. MEASUREMENT OF EACH WORK SHALL TAKE AS FOLLOWS:

Before commencement of work initial levels and to determine the final measurement of the work, final levels of the ground / river bed and bank or structural work as the case may be, shall be taken in presence of the contractor. The contractor will satisfy himself about the correctness of the initial and final levels entered in the level book issued by the Engineer-in-charge and in token of the acceptance of the said levels the contractor shall have to sign in each page of level book in which the said levels are recorded. Basing on these levels, the gross quantity of work executed by the contractor shall be arrived at. After completion of the work the contractor shall be given a written notice to attend the final measurement. On receipt of the notice, the contractor must have to attend the final measurement failing which the measurement ex-parte shall be taken by the Engineer-in-charge which shall be binding on the contractor. In case of the abandonment of work, if it is decided by the Engineer-in charge that final measurements of executed work shall be taken, the same procedure shall be followed as in case of final measurement on completion of work.
It is the responsibility of the contractor to make the site free from all problems to take measurement by the Superintending Engineer or his authorized officer. If, in the opinion of the Engineer-in-Charge, the site is not free from problem for measurement and the contractor does not take any corrective measures to get rid of same, the Engineer-in-Charge shall make the site free from problem to take the measurement at the cost of the contractor and to determine cost involved there of, certificate by the Engineer-in-Charge for the purpose, shall be conclusive and binding.

33.1. The Engineer-in-charge shall decide the contractual matters in accordance with codes, rules and acts in vogue which shall be binding on both parties.

34. REMOVAL OF CONTRACTOR'S MEN:

The contractor shall on the written direction of the Superintending Engineer immediately removed from the works any person employed thereon, who may, in the opinion of the Engineer-in-charge, be incompetent or

has misconduct himself. Such person shall not be employed again on the works without the written permission of the Engineer-in-charge.

35. DETAILS CALL NOTICE BEING PART OF CONTRACT:

The detail Tender Call Notice and all the Annexure there to will form the part of the agreement when the work will be awarded to the contractor. All the correspondences made with the contractor and all his correspondences with the department after the tender is received will also be attached with the agreement.

36. FAIR WAGES CLAUSE:

The contractor should abide the fair wage clause introduced by the Govt. and shall not pay less than the fair wages fixed by the Govt. to the laborer engaged by him in the work.

37. LABOUR LICENSE AND REGISTRATION:

The contractor is to furnish labour license as per the relevant labour Act and rules in force before signing the agreement, failing which execution of agreement will not be entertained.

Preference in price will be given to M/s Odisha Construction Corporation Ltd. as per relevant DOWR Govt. Odisha Circular No. 20754 dated 05.06.2002.

38. QUALITY CONTROL AND TESTING:

The quality control organization of department will conduct necessary tests to ensure specifications and quality of execution of work as per standard procedures in vogue. The testing charges of Reinforcing Bar will be borne by the contractor.

39 TESTING OF THE STRUCTURES:

During execution of work, the contractor shall arrange the requisite equipment for testing of the work if found necessary at his own cost.

40 DEFECTS LIABILITY:

The contractor shall be responsible to make good of the defects at his own expense, which may develop or may be noticed before the expiry of one year from the certified date of completion and which is attributable to the contractor. All notices of such defect shall be given to the contractor promptly. In case, the contractor fails to make good of the defects, the Engineer-in-charge employ other persons/ agencies to make good of such defect, and all expenses consequent thereof and incidental thereto, shall be borne by the contractor.

In the event Government takes over portions of works, as they are completed, the liability of the contractor under this clause for those portions shall extend to a period of one year from the actual date on which portions of the works are taken over to the possession of the Department.

41 ENGINEER-IN-CHARGE'S DECISION:

It shall be accepted as an inseparable part of the contract that in matters regarding materials, workmanship, removal of improper work, interpretation of the contract, drawing and contract specification, mode of

procedure and the carrying out of the work, the decision of the Engineer-in-charge, which shall be given in writing, shall be final and binding on the contractor. The Engineer-in-Charge's final authority applies to technical consideration and does not include decisions regarding sums due to or from the contractor for extension of time.

42 PAYMENT OF PRICE ESCALATION IN THE CONTRACT CONTAINING THE PRICE ADJUSTMENT CLAUSE:

Payment is as per OM No.15847 dtd.19.11.2019, 8189 dated 07.01.2021 & 1739 dated 03.02.2023 of Works Department, Govt. of Odisha as appended.

43. SETTLEMENT OF DISPUTE:

If the contractor considers any work demanded of him to be outside the requirements of the contract or considers any drawing record or ruling of the Engineer-in-charge, on any matter in connection with or arising out of the contract or carrying out of work to be unacceptable, he shall promptly ask the Engineer-in-charge in writing for written instruction or decision. There upon the Engineer-in-charge shall give his written instructions or decision within a period of thirty days of such request. Upon receipt of the written instruction or decision, the Contractor shall promptly proceed without delays to comply with such instruction or decision. If the Engineer-in-charge fails to give his instructions or decision in writing within a period of thirty days after being requested or if the contractor is dissatisfied with the instruction or decision of the Engineer-in-charge, the contractor may within thirty days after receiving instructions or decision of the Engineer-in-charge will approach to the higher authority who shall afford an opportunity to the contractor to be heard and to offer evidence in support of his appeal. The Authority shall give his decision within a period of thirty days after the contractor has given the said evidence in support of his appeal, which shall be binding upon the contractor.

44. RESOLUTION OF DISPUTES:

a)All claims are to be settled by a Civil Court of Competent jurisdiction by way of Civil Suit.

b) The contractor shall not be entitled to invoke Civil Suit until and unless he has completed the work or until the Govt. has made alternative arrangements for completion of work in question as the case may be.

c) The pendency of Civil Suit proceedings shall not dis-entitle the Government for completion of the work.

45. JURISDICTION OF COURT:

For the purpose of jurisdiction in the event of dispute, if any contractor should be deemed to have entered into within the State of Odisha and it is agreed that neither party to the contract has the right to bring a suit in regards to the matter covered by the agreement or contract at any place outside the state Odisha.

45.1. If any further necessary information is required, the Engineer-in-charge will furnish such information on written request, but it must be clearly understood that tender must be received in order and according to instruction / specifications appended herewith.

46. Deleted

47 CEMENT:

The Cement manufactured inside the State of Odisha is to be used as mentioned in Technical Specification.

48. STEEL:

Reinforcement bar manufactured by Steel Authority of India Ltd. (SAIL) / RINL/TATA/JINDAL steel/Shyam steel etc. as approved by Govt. of Odisha is to be used.

49. ROYALTY, DMF, EMF & ADDITIONAL CHARGESOF CONSTRUCTION MATERIALS:

Royalty, DMF, EMF & Additional Charges of construction materials at the rate specified by the Government of Odisha will be recovered from the bills of contractor unless the contractor produces proof of payment of royalty, DMF, EMF & Additional Charges at the source in shape of K-Form.

Signature of witness **Signature of contract**

SECTION – 5

TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION

CHAPTER – 1

1.0. **GENERAL INFORMATION**

1.1. The work under specification pertain to **Construction of C.C. Lining work to Daha Left Distributary from RD 650 m to 7500m under Daha Irrigation Project.** The information and data relating to work and site conditions described hereafter represents the site condition in a general way. It shall be presumed that the contractor satisfies himself as to nature and location of work in general, land, local conditions particularly on the power and handling, storage of materials, disposal of soil, foundation data and bore hole data and etc., before arriving at his rate. The department therefore will not bear any responsibility for any inference on the site condition and consequence thereof.

1.2. **Availability of labour:**

Labour required for the work may be available to some extent at the project area. The contractor must, however, make his own arrangements to fulfill his requirement.

1.3. **Towns**

Brahmapur is a well-developed town with railway station which is about **100** Kms from working site.

1.4. **Access to site:**

The site is accessible by all-weather existing roads.

The department shall not be liable for compensation due to hindrance caused by the regular pedestrian traffic, and in the event of breakdown in communication for closure of the roads due to repairs or for any reason. It is the responsibility of the contractor to make all arrangement for development and maintenance of haul road and approach road as per his requirement as and when required.

1.5. **Availability of Diesel and Lubricants:**

Pumps for supply of diesel, petrol and other lubricants are located at **Bhanjanagar.**

1.6. **Electric Power for construction purpose:**

1.6.1. The Contractor himself is to arrange for requirement of power for the work.

1.6.2. The contractor shall enter agreement with Tata Power South Odisha Distribution Limited (TPSODL) for taking electricity consumption and payment as per requirement of the contractor.

1.6.3. The electrical energy consumed by the contractor shall be measured by suitable metering arrangement to be installed by the contractor on approval of TPSODL at the point of supply. The meter will be sealed in presence of the contractor or his authorized agent and readings will be taken every month for finding the electricity consumed.

1.6.4. **Tariff Rate:**

The tariff rate for consumption of electricity will be in accordance with Electricity (supply) Act, 1948 and Tata Power South Odisha Distribution Limited (General Conditions of Supply) Regulations as amended from time to time.

1.6.5. **Observance of Rules**

1.6.5.1. The distribution of power to the contractor's colony, equipments etc. from the one-point supply will be done by the contractor at his own cost.

1.6.5.2. The contractor shall observe all the conditions required under rule 45 (i) of Indian Electricity Rules (1956) and other pertinent rules for carrying out the electrical installation works in his premises. Power supply to the installations not satisfying the Indian Electricity Act and Rules is liable to be cut off and the department will not have any responsibility for any losses and damages caused for the above.

1.6.5.3. The contractor shall take all precautions to ensure safety of the workers engaged in his electrical lines and installations. The department will not have any responsibility for any accident that may occur in contractor's installation.

1.6.5.4. In case of break-down in power supply for any reason what-so-ever the department is not liable for compensation.

1.6.5.5. The contractor shall take action to rectify the defects, if any, in the installations when pointed out by the Engineer-in-charge or TPSODL in a reasonable time.

1.6.5.6. The Contractor shall permit the department to draw power required for the departmental works, if any from the contractors L.T. lines as and when required by the department. The department will pay the contractor for such consumption at the prevailing tariff rate of TPSODL.

1.7. **Housing**

Private houses may not be available at project site but available at **Hinjilicut.** Land for the construction of temporary houses for the labour may be arranged by the agency at his own costs.

1.8. **Medical Aid**

There is a Government Hospital at **Bhanjanagar** which provides free treatment. The contractor shall however make at his own cost first-aid arrangements at the various work sites in accordance with the labour rules and regulations and as directed by the Engineer-in-charge.

1.9. **Post, Telegraph & Telephones**

Postal and Telegraphic facilities are available at **Bhanjanagar** Telephone connections are also available at **Bhanjanagar** and the same can be availed by the contractor at his own cost.

1.10. **Local Roads**

The existing approach roads to the site of work to the extent available shown in the map enclosed can be used by the contractor. The contractor shall, however construct and maintain connecting roads within the working areas and in his Labour colony areas at his cost. The contractor shall construct and maintain haul roads and other approach roads etc., as may be necessary for the proper execution of the work.

1.11. **Dump Areas.**

Materials excavated from the foundations and in connection with other items of work shall be dumped as directed by the engineer-in-charge from time to time. The contractor shall construct and maintain all roads to the working areas for excavation of foundations, laying of concrete etc., at his own expense.

1.12. **Other Contractors.**

In the matter of dumps, haul roads, diversions, excavations for the foundations etc., the contractor shall take into consideration the needs and requirements of other contractors, if any, working in the vicinity. There should be proper and adequate co-ordination between the working in the vicinity. Further the contractor shall not make or cause discontent or disturbance to the work, labour or arrangements etc. of other contractors in the neighboring and the project localities.

1.13. **Use of Site.**

1.13.1. Contractors will be permitted to use without any charge the site and all lands under the control of project organization as required for execution of work. The Contractor shall not commence any operation on such lands except with the prior approval of the Engineer-in-charge.

1.13.2. All areas of operations including those for his staff and labour colonies handed over to the contractor shall be cleared and handed over to the Engineer-in-charge after completion/recession of contract. While handing over, the contractor shall make good to the satisfaction of the Engineer-In-charge any damage or alteration made to areas or to other property or land handed over to him for purpose of these work.

1.13.3. Temporary structures may be erected by the contractor for storage sheds, office, residence etc., for non-commercial use on the land handed over to him at his expenses and with the permission of the Engineer-in-charge. At the completion of the work, these structures should be dismantled and the site cleared and handed over to the department. The lands required for providing amenities in connection with the work will be given free of cost from the Government lands as shown in the plan enclosed.

1.14 Floods

1.14.1. In case of flash and untimely floods in the river/nalla during the working season resulting in over-topping of coffer dam and flooding of the work area, the contractor shall make his own arrangements at his

cost to shift the machineries, equipments, materials, labour and departmental machineries if hired by the contractor to a safe place. The work shall have to be resumed after receding of floods and necessary strengthening of coffer dam and dewatering will be done by the contractor at his cost. Extension of time for the completion of the procurement processes may be considered by the employer if the discontinuance of the work is beyond the all reasonable attempts of the contractor to thwart such eventualities.

1.14.2. The silt, debris, sand and other materials accumulated in the working area during flash floods or regular floods in the monsoon shall be removed by the contractor as required for continuing the work at his own cost. By any chance, if any excavated portion that could not be filled with concrete by the contractor gets filled up during the monsoon period with earth and silt, its removal will not be paid for again. The contractor will have to re-excavate the same at his own cost.

1.14.3. It shall be distinctly understood that it is entirely the responsibility of the contractor to make such arrangements as may be required from time to time to protect the men, machinery, materials and the work under progress and work for which the measurements were recorded and payment made, against damages either during working season or during the flood season the department accepts no liability, what-so-ever for any damage or loss of men, materials, machinery and work of hindrance caused to the progress of work except as provided in specific clause of General Conditions of Contract under contractor's risk and insurance.

1.14.4. The contractor should provide at his own cost adequate protection measures to the completed works at the end of working season or work in progress against the probable flood during monsoon till completion and handing over of entire work.

CONTRACTOR **SUPERINTENDING ENGINEER**

CHAPTER – II

2. GENERAL SPECIFICATION

The enclosed drawing in the bid document gives broad dimensions and outline of the works to be executed through this contract. These drawings may however be revised / modified form time to time and supplementary additional drawing may also be issued as per necessity. During the course of execution there may be changes in dimension, specifications and shape of components. The changes in the drawing can be done without any way deviating the terms of the contract and the contractor is to execute the work as per revised drawings and specifications at the same rate as agreed upon for the work awarded under the original contract. The contractor shall do no work without proper drawings. He shall check all drawings and specifications carefully and advise the Engineer-In-charge, if any error and omission are discovered where upon he Superintending Engineer will prepare revised additional drawings and specification s as may be required to suit the state of the work. Where the drawings are not consistent with the text of the specification, the text shall govern.

2.1. The rates quoted shall be for finished items of work as per description in schedule of quantities and according to drawings, specifications and conditions of the contract. Detailed construction drawings shall be furnished by the Department. Rates quoted shall be for items of works, specifications of which confirm to details furnished in this report and provisions in Bureau of Indian Standards and shall include all general and incidental charges which will not be paid separately. Such general and incidental charges are listed below for the convenience of the tenderers but are not exhaustive. Omission of any such items herein but required for delivering finished items of work, shall not be a plea that such items are not covered by the rates quoted.

2.1.1. Formation and maintenance of haul roads within the work site, (i) are to be done by the contractor at his own cost. (ii) Existing approaches and haul roads, if any, under the control of the barrage organization may be made use of, but improvement, if required, shall be at contractor's cost.

2.1.2. Labour& material required for construction of reference points, bench marks, pillars etc. for setting out the works shall be at contractor's cost.

2.1.3. The rate offered includes cost of all leads, lifts and scaffolding and gang-ways as and when required for the work. No additional payment in this regard will be entertained.

2.1.4. Construction of coffer dam, dewatering of any water that may accumulate in the working areas as required for carrying out the items under schedules of quantities. This shall include the initial dewatering of the pond formed after the formation of coffer dam and all seepage that may accumulate in the area before construction has to be carried out.

2.1.5. Removal of temporary protection arrangements for the reinforcements and instrument pipes left projecting from the unfinished constructed sections to be attended to in the next working season. The reinforcement etc. have to be thoroughly cleaned and straightened before these are embedded in concrete/masonry.

2.1.6. Providing protection arrangements as per drawing for the reinforcement rods and instrumentation pipes, cable etc., during flood season intervening any two working seasons.

2.1.7. Protection works for the piers during the flood season intervening any two working seasons. This is however, indicative of the actual protection works that will depend on the location and the point of protection and should be done to the satisfaction of the Engineer-in-charge. The responsibility for the safety of the structure rest entirely on the contractor and any damage that occur have to be made good by him at his cost.

2.1.8. Green cutting/high pressure water jetting /chipping off old concrete surface, over which fresh concrete is to be laid, so as to remove laitance and expose coarse aggregate.

2.1.9. Cleaning the areas that will be covered by concrete thoroughly with air and water jet just before laying concrete and applying slurry of cement mortar 1:2.

2.1.10. From work complete including cost of materials, labour, maintenance, erection and removal.

2.1.11. Providing blocks outs (for second stage embedded metal parts of gates) with reinforcement projecting into the block outs.

2.1.12. Fixing first stage embedded metal parts in the block outs.

2.1.13. Furnishing samples of welds to the department for testing cost of binding wire, tack welding wherever required and arrangement for movement of labourers for pouring concrete over the reinforcement such that the sag does not exceed 12 mm.

2.2. The sequence of construction to be adopted by the contractor shall have to be approved by the Chief Engineer. Normally sequence of construction shall be form a lower level to a higher level and from one end of the barrage to other or from both ends.

2.3. Coffer Dam and its Maintenance.

The contractor has to make his own design for the coffer dam and furnish the same along with this tender. The cofferdam may be designed for 25years return flood for non monsoon flows. Any material required for the coffer dam shall be arranged by the contractor. The design of the coffer dam shall be such that its section is of erodible nature and should not form an obstruction to river flow during monsoon period. The design should receive the prior approval of the Engineer-in-charge before being actually executed by the contractor. Forming the necessary coffer dam and its maintenance for the work contemplated in all the working seasons till the final completion date, shall be the responsibility of the contractor. However flash and untimely floods cannot be ruled out during the working season for which the coffer dam should be suitably constructed and maintained by the contractor at his own cost.

2.4. Equivalency of Standard and Codes.

Whenever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Engineer's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 28 days prior to the date when the Contractor desires the Engineer's approval. In the event the Engineer determines that such proposed deviations do not ensure equal or higher quality, the Contractor shall comply with the standards specified in the document.

2.5 Quality Control

2.5.1. Before collecting materials required for execution of the respective items of work and laid down in the schedule of quantities and in the detailed specifications described hereafter in the subsequent sections, the contractor shall ensure that samples of materials proposed to be used are first approved by the Engineer-in-charge. When directed the samples of materials proposed to be used should be furnished to the Departmental Quality control laboratory for testing.

2.5.2. All such testing charges shall be borne by the contractor. The contractor will provide necessary assistance if required for collection of samples. The contractor is liable to pay for any test which is not included in the Agreement but required in the opinion of the Engineer-in -charge during execution of the work for which no additional payment will be made to the contractor.

2.5.3 On the basis of satisfactory test results confirming to technical specification, collection of materials shall be started from the quarry. The testing of materials shall be checked in the field laboratory by the Department as well as staff of Quality Control organisation. If the field test result is found unsatisfactory, the materials shall be rejected.

2.5.4 On receipt of notice from the Engineer-In-Charge and on observation of quality Control Division, Brahmapur the contractor will rectify he defect in stipulate period at his own cost, If the defects are not rectified in the stipulated period, the Engineer-in-charge shall assess the cost, get the defect rectified and recover the same from the dues of the Contractor.

2.6.1 A quarry chart indicating possible sources of materials may be seen in the office of the **Superintending Engineer, Bhanjanagar Irrigation Division, Bhanjanagar, Dist.-Ganjam**. The contractor must however satisfy himself that the materials as required as per specifications and

quantity are available in those quarries. No extra payment will be made due to non-available in those quarries. No extra payment will be made due to non-availability materials as per required specification and quantity in the quarries shown in the departmental quarry chart. The quarry chart is only an indication of source of materials and the department does not accept the responsibility if the materials are not available in full quantity and quality.

2.6.2 No claim for carriages of water whatsoever will be entertained.

2.6.3 Decision regarding usefulness of excavated materials rests fully on the Engineer-In- Charge.

CHAPTER- III

3.0. EARTH WORK

3.1. Scope of work: This section covers item

3.2. Description of the Item:

Refer item No.

of Bill of Quantity.

3.3. Excavation Foundation.

3.3.1. Excavation.

The item includes excavation of foundation for the work which include the R.C.C., Cutoff, raft, abutments, piers, wing walls, cement concrete blocks and loose stone aprons etc. The foundation levels to which the excavation will be made are indicated in the relevant drawings. If the excavation is required to be taken to levels other than those indicated in the drawings the payment on such excavation shall be governed by the same rates in which bidding has been done in the tender schedule. The item “Excavation” as herein used shall in general include excavation after the formation of cofferdam and dewatering of the area, transportation of the excavated material to the dumped area or as directed by the Engineer-in-charge throughout the period of working. During the stage of excavation where stone or concrete blocks are encountered requiring removal by chiseling or blasting, the same shall be done with precaution as specified. The area shall be first excavated up to 15cm. above the foundation level as shown in the drawing. The balance excavation has to be completed only in a few hours before placing concrete. Arrangements for placing concrete shall be made only after the area is inspected and approved by Engineer-in-charge.

3.3.2. Disposal of Materials

Before excavation is started, the deposition of spoil should be carefully planned. The excavated material shall be dumped sufficiently clear of the edges of excavation permitting ample space for installing and lifting of dewatering machines, stacking construction materials etc. or transported to coffer dam, afflux bunds, guide bunds, back filling of abutments or to stock pile areas. In forming stock piles, the useful materials shall be stocked in separate areas with reference to the nature of the materials. Excavated materials, if found suitable, should be utilized for filling behind abutments, and in the afflux bund and guide bund, for which no extra payment will be made. Steps should be taken to keep the materials; clean as subsequent cleaning will

be difficult and imperfect. All other excavated materials shall be dumped in permanent spoil banks or other approved locations. Spoil banks shall be located where they will not interfere with the natural flow of the river or will not obstruct any drainage arrangement.

3.3.3. Measurement.

Immediately prior to the beginning of the work, accurate cross sections of existing ground level at suitable intervals or closer where necessary and normal to the axis/alignment shall be taken over the area to be excavated. Final sections along the same line after the removal of each class of excavation and also on the completion of the excavation shall also be taken. Volumes will then be computed for materials excavated under the different classifications and will be paid for at the rates of respective items which also include conveyance of excavated materials Including loading, unloading and stacking as directed by the Engineer-in-charge.

3.3.4. Dewatering

The Contractor has to make his own arrangement for dewatering from the working area at his own cost and the unit rates for each item of work quoted by the contractor shall include the cost of dewatering and river diversion and cofferdam.

3.4 Excavation in all kinds of Hard Rock & Disposal.

3.4.1. Normal methods of excavation will be by use of explosive i.e by blasting methods, however excavation by wedging, barring and chiseling and control blasting can be done as required at site as per direction of the Engineer-in-charge. The contractor's Item / percentage rateshall include all necessary operations such as ordinary methods of blasting, wedging, barring, chiseling and controlled blasting etc. including loading and transportation to the places away from the project site in low and areas in a systematic manner as directed by Engineer-in-charge. Normal methods of excavation will be by blasting with explosive, all operations, involving transportation, handling, storage, and use of explosives for the blasting shall be confirmed in a accordance with the Indian explosives Act. The contractor shall engage licensed blasters for taking up the blasting operations in the work spot. The contractor shall take all necessary precautions for all accidents which may arise due to blasting. The contractor should have portable magazines near the work site for carrying out day to day blasting operations.

3.4.2. Line Drilling and Broaching

Excavation in rock shall be progressed by systematic line drilling and broaching or by chiseling in locations specified by the Engineer-in-charge.

3.4.3. Blasting

Blasting shall be permitted only when proper pre-calculation is taken for the protection of persons, work and property & on receipt of permission from civil authorities of the district. Any damages done to the work or

property by blasting shall be repaired immediately. Blasting may be done only to depth and extent approved by the Engineer- in-charge with explosives of approved quality and charge and in such locations are made no damage to the rock outside the prescribed limits of excavations. Explosives shall be stored in a safe place at a sufficient distance from the work and under special care of a watch & ward so that in case of accidents, no damage occurs to the other parts of works. All storing, handling, transport and use of explosives, detonators and the equipment there of shall be strictly in accordance with the Indian Explosives act and the explosives Rules-1940 and as amended from time to time. The blasting where required shall be permitted only when proper precaution have been taken for the protection of persons and property in accordance with I.S. 40-81-1976 (Indian Standard specification for safety code for blasting and related drilling operations.) While carrying out excavation adequate precautions in accordance with I.S 3761-1966 (Indian standard Specification for Safety code for excavation work) shall be taken. Holes shall be drilled not exceeding two thirds of the depth of rock to be excavated from the elevation at which the hole is started. The holes shall not be larger than as necessary to permit easy passage of whole sticks of explosives to the bottom of the holes. As the excavation approaches its final limits, the depth of holes shall be reduced progressively. Whenever in the opinion of the Engineer-in-charge, further blasting may injure the rock upon or against which concrete is to be placed, the use of the explosives shall be discontinued and the excavation shall be completed by wedging, barring, Chiseling, drilling or broaching or by other suitable methods. Care should be taken to remove all loose slabs before masonry/concrete is placed for the spillway. Rock bolting compared to excavation of rock may be useful at places in excavation of foundation. The engineer-in-charge will direct where to locate rock bolt and where to excavate by wedging barring. The final prepared foundation shall roughly present a saw tooth out line and shall have at least 50% horizontal or nearly horizontal area to give resistance against sliding or as per direction.

3.4.4. Blasting with Powder

Blasting operations shall be under charges of competent persons specifically for this purpose and be carried out during fixed hours of the day preferably during early hours midday. Lunch hour or at the close of the working day in the presence of competent persons. Prominent sign-board indicating the blasting timings should be put at a number of places. The Engineer shall see that the safety precaution are taken and observed. Red flags shall be prominently displayed and all the people except those who have actually to light the fuse must evacuate to a safe distance from the blast not less than 150 meters as a rule. Sirens shall be sounded five minutes prior to the blast with waiting note and an all clear shall be given with a long blast at the end of the operation. These sirens should be kept at different locations so as to identify the danger zones. All fuses must be cut to the required before being inserted into the holes. The safety fuses of the charged holes are to be lighted in the presence of the superior who must see that the fuses of all holes charged have properly ignited. The number of blasts to be fired and the actual number of shots heard must be compared and the person responsible must satisfy himself by examination that all blasts have exploded before work people are permitted to approach the site. Withdrawal of a charge, which has not exploded, is

not to be permitted under any circumstances, but the tamping and charge should be drilled at a distance of about 23cm. from the old hole and fired in the usual

way. The result shall be carefully examined by the all persons in charge of blasting and the operation continued until the original blast is exploded.

3.4.5. Blasting with Dynamite & other High Explosives:

Sub paras (a) of the Para 4.15.2 instruction for blasting with powder shall apply. The strength of special gelatin to be used in the excavation of foundation as per the percentage mentioned below.

60% Special gelatin for softer rock strata.

70% special gelatin medium hard rock strata

80% special gelatin for hard rock strata

Before holes must be such a size that the cartridges can easily be passed through,and the responsible man in charge of blasting (Supervisor) shall take particular note of these positions and check them again after holes are drilled. The supervisor himself must supervise preparation of all charges necessary for the

bore holes. Blasting plans shall be evolved after trial blasting at the site. The first few rounds blasted at the work site shall be considered as test/trial blasting to find the most economic and efficient drilling and firing pattern consistent with limiting the blast induced peak particle velocity (PPV) within permissible range. He shall adjust the drilling pattern, hole depth, number of holes, change per hole and firing sequence including the types and number of delay of ensuring most favourable angle of breakage. The blasting plan, so evolved and approved by the Engineer-in-charge will restrict the development of crack zone beyond the drilled contour and limit the PPV's influencing the damage prone features/ structures range. Through tail blasting and vibration measurement, the value of variable shall be determined from the following equation.

V=K (Q1/2) 17/D

Where V=Peak particle velocity in mm/sec

Q=Cooperating charge in 1 kg.

D= Distance from the blasting zone in meters.

K=transmission factor constant which depends upon rock characteristics homogeneity of rock and presence of faults and cracks.

Broadly, a peak particle velocity range of 70-100 mm/sec shall be permissible in good rock excavation. The number of holes to be blasted in & around will be governed by the blasting plan evolved through trial blasting as explained above with the frame work of permissible PPV. If blasting is to be done in the civility and any risk phone feature of structures, the permissible PPV shall be reduced and Engineer-in-charge shall lay down the safe limits of PPV.

3.4.6. Explosives and Blasting

Explosives required for rock blasting are to be procured by the contractor at his own cost. It shall be the responsibilities of the contractor to store the explosive purchased by him in accordance with the rules of the explosive act and other rules framed by Government of India. Blasting materials such as gelatin, Detonators and fuse coils will have to be procured by the contractor & the contractors should make his own arrangements for their transport to work spot at his cost and their safe custody in a portable magazine, as per the rules in force and furnished the following details as per the format given below. Capacity License No. &Date Validity Period

The contractor shall acquaint himself with all the applicable laws and regulation concerning, storing, handling and the use of explosives. All such laws, regulations and rules as prevalent from time shall be binding upon the contractor.

The provision detailed in the specifications are supplementary the above laws, rules and regulations, and are also applicable except where they conflict with the above mentioned laws. Further the Engineer-in-charge may issue modification alternation and new instructions from time to time. The contractor shall comply with the same without these being made a cause for any claims. All these materials such as explosives, detonators, fuse coils tamping materials etc. that are proposed to be used in blasting operations shall have the required make and strength. The use of fuse with only on protective coat is prohibited. The fuse shall be sufficiently water resistant as to be unaffected when immersed in water for thirty minute. Rates of burning of the fuse shall be uniform and not less that 4 (four seconds per 35 millimeters of length with 10 percent (ten percent) tolerance on either side. The fuse known as instantaneous fuse shall not be used. Before use, the fuse shall be inspected and most damaged or broken ones discarded. The rate of burning of all new types of fuse or when they have been in stock for long shall be checked before use. The detonators used shall be capable for giving an effective blasting of the explosive.

3.4.7. Personnel

Excavation by blasting shall be permitted only under the personal supervision of competent and licensed persons and trained workmen employed by the contractor at his cost. All supervisors and workmen in charge of makeup, handling, storage and blasting work shall be adequately insured by the contractor. The storage of explosives shall be in charge of very reliable person who may if necessary cause police enquiry being made s to his reliability, antecedents etc, The contractor shall have to produce security for the person in charge of the explosives, if and as required by the engineer-in-charge of the civil authorities of the District. The contractor shall make sure that his supervisor workmen are fully conversant with all the rules to be observed in storing, handling and use of explosives. It shall be assured that the supervisor in charge is thoroughly acquainted with the details of the handling and the blasting operations.

3.4.8. Storage of Explosives

The contractor shall build at his cost a magazine for storing the explosives and portable magazine for carrying the explosives to work spot from the magazine or one storage magazine to be built near the site of the work

on which explosives are to be used. The site of the magazine, its capacity and design shall be subject to approval by the Engineer-in-charge and the Inspector of Explosives, Government of India before the construction is taken up as a rule the explosive should be stored in a clear dry well ventilated bullet proof and fire proof building on isolated site. The explosives, detonators and fuse coils shall each be separately stored. A careful and day to day account of the use of explosives shall be kept by the contractor in register in a manner prescribed by the Engineer-in-charge. The Engineer-in-charge may also pay surprise visit to the storage magazine. In case of any unaccountable storage of the explosives, or if the account is not found to have been maintained in a manner prescribed the contractor shall be liable to be penalized in which case he shall not be entitled to any compensation for the losses etc. The action taken under this cause shall be in addition to that which might be taken by the competent authorities or in the court of law. The magazine shall at all times be kept scrupulously clean. No unauthorized person shall at any time be admitted inside the magazine. A notice shall be hung near the storage prohibiting entrance of unauthorized persons.

The magazines on no account be opened during or on approach of a thunder storm and no person shall remain in the vicinity of the magazine during that period. Magazine shoes without nails shall at all time be kept in the magazine, and a wooden tub or cement through about 300 millimeters high and 450 millimeters in the diameter filled with water shall be fixed near the door of the magazine. Person entering the magazine, must put on the magazine shoes which shall be provided by the contractor for the purpose and be careful.

i. Not to put their magazine shoes to touch ground outside the clean floor.

ii. Not to allow the magazine shoes to touch ground outside the clean floor.

iii. Not to allow any dirt of grit to fall on the clean floor.

Persons with barefoot shall before entering the magazine dip their feet in water and then step direct for tub over the barrier (if there be one) on the clean floor. A brush or broom shall be kept in the lobby of the magazine for the cleaning out the magazine on each occasion it is opened for the receipt, delivery or inspection of explosives, No matches or inflammable material shall be allowed in the magazine. Light shall be obtain from an electric storage battery lantern. No person having articles of steel or iron on him shall be allowed to enter the magazine Oily cotton , rags waste and article liable to spontaneous ignition shall not be allowed inside the magazine workmen shall be examined before they enter the magazine to see that they have none off the prohibited articles on them. No tool or implements other than those of copper, brass, gun mental or wood shall be allowed inside the magazine. All tools shall be used with extreme gentleness and care. Boxes of explosive shall not be thrown down or dragged along the floor and shall be stacked on wooden trestles. Where there are white ants, the legs, of the trestles shall rest in shallow copper, lead or brass blows containing water. Open boxes of dynamite shall never be exposed to the direct rays of the sun. Empty box or loose packing materials shall not be kept inside the magazine. The magazine shall have lighting conductor, which should be got tested at least once a year. The contractor shall within 15 days comply with all the recommendation made by the officer testing the lighting conductor, failing which the Engineer-in-charge shall entitle to comply the same at the contractor's expense which shall not open to question or the

Engineer-in-charge may consider any action that he may consider fit. The following shall be hung in the lobby of the magazine.

i) A copy of rules both in English and Oriya.

ii) A statement showing: the stock in the magazine at the particular time.

iii) A certificate showing the last date of testing of the lightning conductor.

iv) A notice that “Smoking is strictly prohibited”

The magazine shall be inspected at least twice a year by an officer representing the Engineer-in-charge who shall see that all the rules and strictly complied with. He shall notify all omissions etc. to the contractor who shall rectify the defects within a period of 15 days. (fifteen days) from the date of receipt of the notice failing which the Engineer-in-charge may take whatever he considers suitable.

3.4.9. Transport and Strong of Explosives:

For the transport of the explosives and detonators between the store and site, closed and strong containers made of soft materials such as timber, zinc, copper, leather shall be used. Explosives and detonators shall be carried in separate boxes. For the conveyance of primer special containers shall be used. The boxes and containers used shall be kept closed. Explosives shall be stored and used chronologically to ensure the ones received earlier being use first. A make up house shall provided at each working place in which cartridge will be made up by component and licensed man as required for the work. The make-up house shall be separated from other buildings. Only electric storage battery lamps will be used in this house. No smoking shall be allowed in the make up house or generally while dealing explosive. No child under 16 years of age & person who is in a state of introduction shall be employed on the loading & unloading or transport of explosive or be employed in or allowed to enter in premises where explosives are handled and/ or stored.

3.4.10. Disposal of Deteriorated Explosives.

All deteriorated explosive shall be disposed off in a approved manner. The quantity of the deteriorated explosives to be disposed off shall be intimated to the Engineer-in-charge prior to its disposal.

3.4.11. Preparation of Primers:

The primers shall not be prepared near open flames of fire. The work preparation of primers shall always be entrusted to the same personnel; Primers shall be used as early as possible after they are ready.

3.4.12. Charging of Holes

The work of charging of holes shall not commence before all the drilling work at the site is completed and the contractor’s. Supervisor be satisfied himself to the effect by actual inspection. While charging open laps shall be kept away. For charging with powdered explosives, a naked flame shall not be allowed. Only wooden tamping rods, without any kind of metal on the rod shall be allowed. The tamping rods shall have cylindrical ends. Before hole must be of such size that the cartridge can easily pass down & they shall not however be

too big. Only one cartridge shall be inserted at a time and gently pressed into hole with the tamping rods, the sad, clay other temping material used for the holes completely shall not be tampered too hard.

3.4.13. Blasting.

Blasting shall be carried out during fixed hours of the day which shall have the approval of the Engineer-in-charge. The hours once fixed shall not be altered without prior written approval of the Engineer-in-charge. The site blasting operations shall be prominently demarcated by red danger flag. The order of the fire shall be given only be the contractor's Supervisor in charge of the work and his order shall be given by only after giving the warning signal three times, so as to be enable all the labourers, watchman, etc. to reach safe shelters. All the roads and foot paths leading to the blasting areas shall be watched. Road closing barriers should be provided to close the traffic on these roads at least 400m away when the firing is to take place. In special case suitable extra precaution shall be taken. The Engineer-in-charge may however permit blasting for under ground excavation, without restriction of fixed time provided that he is satisfied that proper precaution are taken to give sufficient warning to all concerned and that work of other

agencies on the site is not hampered. For lightening the fuse a lamp with strong flame such as carbide lamp shall be used. The contractor's supervisor shall watch the required time for the firing of the fused and shall see that all the workmen are under safe shelters in good time.

3.4.14. Electrical firing.

Only the contractor's Supervisor in charge shall posses key of the exploder an short firing accessories and he shall keep it away with himself. Special apparatus shall be used as a source of current for the blasting operations. Power lined shall not be tapped for the purpose. The detonators shall be checked before use. For blast in series, only detonators of the same manufacturer of the same group of electrical resistance shall be used. Such electrical lines as could constitute danger for work of charging shall be removed from the site. The firing cables shall have a proper insulating cover so as to avoid short circuiting due to the contract with water metallic part of rock. The use of earth as a return line shall not be permitted. The firing cables shall be connected to source of current only when no body is in the area of blasting. Before firing, the circuit shall be checked by a suitable apparatus. After firing weather which or without an actual blast the contact between the firing cables and the source of the current shall be cut off before any one is allowed to leave the shelter. During storm changing with electrical detonators shall be suspended. The charges, already placed in the holes shall be blasted as quickly as possible but taking all the safety precautions, ad giving necessary warning signals. If this is not possible the site shall be abandoned till the storm has passed.

3.4.15. Precaution after Blasting

After the blast the contractor Supervisor must carefully inspect the work and satisfy himself that all the charges have exploded. After the blast is taken place in underground works, workmen shall not be allowed to go to the place till all the toxic gases are evacuated from the face.

3.4.16. Misfires

If it suspected that part of the blast has failed to fire and delayed, sufficient time shall be allowed to elapse before entering the danger zone. When fuse and blasting caps are used a safe time should be allowed and then the contractor's Supervisor alone shall leave the shelter to see the misfire. None of the drillers are to work nearer this hole under one of the two following operations have been carried out by the supervisor. Either (i) the supervisor should very carefully extract the temping with wooden scraper of jet of water or compressed air using pipe of soft materials and withdraw the fuse with the primer and detonator attached after which a fresh prime and detonator with fuse should be placed in this hole and fired out (ii) the hole may be cleared of 300m of capping & the direction be ascertained by placing a stick in the hole. Another hole may be drilled at least 225mm. away and parallel to it. This hole should then e-charged and
fired. The balance of the cartridge and detonators found in the muck shall be removed. Before leaving this work the contractor's supervisor should inform the supervision of the relieving shift of any case of misfires and should point out the position with Red Cross denoting the same also stating what action if any he has taken in the matter. A register of misfires and their location and how they were dealt with hall be maintained by the contractor. The contractor's Supervisor should also at one report at the contractor's office all cases of misfires, the cause of the same and what steps were taken in connection there with. The name of the day and night shift supervisor of the contractor must be noted daily in the contractor's office if misfire has been found to be due to defective detonator or dynamite the whole quantity of box from which the defective article was taken must be returned to the contractor's office for inspection and shall be disposed off as per rules & regulation of the act. Blasting operation when considered necessary shall be restored to only with written permission of the Engineer-in-charge. Prior inspection shall be carried out for the safety & stability of the public and property. Blasting operation in the proximity of overhead power line, communication line utility lines or other structures shall not be carried on until the operator or the owner of both such lines have been notified and precautionary measures deemed necessary have been taken. Any damage to the neighboring building properties, standing crops and life due to blasting shall be made good by the contractor at his cost.

3.4.17. General

The price included in the schedule for the work required by this section shall be all inclusive constituting full compensation for mobilizing, demobilizing and supplying all equipment, materials, labour, supervision and all incidental work except for any item specifically exempted there from and for which in addition specific payment item has been included in the schedule.

3.4.18. Common Excavation

Measurement for all works done should be on the level sections initial levels and final levels will be taken at every 3m square grid and the contractor shall accept such levels, either in the book or graph sheets, or in both as directed by the Engineer-in-charge. If the dumps the excavated materials in an irregular way or not confirming to the dumping specifications, the department will withhold 20% (of the rate) and the same can only be released after the work is completed up to the foundation grade. No allowance shall be made for over excavations beyond the specified minimum lines of excavations except where specifically authorized.

No extra payment for any over breakage and subsequent repairs shall be payable and deemed to have been included in the applicable item of schedule of bid.

Payment of common excavation shall be made on the basis of the unit price entered for the particular item in the schedule.

3.4.19. Excavation of Soil and Disintegrated (D.I) Rock

Excavation of soil shall comprise of all kinds of soil such as vegetable or organic soil turf, sand, silt, loam, clay mud, peat, black cotton soil, loose or compact moorum, soft stiff/heavy/hard shale, stony earth mixed with gravel having 300mm maximum diameter in one direction. Excavation of D.I. shall comprise of soling of roads/paths, hard core, macadam surface, lean, concrete, stone masonry, brick work, soft conglomerate, lime stone, sand stone, laterite, hard conglomerate and types of D.I. rock, which does not require blasting an can be quarried or split with pick axe and crow bars. If however the contractor resorts to blasting in such strata and D.I. rocks for his convenience, no extra payment shall be made the materials shall not be classified in higher grade. Excavation for canal shall confirm to provisions of relevant I.S codes, Sides slopes are to be provided as per the approved drawings, specification and provision of I.S code.

3.4.20. Excavation of Medium Hard Rock

This shall include all solid rock in place of such hardness and texture that it can not be removed by pick axe and crowbars and only to be removed by means of appropriate blasting. All boulders or detached pieces of solid rocks having volume greater than 0.50 cum, can be classified as Medium Hard Rock. The excavated rock and debris so obtained shall be carried and dumped/stacked separately with varying lead at places indicated by the Engineer. The excavated materials shall be the property of the Department. Payment for medium Hard Rock by means of appropriate blasting shall be made as per level section (Pre & finished). A closer interval for leveling may be adopted if considered necessary as per opinion of the Engineer-in-charge. Boulders having volume more than 0.5 cum shall be pre measured.

3.4.21. Over Excavation

The foundation excavation shall be made to exact designed section in all kinds of soil and D.I. rock. No over excavation will be allowed in such reaches. However, in Medium Hard Rock formation over excavation to the extent of 10 cm. depth on an average will be allowed and paid for in the respective item. In case of over excavation beyond 10 cm depth due to poor geological formation certified by the Superintending Engineer and approved by the Chief Engineer payments would be made for removal of such quantity only.

3.4.22. Rock Excavation

Measurement for payment of medium hard rock and sheet rock excavation in open cut as required by this section shall be made of the total volume of rock in cubic meters contained, within the minimum lines for such excavation shown on the drawings or as specifically directed. The profile of the original rock surface, prior to excavation shall be established by taking levels of 3M. square grid. The final levels on finished surface shall similarly be taken on a 3M square grid on concurrent points as that of initial grid. With these profiles, the quantities on rock excavation shall be worked out. In case hard rock boulders met during

excavation for which blasting is restored to, the isis required to take up blasting & stack the blasted debris in closely packed stack as directed by the Engineer-in-charge and payment will be made for the solid quantity of rock calculated after deducting. No allowance shall be made for over excavation beyond the minimum lines the excavation except where specifically authorized. No extra payment for any over breakage and subsequent repairs shall be payable and deemed to have been included in the applicable item of the schedule of bid. If the contractor dumps the excavated rock in an irregular way or not confirming to the dumping specifications, the department will withhold 20% of the rate and the same can only be released after the contractor removes the materials to the proper place for dumping. Payment for rock excavation shall be made on the basis of the unit price entered for the particular item in the schedule.

3.4.23 Dewatering:

General:

Dewatering shall be carried out by the contractor at his own cost & as per approval of the Engineer in charge to enable excavation, mucking, inspection, final preparation of the surface, providing anchor bars, grouting, laying of concrete & masonry and allied constructional activities.

3.4.24. Dewatering by Electrical/Diesel Pumps

Electric/Diesel Pumps (as approved by the Engineer-in-charge) of requisite capacity shall be installed in order to handle seepage. In case of electric pumps circuits shall be isolated from any other electric installation and the switch gears and pumping equipment shall be maintained in satisfactory condition to avoid loss of energy. If diesel pumps are used, all costs of POL, running and maintenance shall be borne by the contractor deemed to have been included in the unit price of the particular item in the schedule of bid. Similarly the cost of electricity, running and maintenance of electric pumps, if used, shall be deemed to have been included in the unit price for the particulars item in the schedule of bid. No payment will made separately for de-watering. All dewatering is to be done at the contractor's cost and the rates for all items should included the dewatering operation.

3.5. Anchor Bars in Rocks

Drilling Holes for Anchor Bars

Where ever shown in the drawings or as directed, holes shall be drilled into the rock to receive bars for anchoring concrete, masonry and ground mat to the rock. The dimension of the anchor bars and the location diameter and depth of anchor bar holes shall be as shown in the drawings or as directed. The diameter of the anchor bar hoes shall be not less than 15 times the diameter or the greatest transverse dimension of the anchor bar specified for that holes.

3.5.1. Placing Anchor Bars and Grouting

Anchor bars should be cleaned thoroughly before being placed. The holes shall be cleaned thoroughly, kept flagged until placing the bars and shall be filled completely and compactly with grout or mortar mixed in the proportions and to the consistency specified by the Engineer-in-charge. All water shall be removed from the

hole when the anchor grout is placed. The anchor bars shall be forced into place before the grout or mortar has taken its initial set and where practicable shall be vibrated sufficiently so that entire surface of the embedded portion of the bars is in intimate contact with the grout. Special care shall be taken to ensure against movement of the bars, which have been placed. Anchor bars shall be placed and grouted not less than 6 days in advance of concrete/masonry operations to allow the grout to set Anchor bars found loose after setting shall be replaced by the expense of the contractor.

3.5.2. Measurement and Payment

The price entered in the schedule for this work required by this section shall be inclusive of mobilization, demobilization, cost of all materials, labour supervision and all incidental works including all leads, lifts, delifts, charges for loading, unloading, cost of materials, conveyance, taxes and all operation etc. complete.

3.6. Refilling with Sand in Foundation

The sand required for refilling the foundation of the structure bays founded on clay or the deep scour holes shall be free from clods of clay and other deleterious substances and laid in layers of 300mm with profuse watering. The materials excavated from the foundation of the adjoining area can be used for filling subject to its suitability and approval by the Engineer-in-charge.

3.7. Embankment (Afflux bund & Guide bund)

3.7.1. General.

Embankment shall be constructed to the lines and grade with earth fill having desired parameters of density, cohesion, permeability etc. so as to ensure the designed stability and performance of the whole embankment. The quality control organization of the Department will carryout requisite tests for the suitability of the construction material well in advance and the contractor shall ensure that only approved materials are brought to place of fill and used for construction of embankment.

3.7.2. Foundation preparation subsequent to stripping and excavation.

3.7.2.1 Soil Foundation: Soil foundation under the seat of embankment shall be scarified and loosened by means of a plough, ripper or other means to a depth of about 15 cm to 20 cm to the satisfaction of the Engineer-in-charge. Roots or other debris turned up during scarifying shall be removed from the entire foundation area for the fill. It shall then be moistened to slightly above the optimum moisture and compacted by required number of passes of the compaction equipment to the same percentage of compaction as that of embankment. The purpose of using higher moisture than optimum is to ensure forcing of the soil into any unseen soft zones just below the surface. The first few layers of fill for the embankment shall be of depth of 10 cm to 15 cm and shall be carefully placed, ensuring uniform compactions and a satisfactory intimate bond between the foundation soil and fill materials. Heavy rubber tyre rollers or vibratory rollers may be used for compaction because they will follow the irregular surface an d not bridge over small low areas as other type of rolling equipment will do. Sheep foot rollers shall be used for compaction of impervious soil and preferably vibratory type rollers shall be used for compaction of all other soil and rock. Separate payment shall not be

made for preparation of foundation as above and it shall be deemed to have been included in the unit rate quoted for respective item of embankment.

3.7.2.2 Sand Foundation: Sand met within foundation shall be tested for its lateral relative density. In reaches where the relative density is less than 70% the foundation sand shall be compacted by any of the approved methods to obtain a minimum relative density of 70% until the foundation has been tested and the relative density found to exceed 70%, earth fill shall not be allowed to be placed. This is necessary to minimize the effect of any structural readjustment in a loose foundation.

3.8. Borrow area

3.8.1. GENERAL

All materials required for the construction of embankment and around the structures shall be obtained from borrow areas after stripping and duly approved by Engineer-in-charge in consultation with quality control unit of the department only if the materials available from excavation of foundation of the structure and ancillary works are found to be unsuitable for use in construction of the embankment. The contractor has to borrow earth at his own cost and responsibility. No Compensation whatsoever for acquiring land for borrow area and for change in limits and locations of the borrow areas and depth of cut for getting suitable earth shall be paid to the contractor. No excavation is allowed within a distance of ten times the height of embankment from the outer roe. Borrow pits shall be operated so as not to impair the usefulness or mar the appearance of any part of the work or any other property. The surfaces of wasted materials shall be left in a reasonable level and even condition.

3.8.2. PREPARATION OF BORROW AREAS

All areas required for borrowing earth for embankment shall be cleared of all tree stumps, root, bushes, rubbish and other objectionable materials. Adequate lighting arrangement should be provided by the contractor. Particular care shall be taken to exclude all organic matters from the materials to be placed in the embankment. All cleared organic materials shall be burnt to ashes or disposed off as directed. The cleared areas shall be maintained free of vegetable growth during the progress of the work. No payment shall be admissible for preparation of the borrow areas indicated above as this is deemed to have been included in unit bid price.

3.8.3. STRIPPING OF BORROW AREAS

Borrow areas shall be stripped of top soil, and any other objectionable materials to the required depth as approved by Engineer-in-charge. The work may be done manually or with suitable machines. Stripping operations shall be limited only to designated borrow areas. Materials from stripping shall be disposed off in exhausted borrow areas or in the approved adjacent areas as directed. No extra payment shall be admissible for stripping the borrow areas as this is deemed to have been included in the unit bid price.

3.9. HAUL ROADS AND APPROACH ROADS

Construction and maintenance of approach roads and haulage roads will be the responsibility of the Contractor, as per the direction of Engineer-in-charge. The department will have full right of use to those roads for inspection purposes. Proper road sign as required have to be provided for safety. For haulage of earth, the contractor shall construct ramps and haulage of sufficient width along the shortest but most practical route and shall maintain and illuminate them in a satisfactory manner. Watering of the haul road shall be done by the contractor as often as necessary to prevent rising of dust, formation of cuts and consequent deterioration of the surface. Whenever service roads meant for public through fare traverse through or run close to the borrow area, the Contractor shall direct his excavation and haulage operation in such a manner as to ensure uninterrupted use of the service road and safety to the public. At the haul road and service road crossing the contractor shall install necessary check gates and road signs. No Extra payment for haul road is admissible as this is deemed to have been included in the unit bid price for earth work item of schedule of quantities being contingent to the man work.

3.10 Earth Fill Material.

3.10.1. HOMOGENEOUS EARTH FILL

Embankment shall be constructed to the top width and side slopes as shown on the drawings. Suitable excavated materials available from ground cutting, removal of ramps and excavation for structures shall be used for construction of banks. If suitable and adequate materials for constructing embankment is not available from excavations, the desired material shall be obtained from approved borrow areas after getting approval of the Engineer-in-charge. The planning for execution should be such that all the useful excavated materials are utilized in embankment prior to utilization of borrow earth from outside.(i) Only suitable materials under classification shall be excavated, loaded and conveyed to the point of placement in the embankment. Unsuitable materials if conveyed will be removed and disposed clear of the work site as directed by the Engineer-in-Charge at the cost of the Contractor. The maximum dimension of stones, pebbles and rock fragments etc. placed in the outside zone of the embankment shall not be more than 15 cm and the quantity of such stone shall not exceed 5%.(ii) Construction of embankment shall begin at the toe of the fill and in no case shall embankment be widened by material dumped from the top. The material shall be placed in the earth fill in the continuous horizontal layers not more than 15cm in thickness after being rolled as herein specified. The thickness of the layer shall be adjusted by the Engineer-in-charge, if the contractor satisfies the department that the particular type of compactors used by him give the required density as specified in drawing by carrying out trial compaction and requisite tests. The thickness of horizontal layers after compaction shall not be more than 10 cm if compaction is performed by mechanical tampers and not more than 15 cm if compaction by sheep foot rollers. Initially the earth in the embankment fill will be laid in a

greater width than the designed section. Adequate extra width of about 0.6 m on either side of the embankment shall be provided so that the earth fill up to lines of the finished slopes shall have the required compaction as per the drawing and specification. Such extra width shall be removed and utilized in the upper layers of embankment along with slope dressing for which no additional payment will be made as it is deemed to have been included in bid price for respective item. (iii) No fresh layer shall be laid the previous layer is properly watered and compacted as per the requirement. If in the opinion of the Engineer-in-Charge, the surface of the prepared foundation or the rolled surface of any layer of earth fill is too dry or smooth to bind properly with the layer of materials to be placed thereon. It shall be moistened or worked with harrow, scarifier or other suitable equipment in an approved manner to a sufficient depth to provide a satisfactory binding surface with the next succeeding layer of earth fill. If a layer is found to be too wet for proper compaction of the layer of earth fill materials to be placed there on, it shall be racked up and allowed to dry or be worked with harrow, scarifier or any other suitable equipment to reduce the moisture content to the required amount and then it shall be compacted before the next succeeding layer of earth fill materials is placed. (iv) The materials shall be deposited in row parallel to the axis and spread in the uniform layers and breaking clods maximum up to 5 cm. sizes. Loads shall be dumped and spaced so that the progress of spreading shall produce adequate blending resulting in uniform layers not exceeding 22.5 cm. The work of spreading and compaction shall be so adjusted as not to interfere with each other and in such a way that neither of the operations is held up because of non-completion of rolling and watering. The excavation and placing operations shall be such that the material when compacted shall be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability. The surface of banking shall at all time of construction be maintained true to required cross section.

(v) During construction a small transverse slope from centre towards edges should be given to avoid pools of water forming due to rains. Embankment materials shall be placed only when the weather conditions are satisfactory to permit accurate control of the moisture content in the embankment materials. Before closing work on embankment, in any continuous reach prior to setting of monsoon, the top surface shall be graded and rolled with a smooth wheeled roller to facilitate run off. Prior to resuming work, the top surface shall be scarified and moistened or allowed to dry as necessary and approved by the Engineer-in-charge for resumption. The contractor shall provide suitable protection works to protect the slope from erosion due to rain water. No payment whatsoever shall be made for providing such protection work and rectifying the monsoon damages.

3.10.2. MOISTURE CONTROL:

The water content of the earth fill material prior to and during compaction shall be distributed uniformly throughout each layer of materials and it shall be between +2% to (-)2% of the optimum moisture content. Moisture determination of soil as well as determination of needed moisture shall be carried out as per designations of Earth Manual (July'74 second reprint 1985) and IS 2720-1983. Flooding at borrow area for

preconditioning of moisture is preferable and effect only correction for moisture in the embankment. As far as possible the moisture content of the material shall be conditioned prior to its delivery on the embankment. It is preferable to use sprinkler for moisturing earth fill over the embankment use of jet of water for moisturing should be avoided. In order to have proper control of moisture content in the earth fill, no earth work will be done during rainy days. No compensation will be made to the contractor due to held up of work for rain, fog and high moisture content in the working process.

3.11. Compaction

3.11.1. General

(i) Having decided on the filling materials to be used, standard compaction test shall be made on the materials proposed for embankment to indicate broadly which are the most suitable and to give a rough idea of the best type of equipment to be used and the moisture content at which compaction should be undertaken and also to determine the effects of soil moisture content, thickness of layer and number of passes. (ii) Having decided on the thickness of layer and range of moisture contents, test should be made with different type of equipments available and the required number of passes should also be determined.

(iii) In all this work, the state of compaction should be measured in terms of dry density. (iv) Density fests shall be made after rolling, standard proctor density test shall be carried out at regular intervals to account for variations in the borrow area materials as well as that in-situ excavated materials. Not less than three tests shall be carried out to indicate variations in the standard proctor density attained in the laboratory.

(v) Density test shall be conducted from time to time on site to ascertain whether the compactions attained as specified. For every 1500 cubic meters of compacted earth work, at least one field density test shall be taken. Minimum four density tests shall be taken per day irrespective of quantity of earthwork. In case the tests show that the specified densities are not attained, suitable measures shall be taken by contractor either by moisture correction or by entire removal and relaying of layer or by additional rolling so as to obtain the specified density which shall be checked again by taking fresh tests at the same location. Each layer shall be tested after rolling for proper compaction and after that fresh layer over it will be allowed. Necessary unskilled labour required for carrying out such density tests shall be provided by the contractor. However testing charges shall be borne by the department. (vi) Contractor shall supply all materials, labour, machinery and equipment at his cost for the work. (vii) No extra payment shall be made for these operations as this shall be deemed to have been included the price bid in schedule of quantities for the respective items of work.

3.11.2. Rolling.

When each layer of materials has been prepared so as to have the proper moisture content uniformly distributed throughout the material it shall be compacted by passing the tamping roller. The exact number of passes for each layer to obtain specified density shall be designed by the field laboratory after necessary test. The layers shall be compacted in strips overlapping not less than 0.6m. Rolling shall commence at edges and progress towards center longitudinally. The rollers of loaded vehicles shall travel in a direction

parallel to the axis of the embankment. Turns shall be made carefully to ensure uniform compaction. Rollers shall always be pulled. Density tests shall be made after rolling and dry density attained shall satisfy the specified compaction standards. Standard proctor density test shall be carried out at regular interval to account for variations in the borrow area materials as well as that in-situ excavated materials. The locations where compactions of the earth fill materials by means of the roller is impracticable or undesirable the earth fill in that locations shall be specially compacted by means of pneumatic tampers.

3.11.3. COMPACTION OF COHESIONLESS MATERIALS:

Where compaction of cohesion less free draining materials such as sand and gravel is required, the materials shall be deposited in horizontal layers and compacted to the relative density specified. The excavation and placing operations shall be such that the materials when compacted shall be blended sufficiently to secure the highest practicable unit weight and best stability. Water shall be added to the materials as may be required to obtain the specified density by method of compaction being used. The thickness of the horizontal layers after compaction shall not be more than 10 cm if compaction is performed by tampers, not more than 15cm. if by rollers. The relative density of compacted materials shall not be less than 85% as determined by laboratory test.

3.11.4. Dressing slopes

The outside slopes of the embankment shall be neatly dressed to lines and grade as shown in the drawing as the placing of fill progresses. Compaction shall extend over the full width of the embankment and material in slopes shall be compacted as for the rest of the bank. To ensure proper compaction of the edges, the cross section of the fill during construction shall be kept suitably wider as directed by Engineer-in-charge and cross section shall be dressed to the designed requirement after compaction for which no extra payment shall be made as it is deemed to have been included in unit bid price for item of schedule of quantities. Material used to fill depression shall be of same type as used in the embankment and shall be thoroughly compacted and bonded to the original surface. Slopes shall be maintained till final completion and acceptance. Any material, that is lost by rains, weathering or other causes shall be replaced at the cost of the contractor till completion of the works and taking over by the Department.

3.11.5. Settlement Allowance:

In the earth fill embankment, settlement allowance of 2% will be provided. Accordingly extra height shall be provided but payment for design height will be made. The base width of the embankment will not be increased to maintain the design slopes indicated in the drawings for the additional height as settlement allowance, but the following procedure will be adopted. Settlement allowance will be calculated at various levels where the slope is to be changed and the elevations including settlement allowance will be derived, keeping the embankment widths at the designed levels unchanged. The edges of embankment at the increased elevations (including settlement) when joined with the point where the slope has changed earlier

below, shall give the slope to be adopted for construction. If the embankment is raised in more than one season provision for settlement shall be made in the last season's construction as described above.

3.11.6. Measurement and Payment (Earth fill):

3.11.7. MEASUREMENT FOR PAYMENT.

(a) All works shall be measured by levels.

(b) For payments the level books, field book, the cross section sheets and calculation sheets shall be treated as adjuncts to the measurement books. (c) All linear measurements shall be in meters, correct to 0.01 meter, area worked out in square meter correct to 0.01 M2 and volume worked out in cubic meters correct to 0.01 M3.

(d) The quantities between the levels taken after stripping and cross sectional levels taken after construction of consolidated embankments under OMC conditions with the available useful excavated soils within the designed section shall be worked out excluding riprap, rock toe and filters etc. It shall be clearly understood that construction of embankments to extra widths as specified above and extra height formed for settlement allowance as specified earlier will not be included for payment.

(e) The measurement for construction of consolidated embankments with the materials obtained from the borrow area shall be the difference between the net quantities of the final compacted embankment section under OMC and net quantities of compacted embankments constructed with the suitable materials from all excavations as specified above and in earlier paragraphs. Final measurements and levels shall be taken at the cross sections of the completed compacted bank design section after the slopes dressed to ensure that the work is completed as shown on the drawings plus settlement allowances. The measurements for computation of quantities shall not include the extra section provided for compaction of earth fill up to lines of finished slope and for settlement height.

3.11.8. RATE FOR PAYMENT:

The rate for embankment fill under the item provides all costs for labour, materials, tools and plants, machinery, token excavation, transportation and incidental operations required for carrying out and completing the item of work in accordance with the specification, drawing and as directed by Engineer-in-charge.

3.11.9. Fine Dressing and Turfing on the outside slopes.

The outside slope of the embankment as per line, grade and dimensions of the drawing shall be protected by turfing the entire slope including the berms. After the slope has been fine dressed to the line, it shall be roughened or packed evenly without any additional cost. The entire surface shall then be covered with a layer of dub grass sods consisting of blocks or strips of dense living grass growth as approved. The sods shall include a mat of root and earth at least 5 cm. thick. Sods containing an excess among of obnoxious growth shall be excluded. Sods shall be carefully handled in transportation and transplantation so that minimum amount of earth will be lost from the root mass. The strips of blocks of sods shall be laid on the slope in close contact and then tamped firmly in place so as to fill and close joint between the blocks. Interval

of time between collecting and laying shall be kept to a practical minimum and sods shall not be permitted to dry out. Immediately after placing the sods slopes shall be periodically moistured and if necessary for a sufficient period to re-establish the plant growth. Sods shall be transplanted generally from July to November. Arrangement of suitable sods is the responsibility of the contractor. The contractor will maintained the earth fill at his own cost till the items of turfing is completed. The measurement is to be made on the covered area basis and item will be paid at the bid price for finished item after survival of the turf for reasonable period as determined by the Engineer-in-charge. The unit bid price shall be for the finished item including the collection transportation within all lead, all lifts and de-lifts, loading, unloading, surface preparation, transplantation, tamping, watering till survival of sods, all labour, materials, taxes, tools, equipments and all incidental operations necessary to complete the work as per specification and as per direction of Engineer-in-Charge.

3.12. Inspection and Tests

3.12.1. GENERAL

The Engineer-in-charge shall maintain and exercise a thorough check on the quality of fill materials delivered to the embankment and will arrange to obtain the data-in-situ properties of the materials after compaction for comparison with design assumption. To achieve these objectives, a programme of fill testing and inspection shall be planned to effect quality control.

3.12.2. SCOPE OF TESTING AND INSPECTION REQUIRED.

Field control of fill materials will require visual and laboratory checks. The checks on the effectiveness of placement and compaction procedures shall be made by field density test at prescribed intervals. The control shall be both of the method type and on an end result basis. Department might review the design if necessary on examination of density test result and the contractor shall have no claim arising out of such a review and consequent change, if any, in the design.

3.12.3. EMBANKMENT TEST SECTION.

Placement and compaction methods specified will have to be verified by test embankment section to be built prior to starting of fill operations or at an early stage of construction. Either the initial stage of construction itself could be made to serve the purpose of test embankments or test embankment sections can be established in borrow areas. The test sections referred herein shall be used to establish:

a) Layer thickness of fill materials.

b) Optimum Practicable moisture content.

c) Number of passes of sheep foot roller or weight of laboratory rollers vis-à-vis number of passes for effective compaction.

d) For pneumatic tyred compaction equipment, the test required will be such as to determine the most suitable loading, tyred pressures, moisture contents and number of coverage for compaction of the materials. Using the available data from borrow pits, investigations of the materials to be used in the test section, the optimum moisture content as determined by laboratory tests will be known and 3 percent less than this moisture content should be used in the first 3 or 4 layers rolled. After 3 or 4 layers have been placed at 3

percent less than the laboratory optimum moisture content, field density tests should be made throughout the section. These tests should be made for at least each 100 sq. meter of test section area, and should be distributed over the area that they will depict the effects of different compacting conditions encountered during construction. For example, if the section is located near an abutment, certain parts of the area will receive more compaction from track travel than other, hence some tests should be made in the portion compacted early by the rollers and so restored. The next step is to compact another 3 or 4 layers at the moisture content slightly higher (1percent or 2 percent) than the moisture content previously used, maintaining the same rolled thickness of layer and number of roller passes as in above. Field density tests are again made over the test section. If the resulting field dry densities (of material passing the No.4 sieve) show an increase with increase of moisture, then increase the moisture again by another 1percent or 2 percent and repeat the test. If an increase in moisture results in a decrease in field density, then place the next layer slightly dry of the original moisture content used and repeat the test. This procedure is nothing more than developing on the embankment a moisture density relation or compaction curve for certain roller, thickness of layer and a given number of roller trips. If special studies during investigations have indicated that material being tested should be placed within certain moisture limits or if the moisture limits to be used have been specified, the procedure outlined above should include test at these moisture contents or at moisture contents.

3.12.4. BEFORE COMPACTION.

Materials delivered to the fill shall be visually examined and their properties estimated by way of inspection. i) Moisture content tests shall be carried out in the laboratory while placing the fill materials. ii) Moisture content shall be controlled by adding water or allowing the soil to dry according to laboratory tests. iii) It shall be ensured that the methods of dumping, spreading and moisture conditions are such as will, result in reducing segregation and/or variation of moisture content to minimum.

3.12.5. DURING COMPACTION

It is intended that the checks on operations during compaction shall verify : i) That the layer thickness of the materials is specified. ii) That the fill is compacted to required standard proctor density or relative density by the specified number of passes of specified machinery. iii) That no excessive rutting, weaving or a scaling of the fill occurs during compaction.

3.12.5. AFTER COMPACTION**.**

The condition of the fill after compaction shall be observed and recorded particularly with respect to cutting or weaving. However, the properties of materials after compaction shall be determined primarily by field density tests. Routine tests on samples taken from constructed embankments shall include, besides Density tests, Grain size distribution, Atterberg limits, Shear and consolidation characteristics.

3.12.6. FREQUENCY OF TESTING

a) It will be necessary to carry out sampling and test of materials before and after compaction at sufficient frequencies so that effective checks on the fill operations are maintained. The testing frequencies proposed should correspond to the frequencies as shown in Annexure-I. However, the actual frequencies should be adjusted to suit the nature and variability of materials placed and the rate of fill placement. b) Testing shall be performed at higher rates than those given in Annexure -I, during initial stages of placing in order to establish control and testing techniques. Also testing shall be conducted at higher rates in case of special problems such as materials variation, equipment performance and weather. c) In addition, these tests shall be made i) in area where the degree of compaction is doubtful. ii) in area where embankment operations are concentrated. iii) at the locations of all embedded instruments for record. d) Locations of likely insufficient compaction shall cover the following or any other area so determined by Engineer-in-charge. i) The junction between areas of mechanical tamping and rolled embankment along abutments or cutoff walls. ii) Areas where rollers turn during rolling operations. iii) Areas containing materials differing substantially from the average.

3.12.7. RECORDS AND REPORTS.

Records of borrow area materials and embankment placing operations shall be maintained in order to have a continuous check on the suitability and availability of fill materials and quality of the fill. Thus it will be possible to have complete description of materials in any portion of the embankments. A foundation register is to be maintained in approved format for passing of the foundation by competent authority. No fill material to be placed on any part of the foundation unless foundation is inspected, surveyed and approved in writing and cleared by flagging for daily work.

3.12.8. Protection

The contractor shall take all precautions necessary for the protection of the embankment work by diversion of stream, local surface drainage, rain water etc. if these are likely to damage the work. Any damage to earth work due to any reason what so ever shall be made good by the contractor at his cost till the work is certified as completed and taken over by the Department.

3.12.9. Applicable Standard.

Publication of Bureau of Indian Standards (BIS) Indian Standard

(i) IS: 1948-1970 Classification & Identification of soils for General Engineering purpose (First revision)

(ii) IS: 1988-1982 Methods of load test on soils (Second revision)

(iii) IS: 2131-1981 Methods for standard penetration test for soils (First revision).

(iv) IS: 4332-1967 Method of sampling and preparation of established soils for testing (Part-I)

(v) IS: 4558-1983 Code of practice for under-drainage of lined canals (First revision)

(vi) IS: 4701-1982 Earth work on canals (First revision)

(vii) IS: 5529-1969 Test in Over burden (Part-I)

(viii) IS: 7894-1975 Code of practice for stability analysis of earth dams.

(ix) IS: 8414-1977 Guidelines for design of under seepage control measures for earth and rock fill dams.

(x) IS: 8419-1977 Filtration media – sand and gravel (Part-I)

(xi) USBR Earth Manual by United State Bureau of Reclamation. Earth Manual.

(xii) Quality control Irrigation & Power Dept., Govt. of Odisha. & Field instruction.

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ANNEXURE – I

(See Clause 3.5.10.7)

TESTING FREQUENCY

Material Volume or Time between Tests Remarks

before compaction After compaction

Gradation

Moisture content

Field Density

Permea-bility

Triaxial shear tests

Consoli-dation test

1 2 3 4 5 6 7 8

3.12.10. Back filling with selected materials in the back side of abutments, flank wall and the existing flood protection embankment.

3.13. General

a) The type of material used for back fill, and the manner of depositing the material shall be subject to approval by the Engineer-in-charge. As far as practicable, back fill material shall be obtained from the excavation for structures or from excavation of other ancillary works. Back filling shall be restricted until structure is completed. The back fill materials shall only be procured from the site other than excavated pit of the structure when the quality of excavated materials is found unsuitable or the quantity insufficient. The decision of Engineer-in-charge is binding regarding the disposal of excavated material in the dumping yard or to be utilized as back fill materials. The schedule of construction of components of civil works should be prepared such that the maximum amount of excavated material if found suitable should be utilized as back fill materials.

b) Back fill materials shall contain no stones large than 7.5 mm size.

c) The previous materials (sand) with profuse watering used for back filling in the back of abutment flank-wall shall be placed as shown on drawing or as directed by Engineer-in-Charge. d) Back fill shall not be placed against retaining walls until the retaining wall is cured adequately and is strong enough to take lateral pressure of the back fill. e) The back fill material shall be placed carefully and spreaded in uniform layers not exceeding 15 cm. The back fill shall be brought up as uniformly as practicable on both sides of walls and all sides of structures to prevent unequal loading. The back fill material shall be placed at about the same

elevation on both sides of the structure and difference in elevation shall not exceed 15cm at any time. Black cotton soil should never be used as back fill material. Tamping to be used for compaction of the back fill immediately adjoining the structure.

3.14. Measurement and Payment.

Measurement for payment for back filling around structures will be made according to the pay line given or the drawings and the back fill outside of those pay lines will be at the cost of the Contractor. The payment shall be made on cubic meter basis under relevant items of schedule of quantities.

CHAPTER-IV

4.0. CONCRETING

4.1. Scope of works: This chapter covers specification for items No

4.2. Description of Items.

Refer Item No. of Bill of Quantity

4.3. Applicable Publication.

All concrete, its constituents, methods and procedures of manufacture shall conform to relevant Indian Standard Specification and other publications listed below unless otherwise specified.

4.3.1. Publication of Bureau of Indian Standard (BIS)

1. IS: 269-1976 Ordinary and low heat Portland cement (third revision) (with amendment No. 1 to 5)
2. IS: 383-1970 Coarse and fine aggregates from natural sources concrete (second revision) (Reaffirmed 1980)
3. IS: 456-1978 Code of practice for plain and reinforced concrete (third revision) Amendment No.14. IS: 455-1976 Portland slag cement (third revision) (with amendment No. 1 to 5) 5. IS: 457-1957 Code of practice for general construction of plain and reinforced concrete for dams and other massive structures. 6. IS: 460-1985 Test Sieves

Part 1 to 3

7. IS: 516-1959 Methods of test for strength of concrete (with amendment No.1)
8. IS: 650-1966 Standard sand for testing of cement (first revision) (with amendments No. 1 & 2) (Reaffirmed 1980).
9. IS: 883-1970 Code of practice for design of concrete member in bulking (Third Revision).
10. IS: 1199-1959 Methods of sampling and analysis of concrete.
11. IS: 1489-1976 Portland pozzolana cement (Second revision) (With amendments No. 1 to 5)
12. IS: 1791-1985 General requirements for batch concrete mixers (Second revision)
13. IS: 2506-1985 General requirements for concrete vibrator screed board type (first revision)
14. IS: 2580-1982 Jute sacking bags for packing cement (Second revision) Amendments No. 1 to 3
15. IS: 2722-1964 Portable swing weigh batchers for concrete (Single and double bucket type
16. IS: 3085-1965 Methods of test for permeability of cement mortar and concrete (Re-affirmed 1980)
17. IS: 3770 Code of practice for concrete structures for the shortage of liquids Part 1 to 4 18. IS: 3558-1983 Code of practice for use of immersion vibrators for consolidating concrete (first revision) 19. IS: 3873-1978 Code of practice for laying in-situ cement concrete lining on canals (First revision)
20. IS: 4031-1968 Methods of physical tests for hydraulic cement (Reaffirmed 1980)
21. IS: 4032-1985 Method of chemical analysis of hydraulic cement (first Revision)
22. IS: 4656-1968 From vibratos for concrete
23. IS: 4845-1968 Definition and terminology relating to hydraulic cement (Reaffirmed 1980)

24. IS: 4634-1968 Method for testing performance of batch type concrete mixers.
25. IS: 4925-1968 Concrete batching and mixing plant.
26. IS: 4926-1976 Ready-mixed concrete (first revision)
27. IS: 5242-1979 Method of test for determining shear strength of metals (first revision)
28. IS: 5512-1983 Flow table for use in tests of hydraulic cement and pozzolanic materials (first revision).
29. IS: 5513-1976 Vicat apparatus (first revision with amendment No.1).
30. IS: 5515-1983 Compacting factor apparatus (first revision)
31. IS: 5529 Code of practice for in situ
Part 1 & 2
32. IS: 5640-1970 Method of test for determination of aggregate impact value of 33. IS: 5816-1970 Method of test splitting strength of 34. IS: 5889-1970 Vibratory plate compactor (with amendment No.1)
35. IS: 5829-1970 Concrete transit mixers and agitators.
36. IS: 6461 Glossary of terms relating to cement concrete. Part I to XII
37. IS: 6923-1973 Method of test for performance of screed board concrete vibrator.
38. IS: 6925-1973 Method of test for determination of water soluble chlorides in concrete admixtures.
39. IS: 7245-1974 Concrete pavers.
40. IS: 7320-1974 Concrete slump test apparatus with (amendment No.1)
41. IS: 7861 Code of practice for extreme weather concreting. (part 1&2)
42. IS: 8041-1978 Rapid hardening Portland cement (first revision with amendment No. 1 &2).
43. IS: 8043-1978 Hydrophobic Portland cement (first revision with Amendments No. 1 & 2)
44. IS: 8112-1967 High Strength Ordinary Portland Cement (with amendments No. 1 to 4)
45. IS: 8142-1976 Method of test for determining setting time of concrete by penetration resistance.
46. IS: 8989-1978 Safety code for erection of concrete framed structures.
47. IS: 9017-1978 Method of making curing and determination of compressive strength of
concrete test specimens.

Code of practice for corrosion protection of steel reinforcement in RB & BCC Construction A mixture of concrete Method of test for abrasion resistance of concrete. Design aids for reinforced concrete to IS: 456-1978. In addition to the above relevant Indian Standard following other publications shall also apply in case of wanting specification Indian Standard.

4.3.2 Other Publications:

1. USBR Concrete Manual (Eight edition revised print 1981)
2. ASTM C-156-80 water retention test.
3. ASTM C-309-81 Type-2 Liquid membrane- Forming compound for curing concrete.
4. ASTM C-491-90 Water reducing agents.
5. ASTM C-494-Type D water reducing agent and set retarder.

6. ASTM E-97 light reflectance test

7. IRC Standard specifications and code of practice for Road bridges (Section-I, II & III)

8. Govt. of Odisha quality control and field instruction manual (1989) I & P Dept.

4.4. Composition

a) Concrete shall be composed of cement, fine aggregate (natural sand or manufactured sand or both), coarse aggregates (manufactured), admixtures (if required) and water, well mixed in proportion and brought to the proper consistency. The design mix proportion shall be adjusted to produce a durable and workable concrete, suitable for specified conditions of placement and design strength. Use of approved admixture shall be permitted by Engineer-in-Charge only on satisfactory evidence that its use does not adversely affect the properties of concrete. b) For all items of concrete in any portion of the structure or its associated works, where nothing is specified, controlled concrete shall be used.

Control Concrete

For controlled concrete, the design of the mix proportion should be arrived on basis of trial mix after preliminary tests. Prior to and during construction, all necessary precautions should be observed to ensure that the required working strength is attained and maintained. The controlled concrete shall be of their required grade as M-10, M-15, M-20 and M-25 with proportions of cements, fine aggregate, coarse aggregates and admixture specified by weights. In designing the concrete mix the letter 'M' refers to the mix and number to the specified characteristic compressive strength of 15cm cube at 28 days expressed in N/mm2.The compressive strength requirement for various grades of concrete shall be as given in the following table.

Grades of concrete Compressive strength N/mm2 on 150 mm cube in minimum at 7 days minimum at 28 days.

4.5. Materials

4.5.1. Cement

a) Ordinary Portland cement (OPC), Portland Pozzolana cement (PPC) shall be procured in bulk by the contractor. The contractor shall not be allowed to use bag cement, unless specifically so permitted by the Engineer-in-charge. b) Only Ordinary Portland cement (OPC) shall be used for controlled concrete and other RCC construction. Pozzolana Portland Cement (PPC) may be allowed in mass concrete etc. c) The Contractor shall create a suitable and adequate infrastructures for procuring, handling, storing and conveying bulk cement to batching plant at site, with advance planning of work to be done during next one month. d) Immediately upon receipt at the site of the work, cement shall be stored separately in dry, water tight and properly ventilated structures at the cost of the contractor. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. The contractor shall produce test certificate of the manufacturer for every 500 tons of receipt of cement or as approved by Engineer-in-charge.

e) Sampling & testing shall be done by the laboratory of the Dept. No cement shall be used until clearance has been given by Engineer-in-charge that the test result are satisfactory. Cement older than 90 days shall not be used unless the test result satisfy the minimum strength requirements. For physical and chemical requirements, ordinary Portland cement and Portland pozzolana cement to conform IS: 269-1976 and IS: 1489-1976 respectively. Actual cement level required for the concrete shall be determined by mix-design.

4.5.2. Fine Aggregates

4.5.2.1. General aggregates shall conform to IS: 383-1970 or its latest version. Sand to be used shall be natural as obtained from the river bed from specified quarries. The contractor may obtain sand from different sourced which shall meet requirement of specification. Fine aggregates will be tested for their gradation specific gravity, water absorption, fineness modulus, soundness, petrography analysis, deleterious constituents and alkali aggregate reactivity to assess suitability for use.

4.5.2.2. QUALITY

a) Sand shall consist of hard, dense durable and uncoated silicious gritty materials. It shall be free from injurious amount of dust, lumps, soft and flaky particles, shale, alkali, organic matter, loam and other deleterious substances. Sand shall be washed if necessary to remove all vegetations and other foreign matter. The cost of washing and screening shall be borne by the Contractor. The maximum percentage of each of the deleterious substance in sand as delivered to the mixer shall not exceed the following values.

Material Passing *Percentage by weight*

75-Micron IS Sieve 3.0

Clay lumps 1.0

Cinders and Clinkers 0.5

Mica 2.0

Total of all deleterious substances Including alkali, mica coated grains, soft and flaky particles, loams etc. 5.0

a) Sand shall be free from injurious amount of organic impurities. Sand that are producing a colour (obtained by dissolving 9 grams of chemically pure terric chloride and 1 gram of CP cobalt chloride in 100 ml of water to which one-third ml of hydro-chloric acid has been added) darker than the standard in the test (Organic test for organic impurities shall be rejected.

4.5.2.3. GRADING

a) Sand shall be well graded so as to impart good workability and good finishing. Sieve analysis of natural sand shall conform to the following limits of gradation. *IS Sieve Percentage of weight passing on Sieve*

4.75 mm 100

2.36 mm 90-100

1.18 mm 70-100

600 micron 40-100

300 micron 5-70

150 micron 0-15

b) A sand whose grading falls outside the specified limits due to excess or deficiency of coarse or fine particles may be processed to comply with the standard by screening through a suitably sized sieve and/or blending with required quantities of suitable sizes of sand particles. Based on test results and in the light of practical experience with the use of local materials, deviation in grading of sand may be considered by the Engineer-in-charge.

4.5.2.4. FINENESS MODULUS

a) Sand should have a fineness modulus between 2.1 to 3.0 subject to the gradation specified in the preceding paragraphs. b) The modulus shall be computed by adding cumulative percentage of sand retained on the IS Sieves 4.75 mm, 2.36 mm, 1.18mm, 600 micron, 300 micron, 150 micron and dividing the sum by 100. Gradation of sand shall be so 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. Sand having any deviation from the specified range or gradation and fineness modulus shall not be permitted to be used in work without the written permission of the Engineer-in-charge.

4.5.2.5. SPECIFIC GRAVITY – 2.6 minimum.

4.5.2.6 BULKAGE – less than 20%

4.5.2.7 STORAGE

All sand shall be stored on the site of work in such a manner as to prevent intrusion of foreign matter.

4.5.3. Coarse Aggregates.

4.5.3.1. GENERAL

a) Coarse aggregates for concrete shall consist of clean, dense and durable crusher broken hard granite metal free from vegetable matter. Predominantly flaky aggregates shall not be used. The percentage of deleterious substance in coarse aggregate shall not exceed the following values. Materials passing 150 micron 1

IS Sieve screen

Shale 1

Coal 1

Soft fragments 3

Other deleterious substance 1

Clay-lumps 1

The sum of total of all deleterious materials shall not exceed 5 percent by weight. b) Coarse aggregates will be tested for their gradation, specific gravity, water absorption, impact and abrasion values, soundness, spectrographic analysis, deleterious constituents, flakiness and elongation indices and alkali aggregate reactively in accordance with IS 2386-1963 (Part I to VIII) and other relevant standards to assess its suitability. Coarse aggregates shall be washed, if necessary to remove all vegetation and other perishable

substances and objectionable amounts of foreign matter. The cost of washing and screening shall be borne by the Contractor.

4.5.3.2. GRADING

a) Coarse aggregate shall be well graded and shall have a maximum size of 40 mm. The following shall be tentative maximum nominal size of coarse aggregate for the different items. Item of construction Maximum. Size of coarse aggregate i) R.C.C raft, piers, abutments, Flank walls and flared wall, C.C. block 40.mm ii) R.C.C works in glacis, box girders Deck slab, kerb, parapet walls, diaphragm wall, approach slab, pier caps and other thin walled members and in zones of congestion caused by closely spaced reinforcement bars. 20 mm iii) Wearing Coats 12 mm iv) For any other items of construction not covered by item (i) to (iii) As specified in drawings or in case it is not specified as directed by the Engineer-in-Charge.

b) For heavily reinforcement concrete members, maximum size of aggregate shall usually be restricted to 5mm less than the minimum lateral clear distance between the main bars of 5mm less than the minimum cover to the reinforcement, whichever is smaller.

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

d) The grading of coarse aggregate shall be in the nominal sizes as mentioned in Table-II & IS: 383-1970 reproduced below.

Table – II of IS: 383-1970

IS Sieve Percentage passing for graded aggregate of maximum nominal size (by weight) Designation 40 mm 20 mm 16 mm 12.5 mm 80 mm 100 ---- --- --- 63 mm --- ---- --- --- 40 mm 95-100 100 --- ---20 mm 30-70 95-100 100 100 16 mm --- --- 90-100 ---12.5 mm --- --- --- 90-100 10 mm 10-35 25-55 30-70 40-85 4.75 mm 0-5 0-10 0-10 0-10 2.36 mm --- --- --- ---

However, the exact gradation required to produce a dense concrete of specified strength and desired workability shall be in grade ranging from 40mm to 4.75 mm. Each grade of material shall be stacked separately. Specific Gravity – 2.60 minimum

4.5.3.3. STORAGE

a) Aggregate shall be stacked in such a way as to prevent the intrusion of foreign materials such as soil, vegetable matter etc. Heaps of fine and coarse aggregates shall be kept separate. When different sizes of fine of coarse aggregate are procured separately. They shall be stored in separate stock piles, sufficiently away from each other to prevent the materials at the edge of the piles from getting intermixed with each other.

b) The aggregates shall be stock-piles adjacent to the mixer site so as to require minimum re-handling and labour when conveyed to the mixer. c) The aggregates shall be placed on a dry hard patch of ground. The aggregates shall be kept free of dirt, rubbish, papers, vegetable matters and bidi etc. on the stock piles.

d) To minimize moisture variations the stock piles shall be spread over as large in area as possible but left low and fairly uniform in height preferably 1.25 to 1.50 meter and the lowest layer of about 30 cm height shall be allowed to act as drainage layer and not used till end.

4.5.4. Water.

a) Water used for mixing of concrete and mortar shall be free from injurious amounts of deleterious materials. Portable water is generally considered satisfactory for mixing and curing. Samples of water will be tested before use. b) Where water is found to contain any sugar or an excess of acid, alkali or salt, the Engineer-in-charge will refuse to permit its use. As a guide the following table represents the maximum permissible values.

Mg. per lit.

Organic 200

Inorganic 3000

Sulphate 500

Alkali chlorides i) 1000 for R.C.C

ii) 2000 for plain concrete

PH value 6 to 8

Suspended matter 2000

4.5.5. Admixtures

i) General

No materials other than the essential ingredients i.e. cement, aggregate and water shall ordinarily be used in the manufacture or concrete of mortar. But the engineer-in-charge may permit the use of approved admixtures for imparting specific characteristic to the concrete, on satisfactory evidence that its use does not in any way adversely affect the properties of concrete particularly its strength, volume changes, durability and has no deleterious effect on the reinforcement. Cost of such admixtures shall be borne by the contractor and shall be deemed to have been included in the unit rates for relevant items. Air entraining agent (AEA) confirming to requirement of IS 9103-1979 may be used as necessary, only on approval of Engineer-in-charge. The air entraining agent as an admixture may be added to the concrete batch in form of solution. It shall be batched by means of mechanical batches 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 us ed shall be such as to effect air entrainment from 4 to 6 percent by volume. The resulting modification, if any, to the content or proportion of cement as a consequence there of shall be accounted for in the rate for payment according to general technical specifications for concrete. i) Tests. The contractor shall provide satisfactory facilities for easy and quick collection of adequate test samples. All tests for the evaluation and approval of an admixture shall be made at the expense of the contractor.

4.5.6. Epoxy

Use of Epoxy for bonding fresh concrete for repairs may be permitted on written approval of the Engineer-in-charge. Epoxy shall be applied in accordance with the instructions of the manufacturers. The cost of such repair with all materials shall be borne by the contractor.

4.5.7. Steel

As per specification under chapter reinforcement.

4.5.8. Testing of materials before collection.

Before collecting materials required for the concrete work, the contractor shall ensure that the samples of materials proposed to be used are supplied to be project laboratory for test and materials shall be collected only after ascertaining its suitability from results of the test.

4.6. 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) Supply of properly graded aggregates of uniform quality should 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. Grading of coarse and fine aggregate shall be checked as frequently as possible, frequency for a given job being determined by the Engineer-in-charge, to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary 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 weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

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 noted in the moisture content. For the determination of moisture content in the aggregate, IS 2386-1963 (part-III shall be referred to. Suitable adjustments shall also be made in the weight of aggregates to allow for variations in weight of aggregates due to variations in their moisture content. d) 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 as follows:

Sl. No. Type of Work Allowable slump for compaction

1 Mass concrete for RCC foundation footings and retaining walls. 10 mm to 25 mm

2 Beams, slabs and columns 25 mm to 40 mm

3 Thin RCC section or sections with congested steel. 40 mm to 50 mm.

i) If the specified slump is exceeded at the placement, the concrete is unacceptable. The Engineer-in-charge may allow for use of lesser slump whenever concrete of such lesser slump can be consolidated readily into place by means of vibration.

4.7. Production of Concrete

The contractor shall furnish his proposed plant layout and methods of concrete production, concrete transportation and concrete placement to the Engineer-in-charge. He shall ensure that these are adequate and suitable to meet the construction, specifications. He shall submit detailed description of handling and placing layouts and equipment he proposes to use, requirements for minimizing segregation and slump loss shall be strictly absorbed by the contractor in all handling and placing operations and any equipment/methodology found incapable of producing acceptable results shall be promptly replaced/modified.

4.7.1. Production of Aggregates.

Production of aggregates 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 sand 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-mingling of various sizes of aggregates required separately for grading purposes. No foreign matter shall be allowed to be mixed up with the aggregates.

4.7.2. Batching

a) The contractor shall provide such means and equipments as are required to accurately determine and control the relative amounts of the various materials including water, cement, admixtures, sand and each specified size of coarse aggregate required for the concrete. Such means and the equipment and its operation shall be subject, at all times, to the inspection and approval of the Engineer-in-charge. b) The measuring and weighing equipment shall operate within the limit of accuracy specified. Standard test weights and other auxiliary equipment required for checking their satisfactory performance shall be provided by the contractor. c) The equipment shall be capable of controlling the delivery of material for weighing or volumetric measurement so that the combined inaccuracies in feedings and measuring during normal operations do not exceed 1% for water 3% for all aggregates. Periodical tests shall be made at least once in every two weeks in the case of equipment for measuring water, cement and admixtures and at least once in every month in case of equipment measuring sand and coarse aggregate. However, this shall not obviate any surprise checking and testing at any time as desired by the engineer-in-charge. Repairs, replacement, or adjustment of equipment shall be made as necessary, in order to secure satisfactory performance. d) 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 in accordance with the method prescribed in Appendix-A of IS 2720 and its subsequent amendments. In case of coarse

aggregates, percentage of free water shall be determined by weighing a representative sample, then surface drying each particle individually with a clean piece of cloth and re-weighing. e) The proportions of various materials shall be changed as directed in order to maintain the desired quality of the concrete. f) Aggregate shall not be batched for concrete for mortar when free water is dripping from the aggregate.

4.7.3. Mixing.

a) For all work works, concrete ingredients shall be thoroughly mixed in mechanical mixer to ensure uniform distribution of all component materials throughout the concrete at the end of the mixing period and shall be as dense as possible, plastic enough to consolidate well. Mixing shall be done as per clause 9.3 of IS:456-1978. The mixture should comply with IS: 1971-1968. b) Mixing shall be continued until there is an uniform distribution of the materials and the concrete is uniform in colour and consistency. The time of mixing shall be as shown in Table-I of IS: 457-1978 reproduced below:

Capacity of Mixer Minimum time of mixing

Natural Aggregates Manufactured Aggregates

3 m3 or large 2 minutes 2 1/2 minutes

2 m3 1 1/2 minutes 2 minutes

1 m3 or smaller 1 1/4 minutes 1 1/2 minutes

c) The concrete as discharged from the mixer, shall be uniform in composition and consistency from batch to batch. Workability shall be checked at frequent intervals as per IS: 199-1959. Mixers will be examined regularly by the Engineer-in-charge for changes in conditions due to accumulations of hardened concrete or mortar or to wear and tear of blades. Any mixer that at any time produces unsatisfactory mix shall not be used until repaired, If repair attempts are unsuccessful, a defective mixer shall be replaced. Batch size shall be at least 10%, but not in excess of the rated capacity of the mixer. c) Water shall be admitted prior to and during charging of the mixer with all other concrete ingredients. After all materials are in the mixer, each batch shall be mixed for not less than time specified in table-I of IS: 457-1957. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer. The minimum mixing time specified is based on average mixer performance. The Engineer-in-charge may adjust the minimum mixing time as required by the observation of the mix delivered from mixer. Excessive mixing which require addition of water to maintain the required concrete consistency will not be permitted. d) The first concrete batch at the start of continuous mixing operation or after lapse of 30minutes in continuous mixing operation shall be made richer by the addition of extra cement as directed. e) For any one batch, the difference between the unit weight 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. f) The full contents of the drum shall be discharged quickly to avoid segregation. g) The minimum mixing periods specified are conditional 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 may be adopted. i) Five to ten percent of the total quantity of

water required of mixing, adequate to wash 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 and fine aggregate of cement adhering to the sides.

h) Concrete which has been kept unused for more than 30 minutes after the addition of water shall be rejected unless the concrete is in such a condition that it can be subsequently vibrated in place and its use is specifically permitted. i) When the mixer is stopped, before placing again any ingredients in the mixers, all hardened concrete or mortar shall be removed from the inner surface of the mixer. j) 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.

k) A representative of Engineer-in-charge shall supervise all stages of production of concrete. Preparation of test specimens and site test shall be supervises.

4.8. Transportation of concrete:

a) Concrete shall be transported from mixer the to the place of final placement as rapidly as possible by methods which will prevent segregation of the ingredients or slump loss in excess of 25mm and or a loss in air content of more than one percent before the concrete in placed in the works. It shall be transported, laid and compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed agitators. Wherever the length of haul from the mixing plant to the place of deposit is such that the concrete unduly compacts or segregates suitable agitators or transit mixers shall be used for conveying concrete. Conveying concrete by head load shall not be permitted. b) The contractor shall be required to deploy mechanized transportation and placement of concrete such as transit mixer, buckets, and cranes etc. Use of belt conveyors is also allowed if segregation and objectionable slump losses are prevented and there is no loss of mortar on the return belt. The belt should be suitably protected from the sun during hot weather. Suitable hoppers and drop chutes shall be used wherever necessary to prevent segregation. c) If buckets are used for conveying low slump concrete, they shall be capable of prompting 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 bottom dump type permitting an even 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. d) Use of chutes may also be allowed subject to the satisfaction of Engineer-in-charge, and fulfillment of the following requirements: i) The chute shall be on a slope sufficiently steep to handle concrete of the least slump that can be worked and vibrated and also the chute is to be adequately supported so that the slope would be constant for varying loads. ii) Effective end control through

suitable drop chutes shall be provided that will produce a vertical drop and prevent separation of the ingredients. The chute plant shall be of such size and design as to ensure practically continuous 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 2 ½ horizontal. The required consistency of concrete shall not be changed in order to facilitate chuting. Where it becomes necessary to change the consistency, the concrete 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. 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 in 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 after and debris shall be disposed off outside the forms. Slope of chutes shall be so adjusted that the concrete flows without the use of an excessive quantity of water and without any segregation of its ingredients. e) Use of pump-crete may also be allowed, subject to the satisfaction and approval of the Engineer-in-charge. This will require a slump of 75mm-100mm of the concrete mix and limiting the maximum size of aggregate to 38mm. Super plasticizers, if needed shall be used with the approval of Engineer-in-charge. A constant supply of fresh, plastic, un-separated concrete of medium consistency will be essential for satisfactory operation of the pump. Concrete pump lines shall be suitably shaded by wrapping them with burlap and kept damp. f) Equipment used for transporting concrete from batching plant to the forms shall be maintained free from the previously deposited concrete and leakage of mortar. Batch containers, transit mixers, agitators, chutes, concrete pumps, pipe-lines and discharge hopper shall be thoroughly cleaned after each batch and wash water and debris shall be disposed off outside.

4.9. Hot weather precautions.

The concrete as deposited shall have a temperature not higher than the stipulated value (900 F). Placement of concrete at a higher temperature is label to impair the quality and durability of concrete.

Precautions: Insulating water-supply lines/tanks; using cold water. Cooling course aggregate by sprinkling water; Working only in evenings and nights; (avoiding working during hot hours of the day) Shading materials and facilities not otherwise protected from the heat. Concreting operations shall be temporarily suspended during excessively hot weather when the air temperature inside the form exceeds 1150 F or when conditions are such that the concrete cannot be placed at the required temperature. Wherever necessary, exposed surfaces of fresh or green concrete shall be adequately shaded from the direct rays of the sun and protected against premature setting or drying by curing under continuous fine spray of water. Curing compound may be applied to exposed faces of piers and similar other structures.

4.10. Preparation for placing concrete

4.10.1 General Requirement.

a) Concrete shall not be placed in any part until all form work required is completed, embedded parts, if any, is installed and checked and surfaces prepared for placing. No concrete shall be deposited until the foundation has been inspected and approved. 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 before fresh concrete is placed.

4.10.2. Foundation Surfaces

a) Immediately before placing concretes all surfaces of foundations upon or against which the concrete is to be placed, shall be free from standing water, mud and debris.

All surfaces of rocks upon or against which concrete is to be placed shall in addition to the foregoing requirement be cleaned and free from all lubricants. Objectionable coating and loose semi-detached or unsound fragments are to be removed. The surface of absorptive foundations 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 surface of rock shall be performed by the use of high velocity air water jets, sand blasting, stiff brooms, picks or by other effective means. The washing and scrubbing process shall be continued until the wash water collected 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 are no longer needed the same shall be cleaned with air water jetting and filled up completely with cement slurry.

b) In the case of earth or shale foundations all soft or loose soil and surface debris shall be scraped and removed. The surface shall be moistened to a depth of about 15 cm. (6inches) to prevent the sub grade from absorbing water from the fresh concrete. Just before placing, the surface of the earth shall be tamped or otherwise consolidated sufficiently to prevent contamination of concrete during placing. If sub-soil water is met with the foundation, it shall be dewatered as directed till the placing and setting of concrete. All concrete shall be placed on 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 approve rolling and desired compaction has been obtained. 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 seems so as to prevent the loss of mortar from the concrete.

4.10.3 Surfaces of Construction / Lift Joints.

i) Construction joints are defined as concrete surfaces upon or against which concrete is to be placed and to which new concrete is to adhere but which have become so rigid that the new concrete can not be incorporated integrally with that previously placed. The provision of construction joint shall conform to

clauses 12.4.1 and 12.4.2 of IS 456-1978 and its latest amendments. The positions of construction joints envisaged during construction are subject to the approval of the Engineer. The concrete of the earlier pour shall be chipped to produce a rough surface or green cut with air water jet after the concrete has hardened sufficiently (4 to 6 hours after vibration) as directed by the Engineer. ii) All the joints shall cleaned by the contractor at his cost to the satisfaction of the Engineer. All intersections of construction joints with concrete faces which will be exposed to view shall be made straight, level and plumb. All exposed construction joints shall confirm to the requirements of aesthetic and their pattern shall be subject to the approval of the Engineer. Surfaces of the construction joints which have been permitted to dry by reason of the succeeding layer not placed within the specified moist curing period shall be kept moist for at least 72 hours prior to placing the succeeding layer. iii) Disturbance of surface concrete at the joints shall be avoided during the early hardening period. Before placing the succeeding layer the surface of the construction joints shall be thoroughly cleaned, and loose defective of fractured concrete shall be
removed satisfactorily. iv) The surface of construction/contraction 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 scrapping, chipping or other suitable means. v) The surface of construction/lift 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 lying concrete depending upon temperature; the surface shall be cleaned by wet sand blasting/high pressure water jetting just prior to placing next lifts. For effective green cutting, the compressed air pressure should not be allowed to fall below 6.33 kg/cm2. The water pressure should be sufficient to bring the water in to effective influence of the air pressure. As an approximate estimate, the quantity of compressed air required by the green-cutting gun is 2 m3/min. and the quantity of water 273 liters/minute. vi) The methods used in disposing of waste water employed in cutting, washing and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor or affect exposed surfaces of the structures. Methods of disposal of waste water shall be subject to approval.

4.11. Placing and Compacting Concrete.

4.11.1. General

a) All surfaces upon or against which concrete is to be laid shall be prepared in accordance with the drawings. b) No concrete shall be placed in any part of the structure, until all the form work, installation of parts to be embedded, if any, have been embedded and approved by the Engineer. The contractor shall notify the Engineer-in-charge at least 24 hours before batching begins for placement concrete. Placement shall not begin until all preparations are completed and correct placement checkout card has been signed by the contractor or his authorized representative and the authorized representative of the Engineer-in-charge satisfying the completion of preparation of surfaces upon or against which concrete is to be laid.

c) If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again. d) All absorptive surfaces against which concrete is to be laid shall be moistened thoroughly so that moisture will not be withdrawn from the freshly placed concrete. The surfaces however shall be free from standing water. The concrete shall be deposited as nearly as possible in its final position and compacted before setting commences and should not be subsequently disturbed. Methods of placing should be such as to avoid segregation. Care should be taken to avoid displacement of reinforcement of movement of form work. All concrete which has set before placement shall be rejected and immediately removed from site of work. e) Treatment of Cold Joint In concrete placement, delay may occur resulting in cold joints within a lift. When placement is resumed while concrete is still green and not fully hardened (and therefore capable of ready bonding), all laitance shall be removed by scrubbing the wet surface with wire or bristle brushed of with a hand pick, care being taken to avoid dislodgement of any particles of coarse aggregate. The surfaces shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of the concrete to be placed on this surface shall not exceed 160mm. In thickness and shall be well rammed against old work, particular attention being given to corners. f) In placing concrete in a lift successive batching of concrete shall be placed in a systematic arrangement in order to avoid long exposure of parts of the live surface of a concrete layer. g) If, for any cause, the working surface is left exposed until it has hardened to a considerable extent, it shall be left to set and cured for not less than 56 hours or longer. If for any reason, concreting is discontinued the initial setting time of already laid concrete is over, the surface thus interrupted shall be roughened and given a

thoroughly clean up, thoroughly wetted and covered with a 13 mm thick layer of mortar composed of cement and sand with same ratio as in the concrete mix itself. This 13 mm layer of mortar shall be freshly mixed and placed immediately before placing a new concrete. h) In placing concrete the exposed area of fresh concrete shall be maintained at the practical minimum by first building up the concrete in approximately horizontal layers to the full width of the block and to full height of the lift over a restricted area at the down-stream end of the block and then continuing upstream in similar progressive stages to the full area. The slope formed by the unconfined upstream edge of the successive layers of concrete shall be kept as steep as practicable in order to keep its area minimum. Concrete along these edges shall not be vibrated until adjacent concrete in the layer is placed, except, that it shall be vibrated immediately when weather conditions are such that the concrete will hardened to an extent that later vibration may not fully consolidate and integrate if with the concrete to be placed later. i) 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. j) In form work, structural concrete placement shall generally be started with a over sanded mix containing 20mm. maximum size aggregate and 50kg of extra cement for one cubic meter and having a slump of 125mm placed 10cm deep on the joints at the bottom of the form. Concrete placement shall commence immediately thereafter. k) If concrete is placed monolithically around openings having vertical dimension greater than 60cm or if concrete in deck, floor slabs or other similar parts of structures is placed monolithically with supporting

concrete, the following requirements shall be strictly observed. l) Concrete shall be placed up to top of the formed opening at which point further placement will be delayed to accommodate settlement of fresh concrete. If bevels are specified beneath nearly horizontal structural members such as decks, floor slabs, beams and girders, such bevels being between the nearly horizontal members and the vertical supporting concrete below, concrete shall be placed to the bottom of the bevels before delay of placement. m) The last 60 cm or more of concrete placed below horizontal members or bevels shall be placed with a 50mm or less slump and shall be thoroughly consolidated. n) All form work and reinforcement contained in it shall be cleaned and made free from standing water and dust immediately before placing the concrete. o) In placing concrete on unformed slopes so steep as to make internal vibration of the concrete impractical without form in place, concrete shall be placed ahead of non-vibrating slip-form screed extending approximately 0.75 meters back from its leading edge. Concrete ahead of the slip from screed shall be consolidated by internal vibrators so as to ensure complete filling under the slip form. p) Except where otherwise agreed to by the Engineer-in-charge, concrete shall be placed in approximately horizontal layers to compacted depth of not more than 45cm. Where internal vibrators are used after getting the approval from the Engineer-in-charge, lesser depths of layers of concrete may be placed where concrete cannot otherwise be placed and consolidated in accordance with the requirements of these specifications. q) Forms shall be constantly monitored and their position adjusted as necessary during concrete placement. r) A cold joint is an unplanned joint resulting when a concrete surface hardens before the next batch in placed against it. Cold joints will be allowed only in the event of equipment breakdown prolonged or heavy rainfall or other unavoidable prolonged interruption in continuous placement of concrete. The unconsolidated concrete may hardened to the extent that later vibration will not fully consolidate it, the contractor shall immediately consolidate such concrete to a stable and uniform slope. If delay of placement is short enough to permit penetration of the underlying concrete, placement shall resume with particular care being taken to thoroughly penetrate and re-vibrate the concrete surface. If concrete cannot be penetrated with vibrators, the cold joint shall be then treated as a construction joint. Care shall be taken to prevent cold joints while placing concrete in any part of the work. The concrete placing rate shall be such that while previously placed adjacent concrete is plastic, later concrete can be made monolithic by normal use of vibrators.

s) Concrete shall not be placed in rain sufficiently prolonged to wash mortar from concrete.

4.11.2. Compaction

Concrete shall be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcement, around embedded fixtures and into corners of form work. Wherever possible vibrators of the surface, form or immersion type shall be used. Over vibration and under vibration shall be avoided.

a) All concrete shall be compacted to produce a dense homogenous mass with the assistance of vibrators 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, concrete shall be compacted by mechanical vibrator. The vibration of the concrete shall be adequate and efficiently performed for which sufficient number of vibrators of required capacities in serviceable condition shall be kept at site before start of the concrete work, so that spare equipment is always available in the event of break downs. b) Compaction of concrete shall whenever practicable, be carried out by use of immersion type vibrators. Vibrators having heads of 100mm or more in diameter shall be operated at speed of at least 6000 vibrations per minute when immersed in the concrete. Vibrators having vibrating heads less than 100mm. in diameter shall be operated at a speed on at least 7000 vibrations per minute.

4.12. Repair of concrete

i) It will be the obligation of the contractor to repair imperfections in the work expeditiously and of the necessary standards of workmanship through deployment of capable crew. Repair should be completed within 24 hours after the forms have been removed. Before repairs are commenced, the methodology of repairs and material to be used shall be got approved from the Engineer-in-charge. The proven methods of repair of concrete are outlined in the USBR Concrete Manual (Eighth Edition – Revised, 1988), which include: Dry-Pack Mortar; Replacement Concrete; Replacement Mortar; replaced aggregate concrete; & Epoxy concrete etc. ii) Surface of concrete finished against forms shall be smooth, free from projections. Immediately upon the removal of forms within 4 hours thereof wherever practicable, all unsightly ridges of fins shall be removed and any local bulges on exposed surfaces shall be remedied by tooling and rubbing. All holes left by the removal of fasteners from the tie rods, after being removed with a toothed hammer shall be neatly filled with requisite dry patching mortar. iii) All honey combed, porous, fractured or otherwise in the opinion of the Engineer-in-charge, additions are required to bring it to the prescribed lines, shall be removed by chipping concrete. The chipped opening shall be sharp edges and keyed and shall be filled to the required lines with fresh concrete or as found suitable. iv) Concrete replacement shall be used when holes extend 0.05 sq meters in area and deeper than the reinforcement steel in reinforced concrete and in un-reinforced concrete where the holes are 0.1 sq. meter in area and 100 millimeters or more in depth.v) Where concrete is used for filling as mentioned above, the defective concrete shall be

removed and good concrete exposed but in no case less than 100 millimeters in depth and the concrete will be reinforced if necessary and as directed by the Engineer-in-charge. vi) Dry packing mortar shall consist of one part of cement to 2(Two) parts sand by volume and just enough water so that the mortar as used will stick together on being module into ball by slight pressure of the hands and will not exclude free water when so pressed but will leave the hands damp. The mortar shall be fresh and shall be placed within 30 minutes after preparation. vii) The mortar shall be placed in layers not more than 25 millimeter in thickness after being compacted and each layer shall be thoroughly tamped to the satisfaction of the Engineer-in-charge. Each layer except the last shall be roughened thoroughly to provide an effective bond with the succeeding layers. The last or finishing layer shall be smoothened to form a surface continuous with surrounding concrete. Dry

packing mortar shall be used for filling behind reinforcement or for filling holes that extend completely through a concrete section. Guniting shall be used for holes too wide for dry patch mortar filling and too shallow for concrete filling. viii) All patches shall be bonded thoroughly to the surface of the chipped openings and shall be sound and free from shrinkage crack. ix) All procedures for the replacement of concrete, mortar replacement, use of epoxies and curing of repairs shall be according to the provisions laid down in Chapter – V "Repairs & Maintenance of Concrete—Concrete Manual, United State Bureau of Reclamation, Eighth Edition, Revised 1981 vide paras 130(b), (c), (e) 133, 134 & 136 of the concrete manual as may be applicable to these repairs.

4.13. Curing and Protecting

4.13.1. All concrete shall be protected against injury until final acceptance. Exposed finished surfaces of concrete shall be protected from the direct rays of the sun for at least 72 hours after placement. Fresh exposed concrete shall also be protected from the action of the rains and mechanical injury. No fire shall be permitted in direct contact with concrete at any time. Concrete in which standard Portland cement is used shall be kept continuously moist for not less than 14 days for normal concrete by covering with saturated materials like burlap/hessian cloth etc. or a system or perforated pipes, mechanical sprinklers or hose or by one other methods approved by the Engineer-in-charge.

4.13.2. All openings formed through the concrete, should be closed during the entire curing period and as long there after as practicable to prevent circulation of air and prevent the resultant cracking.

4.13.3. Construction joints shall be cured in the same way as the other concrete and shall also be kept moist for at least 72 hours prior to the placing of additional concrete upon the joints. Horizontal surfaces shall be cured by the use of wet burlap/hessian cloth etc. or mats which will satisfactorily supply the required curing water. The time of applying damp sand shall be specified by the Engineer-in-Charge before which curing will be carried out by other methods approved by the Engineer-in-charge.

4.13.4. The method of keeping formed concrete surface moist, shall be by continuous sprinkling or spraying of water as may be necessary to prevent any portion of the surface from drying during the specified curing period.

4.13.5. The water and other methods of curing shall be handled as not to stain concrete surfaces which shall be exposed.

4.13.6. The actual method of curing adopted shall be subject to the approval of the Engineer-in-charge. The contractor shall have on hand, and ready to install before actual concrete placement is started, all equipments needed for adequate curing and protection at all location of concrete placement.

4.13.7. Finished concrete surfaces shall be protected from stains and/or abrasion surfaces or edges likely to be injured during the construction period shall be kept properly protected by leaving forms in place or erecting protective covering satisfactory to the Engineer-in-charge.

4.13.8. In case the curing operations are inadequate or unsatisfactory, the engineer-in-charge shall be entitled to take such steps as he may deem necessary to make good the deficiencies and defects, at the

contractor's risk and cost. Curing and protection should confirm to para 4-14 of I.S. 457-1957 with the latest amendments.

4.13.9. Membrane Curing.

Curing compound may be applied to the concrete surfaces, which will be permanently exposed to air, by spraying one coat to provide a continuous uniform membrane over all area with the coverage per liter as prescribed by the manufacturer according to the roughness of the surface to be covered. It may be necessary to cover the surface adequately; a second coat of curing compound shall be applied by spraying at right angles to the direction at which the first coat is applied.

4.14. Expansion joints in concrete.

Expansion joints shall be provides as shown on the drawing or as directed. Performed bituminous fiber type expansion joint filter materials shall be placed in the expansion. Open joints or false joints shall be constructed as shown in the drawing or as directed by the Engineer-in-Charge. For details of performed bituminous filler refer Section – XI.

4.15. Concrete in Block outs

a) All concrete required to be placed in block outs to permit the installation and adjustment of mechanical and other embedded parts shall be included in the respective concreting work of the component. The concrete surface with 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-outs 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 and or sand blasting as directed by the Engineer-in-charge and in such a manner as not to loosen, crack or disintegrate any part of the concrete beyond the roughened surface. After roughening the surface, old concrete shall be cleaned thoroughly of loose fragments, darts 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.

4.16. Embedment in concrete.

In some location of the structures, embedment for 2nd stage concrete of gate guides electrical conduit lines, piezometers and other fixtures or openings have to be provided in concrete/masonry work as shown on relevant drawings or as directed by Engineer-in-charge. Construction of the surface for either placement of concrete or for lying of masonry shall have to be suitably carried out so as to provide such embedment/fixtures/openings. Grouting of concrete behind the gate guides, where ever necessary shall have to be done. No extra payment shall be made for the operations as this shall be deemed to have been included in the price bid in schedule of quantities for the respective item of work.

4.17. Tests and Standards of Acceptance.

4.17.1. General

Testing of concrete shall be carried out at the cost of the contractor by the Quality Control Organization of the department. The representative samples shall be taken at the site of lying the concrete in accordance with relevant Indian Standard Specification.

4.17.2. Sampling Procedure and Frequency

a) Sampling procedure: A random sampling procedure shall be adopted to ensure that each concrete batch has reasonable change of being tested; i.e. the sampling should be spread over the entire period of concreting and should cover all mixing units. b) Frequency: The minimum frequency of sampling of concrete of each grade shall be in accordance with the following as per I.S. 456-1978.

Quantity of concrete m3 Number of samples

1 to 5 1

6 to 15 2

16 to 30 3

31 to 50 4

51 to above 4 plus one additional sample

for each additional 50m3 or part thereof.

Note: At least one sample shall be taken during each shift.

4.17.3. Test Specimen

a) 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 from work, or to determine the duration of curing or to check the testing cubes by accelerated methods as described in IS:9013-1978. The specimen shall be tested as described in IS:516-1959.

b) For controlled concrete preliminary tests shall consists of three sets of separate tests and in each set, tests shall be conducted on six specimens. Not more than one set of six specimens, shall be made on any particular day. 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.

4.17.4. Test Strength of Samples

a) The test strength of the samples shall be the average of three specimens. Individual variation shall not be more than 15 percent of the average. b) Contractor shall provide necessary unskilled labour and facilities for collection of samples, curing in tanks, transportation of cores etc. and his authorized representative shall remain present at the time when the samples, cores etc. are collected. Testing shall be carried out at the testing laboratories set up close to the site 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.

4.17.5. Acceptance Criteria.

a) 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 for each day may have values less than the specified strength provided the lowest value is not less than 85% of the specified strength. b) In case the concrete does not conform to the accepted 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 derived from tendered rate or as approved by him provided that the strength does not affect integrity of the structure. Whenever necessary for the purpose of obtaining economy, workability, density, impermeability, durability strength or on account of variation in the quality and gradation of aggregates or other materials, the Engineer-in-charge, in consultation with quality control organization shall, after testing make necessary changes in the protection of mix. Contractor shall have to effect these changes and will not be entitled to any compensation on account of such changes.

4.18. Tolerance for Concrete Constructions

(A) General

Tolerances are defined as allowable variations from specified lines, grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades and dimensions are listed as given under sub paragraph (B) below .

The intent of this paragraph is to established tolerance that are consistent with modern construction practice that is governed by the effect that permissible variations may have upon a structure. The government reserves the right to diminish the tolerance set fourth herein if such tolerance impair the structure action, operational function or architectural appearance of a structure or position thereof.

Concrete shall be within all stated tolerances even though more than one tolerance may be specified for a particular concrete structure. Provided that he specified variation for one element of the structure shall not apply when it will permit another element of the structure to exceed its alterable variation. Where tolerance are not specified for particular structure, tolerance shall be those specified for a similar work. As an exception to clause 2 of the general provisions, specific tolerance shown herein in connection with any dimension shall govern. The Contractor shall be responsible for finishing the concrete forms within the limits necessary to insure that the completed work will be within the tolerance limits specified. The defective work where the tolerance limit is exceeded shall be remedied in accordance with the sub paragraphs (B) and (C)

(B) Variations from Specified Lines, Grades and Diminution.

Hardened concrete structure shall be checked by the Contractor and will be subject to such inspection and measurement as needed to determine that the structures are within the tolerance specified in the table below. Variation is defined as the distance between the actual position of the structure or any element of the structure and the specified position in plan for the structure or the particular element. Plus minus variation shown (1) as indicate a permitted actual position up or down and in or cut form the specified portion in plan. Variations not

designated as plus or minus indicate the maximum deviation permitted between designated successive points on the completed element of construction.

Specified position in plan is defined as the lines, grades and dimensions described in those specifications or shown on the drawings or as otherwise prescribed by the Engineer-in-Charge.

Table Variations-from Specified Lines, Grades and Dimensions

A. Tolerance for canal lining, excavation

1. Excavations

a. Departure from established alignment.
± 20mm on straight sections,
± 50mm on tangents, and
± 100mm on curves

b. Departure from established alignment
± 20mm

2. Lining

a. Departure from established alignment
± 20mm on straight reaches

± 50mm on partial curves on tangents

b. Departure from established grade ± 20mm

B. Tolerance for canal structures

1. Deviations from specified dimensions of cross section of columns, beams, piers and slabs [(-) 6mm to (+) 12mm]

2. Deviations form dimensions of footing

a. Dimensions form plan = (-) 12mm to (+) 50mm.

b. Eccentricity (±) 0.02 times width of footing in the direction of deviation out not more than 50mm

Thickness = (±) 0.05 times the specified thickness.

Note : Tolerance apply to concrete dimensions only, but not for positioning of vertical reinforcing bar or dowels.

(C) Concrete Surface Irregularities

a. General

Bulges, depressions and offsets are defined as concrete surface irregularities concrete surface irregularities arc classified as “abrupt” or “gradual” and are measured relative to the actual concrete surface.

b. Abrupt Surface Irregularities

Abrupt surface irregularities are defined herein as offsets such as those caused by misplaced or loose forms, loose knots inform Lumber, or other similar forming faults. Abrupt surface irregularities are measured using a straight edges held firmly against the concrete surface over the irregularity and the magnitude of the offset is determined by the direct measurement.

c. Gradual Surface irregularities

Gradual surface irregularities are defined here in as bulges and depression resulting in gradual changes on the concrete surface. Gradual surface irregularities are measured using a suitable template conforming to the design profile of the concrete surface being examined. The magnitude of the gradual surface irregularities is defined herein as measures of the rate change in slopes of the concrete surface.

The surface irregularities shall not exceed 6mm for bottom slab and 12 mm for side slopes when tested with a straight edge of 1.5 meter in length. The magnitude of gradual surface irregularities on concrete shall be checked by the Contractor to ensure that the surfaces are within the specified tolerances. The Engineer-in-Charge will also make such checks to hardened concrete surface as determined necessary to insure compliance with such specifications.

(D) **Repair or Hardened Concrete Not within Specified Tolerance**

Hardened concrete which is not within specified tolerances shall be repaired to bring it within those tolerances. Such repair shall be in accordance with paragraph 6.2.2 I and shall be accomplished in a manner approved by the Engineer-in-Charge. Concrete repair to bring concrete with the tolerances shall be done only after consultation with a representative of the Engineer-in-Charge regarding the method of repair. The Engineer-in-Charge regarding the method of repair. The Engineer-in-Charge shall be notified as to the time when repair will be performed.

Concrete shall be finished in a manner which will result in concrete surface with a uniform surface with a uniform appearance. The fins and any rough projections can then be rubbed down and the whole surface brought to an even finish by rubbing with a wooden float using a mortar of one part cement by two parts of coarse sand as an abrasive, the mortar at the same time filling the voids. A neat cement work shall then be applied to give a smooth surface. If the concrete has set hard, the fins and rough projections, if any, shall be removed by using corborandum brick or a paved grinding machine by chipping, before finishing off with the smoothing wash. If the work of chipping is not done with care or if the surfaced exposed after removal of the forms cannot be satisfactory dealt with this manner due to bad work or for other reasons, a coat of cement plaster of 1:2 of thickness as ordered by the Engineer-in-Charge shall be applied. No extra payment will be given for finishing concrete surface as instructed above in this clause.

(E) Prevention of Repeated Failure to Meet Tolerances

When concrete placements result in hardened concrete that does meet the specified tolerances. The Contractor shall submit to the Engineer-in-Charge an outline of all prevention actions such as modification to form, modified procedure for setting screeds, and different finishing techniques to be implemented by the Contractor to avoid repeated failure.

The Engineer-in-Charge reserves the right to delay concrete placement until the Contractor implements such preventive actions which are approved the Engineer-in-Charge an outline of all prevention actions such as modification to form, modified procedure for setting screeds, and different finishing techniques to be implemented by the Contractor to avoid repeated failure.

The Engineer-in-Charge reserves the right to delay concrete placement until the Contractor implements such preventive actions which are approved by the Engineer-in-Charge.

6.2.14 Reinforcement Bars

(A) General

Reinforcing bars shall be placed in the concrete as shown in the drawings or as directed. For concrete : Canal lining the reinforcement rods as provided for the drawing shall be placed. For anchoring the concrete canal lining to the Hard rock provision of anchor rods is made in the drawing and the Contractor shall place these anchor rods to the spacing and depth shown in the drawings.

(B) Materials

Unless shown otherwise on the drawings the reinforcement to be used shall be high yield strength deformed bars of grade FE 415 conforming to I.S. 1786-1985 specification for high yield strength deformed steel bars and wire for concrete reinforcement.

(C) Placing

Reinforcement shall be bent and fixed in accordance with the procedure specified in I.S. 2505-1963 (code of practice for bending and mixing of bars for concrete reinforcement). All reinforcement shall be placed and maintained in the position shown in the drawings, provided that the location of the splice may alter subject to written approval of the Engineer-in-Charge.

Subject to the written approval the Engineer-in-Charge, the contractor may, for his convenience, splice bars at additional locations other than those shown on the drawings. All additional splices allowed shall be at the expense of the Contractor. In order to meet design and space limitation on splicing some bent bars may be exceed usual clearance cutting and bending of such bars from stock lengths may be required at the site.

Unless otherwise prescribed, placement dimensions shall be to the center line of the bars. Reinforcement will be inspected for compliance with requirement as to size, shape, length, splicing position and amount after it has been placed, but before being embedded with concrete.

Before reinforcement is embedded in concrete the surface of the bars shall be leaned of heavy flaky rust, loose scale, dirt, grease or other foreign substance which in the opinion of the Engineer-in-Charge are objectionable. Heavy flaky rust that can be removed by firm rubbing with burlap or equivalent treatment in considered objectionable.

As specified clause 11.3 of I.S. 456-2000 unless otherwise specified by the Engineer-in-Charge, reinforcement shall be placed with the following tolerances.

a. for effective depth 200 mm or less = $\pm$ 10 mm

b. for effective depth more than 200 mm = $\pm$ 15 mm

The cover in no case be reduced by more than one third of the specified cover or 5 mm which ever is less.

Reinforcement shall securely held in position so that it will not be displaced during the placing of the concrete and special care shall be exercised to prevent any disturbance of the reinforcement in concrete that has already been placed. Welding of bars shall be done as directed by the Engineer-in-Charge and in conformity with the requirements clause 11.4 of I.S. 456-2000. Chairs, hangers, spacers and other supports for reinforcement shall be of concrete, metal or other approved material. Concrete cover shall be as shown on the drawings.

(D) Splicing

a. Where it is necessary to splice reinforcement the splices shall be made by lapping, by welding, or by mechanical means.

Where permitted or specified on the drawings, joints of reinforcement bars shall be buttwelded so as to transmit their strength. Welding of bars shall be done as directed by Engineer and conforming with requirements of Clause 11.4 of I.S. 456-2000.

If it is proposed to use welded splices in reinforcing bars, the equipment, the material and all welding and testing procedures shall be subject to the approval of the Engineer. The Contractor shall also carryout test welds as required by the Engineer. No extra rate will be paid for welding reinforcement test-welds as bid rate in bill of quantities is inclusive of this item. For welded splices for reinforcing bars conforming to I.S. 1786-1985, welding shall be done in accordance with IS 9417-1979. for reinforcing bars conforming to IS : 432 (Part-I)-1982, welding shall be done in accordance with IS 2751-1979. Electrodes for manual metal are welding shall conform to IS : 814 (Part-I) 1974 and IS 814 (Part-II) 1974. Mid steel filler rods for Oxy-acetylene welding shall conform to IS : 1278-1972 provided they are capable of giving a minimum butt weld tensile strength of 41 Kg/mm2.

Only electric are welding using process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall accepted. Suitable means shall be provided for holding bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in two or three steps, previous surfaces shall be cleaned well. Ends of bars shall be cleaned of all Iron, scale, rest paint and other foreign matter before welding.

b. Reinforcing bars of 28 mm in diameter and larger may be connected by butt welding provided that lapped splices will be permitted if found to be more practice than butt welding and if lapping does not encroach on cover limitation or hinder concrete or reinforcement placing.

c. Reinforcing bars 25 mm in diameter and less may be either, lapped or butt welded whichever is practicable.

Butt welding of reinforcing bars shall be performed either by the gas pressure or flash pressure welding process or by the electric are methods under cover from weather.

Welded pieces of reinforcement shall be test at the rate 5% of total number of joints welded. Specimen shall be taken from the actual site of work. Strength of the weld provided shall be at least 25% higher than the strength of bar.

c. Welded joints or splices shall preferably be located at points where steel will not be subject to more than 75% of the maximum permissible stresses and welds so staggered that at any section not more than 20% of roads are welded. Approval of such addition splices will generally be restricted to splices not closer than 8 meters in horizontal bars or 4 meters in vertical bars measured between mid point of laps.

(E) Reinforcement Drawings

The Engineer-in-Charge will supply drawings of reinforcement details and bar bending schedules for adoption.

(F) Measurement and Payment

Measurement for payment of reinforcement bars will be based on the weight of the bars placed in the concrete in accordance with the drawings supplied by the Engineer-in-Charge when conformance with these specifications drawings has been determined at the time of embedment. Except as otherwise provided below payment for furnishing and placing reinforcing bars will be made at the unit price bid in the bill of quantities for furnishing and placing reinforcement bars which unit price shall include the cost of reinforcing bars, attaching

wire, ties or other approved supports and of cutting bending, cleaning securing and maintaining in position reinforcing bars as should on the drawings, chairs, spacer bars and lapping shall be considered for payment at unit price as provided in BOQ .

The total weight of bars placed as reinforcement in concrete shall be arrived at by adding the product of lengths of each size and mass parameter (vide table 1 and paragraph 6.2.1 of I.S. 1786-1985) of that size or rod.

6.2.15 Dowels

The dowels shall be of same HYSD bars of grade FE 415 conforming to I.S. 1786-1985 as used for reinforcement.

Details for dowels shall be as shown on the drawings or as directed by the Engineer-in-Charge.

Dowels shall be placed in the concrete where shown on drawings or where directed and will be inspected for compliance with requirement as to size, shape, length, position, and amount after they have been placed but before being covered by concrete.

Before the dowels are embedded in concrete, the surfaces of dowels be cleaned of all dirt, grease or other foreign substances which in he opinion of the Engineer-in-Charge are objectionable.

The dowels shall be accurately placed and secured in position so that they will not be placed during the placing of the concrete.

Measurement for payment of dowels will be made only on the weight of dowels placed in the concrete in accordance with the drawings or as directed by Engineering-in-Charge. Payment for furnished and placing of dowels will be made at the unit price bid in the bill of quantities for furnishing and placing of reinforcing bars which unit price bid in the bill of quantities for furnishing and placing of reinforcing bars which unit price shall included the cost of furnishing all the materials and for placing the dowels as required.

6.2.16 Preparation for placing

(A) General

No concrete shall be placed until all form work installation of items to be embedded and preparation of surface involved in the placement have been approved.

The Contractor shall supply concrete placement checkout cards (Placement Register) satisfactory to the Engineer-in-Charge and shall provide a water tight container for such cards at the convenient location near the individual concrete placement site. The cards shall list all the various work items for example clean up and embedded items required prior to placement of concrete. After each work item for an individual placement has been completed that item on the cards shall be signed by the contractor or his representative signifying completion o the required work. Engineer authorized by the Engineer-in-Charge will inspect the work during and after completion of each phase of preparation and if the work is satisfactory will sign the check-out card (placement register). Approval of preparation for placement will not be complete until the Contractor or his representative and above authorized Engineer have approved by the signature all applicable, items for the placement.

All surfaces of forms and embedded materials shall be free from curing compound, dried mortar from previous placements and other foreign substance before the adjacent or surrounding concrete placement is begun.

Prior to beginning concrete placement, the Contractor shall make ready a sufficient number of properly operating vibrators and operators and shall have readily available additional vibrators to replace defective one during the progress of the placement. The Engineer's representative at the placement may be delay the start of the concrete placement until the number of working vibrators available is acceptable.

(B) Foundation Surfaces

All surfaces upon or against which concrete is to be placed shall be free from frost, ice, water, mud and debris.

(a) Rock surface shall be free from oil, objectionable coatings, and loose semi-detached and unsound fragments, Immediately prior to placement of concrete, surface dry condition.

(b) Earth foundation surfaces shall be wet to a depth of 15 cm or to impermeable material whichever is less concrete placement.

(c) Construction Joints

Construction joints are defined as concrete surfaces upon or against which concrete to be placed and to which new concrete is to adhere but which have become so rigid that the new concrete can not be incorporated integral with that previously placed. The provision of construction joints shall conform to clause 12.4.1 and 12.4.2 of I.S. 456-2000. When the work has to be resumed on a surface which has hardened such surface shall be roughened. It shall then be swept clean thoroughly wetted. For vertical joins neat cement slurry shall be applied on the surface before it is dry. For horizontal joints the surface shall be covered with a layer of mortar about 10 to 15 mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing of the concrete.

Where the concrete has not fully hardened all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgment of particles or aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface, a layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots, and work thereafter shall proceed in the normal way.

(D) **Contraction Joints**

Contraction joints serves to provide for volumetric shrinkage of monolithic concrete and or movement between monolithic unit a established joints, thus preventing formation of objectionable shrinkage elsewhere in concrete. \prior to application of wax based curing compound to contraction joints, the surface of all joints shall be cleaned thoroughly of accretion of concrete or other foreign material by scraping, chipping or other means approved by the Engineer-in-Charge. Water stops, reinforcing bars and embedded items shall be free of curing compound when adjoining concrete is placed.

6.2.17 Placing

(A) **General**

The Contractor shall notify the Engineer-in-Charge before batching begins for the placement shall not begin until after preparations are complete and the concrete. Placing shall be performed only on the presence of an authorized Engineer's representative. Placement shall not begin until after preparations are complete and the concrete placement check out card has been signed by the Contractor or his representative and the authorized representative of the Engineer-in-Charge substantiating completion of all preparation for that placement.

All surface upon or against which concrete is to be placed shall be prepared in accordance with paragraph 6.2. 16.

Retempering of concrete will not be permitted. Any concrete which has become so stiff that proper placing cannot be assured, shall be wasted. Concrete shall not be placed in standing water except with written permission of the Engineer-in-Charge and the method of placing shall be subjected to approval concrete shall not be placed, running water until after the concrete has hardened.

Concrete shall be deposited as nearly as practical in its final position and shall not be allowed to flow in such a manner that the lateral movement will cause segregation of coarse aggregate from the concrete mass. Methods and equipment employed in depositing concrete in forms shall minimize clusters of coarse aggregates clusters, that occur shall be scattered before the concrete is vibrated.

Forms shall be constantly monitored and their position adjusted as necessary during concrete placement in accordance with paragraph 6.2.12 and 6.2.13.

All concrete except canal lining shall be placed in approximately horizontal layers. The depth of layers shall not exceed 15 cm . The Engineer-in-Charge reserves the right to require lesser depths of layers where concrete cannot otherwise be placed and consolidated in accordance with the requirements of these specification. All Construction joints which interest exposed concrete surface shall be made straight and level to plumb except as shown otherwise on the drawings.

The placing of concrete shall be accordance with clause 12.2 of I.S. 456-2000.

If concrete is placed monolithically around openings having vertical dimension greater that 60 cm or if concrete in decks, floor slabs, or other similar parts of structure is placed monolithically with supporting concrete, the following requirements shall be strictly observed.

a. Concrete shall be placed up to the top of the formed opening at which point further placement will be delayed to accommodate settlement of fresh concrete. If levels are specified beneath nearly horizontal structural members such as decks floor slab, beams and girders or the levels being between nearly horizontal members and vertical supporting concrete below, concrete shall be placed to the bottom of the bevels delay of placement.

b. The last 60 cm or more of concrete placed below horizontal members or bevels shall be placed with a 50 mm or less slumps and shall be thoroughly consolidated.

In placing concrete on unformed slopes so steep as to make internal vibration of the concrete impractical without footing, the concrete shall be placed ahead of nonvibrating slip from screed extending approximately 0.75m back its leading edge. Concrete ahead of slip from screed shall be consolidated by internal vibration so as to ensure complete filling under the slip form.

A cold joint is an unplanned joints resulting when a concrete surface hardens before the next batch is placed against it, cold joints would be allowed only in the event of equipment breakdown or other unavoidable

prolonged interruption of continuous placing. If such unavoidable delays in placing occur which make it appear that unconsolidated concrete may harden to the extent that later vibration will not fully consolidate. It, the contractor shall immediately consolidate such concrete to a stable and uniform slope. If delay of placement is then sort enough to permit penetration of underlying concrete vibrate concrete surface placed before the delay. If concrete cannot be penetrated with vibrator, the cold shall be then treated as a construction joint. Care shall taken to prevent cold joints when placing concrete in any part of the work. The concrete placing rate shall ensure concrete is placed while the previously placed adjacent t concrete is plastic so that the concrete can be made monolithic by normal of vibrators/tampling.

Concrete shall not be placed in placed in rain sufficiently heavy or prolonged to wash mortar from concrete. A cold joints may necessarily result form prolonged heavy rain fall.

The Contractor shall not be entitled to any additional payment, ever the unit price bid in the scheduled for concrete by reason of any limitation in the placing of concrete, required under the provisions of this paragraph.

(B) **Transportation**

The transportation of concrete shall conform to clause 12.1 of I.S. 456-2000

The methods of equipment used for transporting concert from the batch plant to its final position in the placement and the time that elapsed during transportation shall not cause measurable segregation of coarse aggregate or slump loss during transportation exceeding 5 centimeters.

Concrete shall be deposited as near as particular to its final position. The use of Aluminium pipe or Aluminium chutes for delivery of concrete will not be permitted. Concrete buckets shall be capable of promptly discharging concrete of the specified mix design and the dumping mechanism shall be capable of discharging at one location, small portions of concrete from a full bucked.

If used to transport concrete, the truck mixers shall meet the applicable requirements of paragraph 6.2.10.

The transporting equipment for placing concrete shall readily handle the place concrete of the specified slump. The contractor shall when directed, replace in adequate transporting equipment with acceptable equipment.

(C) Compaction

The compaction of concrete shall conform to clause 12.3 of 1.5. 456-2000.

Concrete shall be consolidated by the vibrators / tampers. The vibrations shall be sufficient to remove all undesirable air voids from the concrete, including the air voids rapped against the forms. After consolidation, the concrete shall be free of rock pockets and honey comb areas and shall be closed snugly against all surfaces of forms and embedded materials. All concrete shall be properly consolidated before it hardens.

Except as herein after provided, consolidation of all concrete shall be by immersion type vibrators. Immersion type vibrators shall be operated in nearly vertical position and the vibrating head shall penetrate and vibrate the concrete in the upper portion of the underlying layer. Care shall be exercise to avoid contact of the vibrating head with embedded items and with formed surfaces which will later be exposed to view. Concrete shall not be placed thoroughly consolidated. From vibrators shall be used in conjunction with slip form lining machines to consolidate concrete in canal linings. Such vibrators shall be arranged for effective uniform consolidation of the concrete. The Engineer-in-Charge or his representative may remove samples of hardened concerns for

testing and examination, and the Contractor shall pair, at no cost to the Government, concrete from which such samples are removed.

Immersion type vibrators shall be operated as speeds of at least 7000 revolutions per minute when immersed in concrete. Form vibrators shall operate at speed of at least 8000 revolutions per minute when being used to consolidate concrete, The Contractor shall immediately replace improperly operating vibrators with acceptable vibrators.

6.2.18 Finishes and Finishing

The require of finishing of concrete surface shall be as specified in this paragraph, paragraph 6.2.12 and 6.2.13, or otherwise indicated in the drawings. The Contractor shall notify till Engineer-in-Charge before finishing concrete. Unless inspection is waived, in each specific case, finishing of concrete shall be performed only when a Engineer's representative is present. Concrete surface will be tested by the Engineer-in-Charge in accordance with paragraph 6.2.13 where necessary to determine where the concrete surface is within the specified tolerances. Finished concrete which is not within the specified tolerances shall be repaired in accordance with paragraph 6.2.21

Interior surface shall be sloped for drainage where shown on the drawings or as directed. Surfaces which will be exposed to the weather and which would normally be level, shall be sloped for drainage.

Floating may be performed by use of hand or power driven equipment. Floating shall be started as soon as screeded surface has stiffened sufficiently and shall be minimum necessary to produce a

Surface that is free from screened marks and is uniform in texture. Joints and edges shall he tolled where shown on drawing or as directed.

After the surface of road way slabs of concrete bridges, have been wooden floated, the surfaces shall be given a broom finish. The finish shall be applied when the water sheet has practically disappeared. The broom shall be drawn transversely across the pavement with adjacent strokes slightly overlapping. The brooming shall be completed before the concrete is in such condition that the surface will be torn or unduly roughened by the operation. The finished surfaces shall have a uniform appearance and shall be free of corrugations exceeding 1.5 millimeters in depth. Broom shall be of a quality, size and construction and be so operated as to produce a surface finish satisfactory to the Engineer-in-Charge.

The finishing in lining shall be in accordance with clause 5.7 of I.S. 3873-1978. The finished surface shall be equivalent in evenness, smoothness and free from rock pockets and surface produced by a lining machine meets the specified requirements, no further finishing operations will be required.

The top portion of the side slopes of the canal lining extending 0.5 to 1.0 meter vertical below the top of tile lining shall receive a nonskid, longitudinal brisk finish as approved by the Engineer-in-Charge.

6.2.19 Protection

The Contractor shall protect all concrete against damage until final acceptance by the Engineer-in-Charge.

The Contractor shall provide protection to prevent erosion to fresh concrete whenever precipitation either periodic or sustaining is imminent or occurring.

When precipitation appears imminent the Contractor shall immediately make ready at the placement site all materials which may be required for protection of fresh concrete. The Engineer-in-Charge may delay placement of concrete until adequate provisions for protection against weather are made.

All fresh concrete surfaces shall be protected from contamination and from foot traffic until the concrete has hardened. Hardened concrete surfaces which have to receive finish shall be protected against damage from foot traffic and construction activity by covering with protective mats, plywood, or by other effective means. Method of protection shall be subject to approval by the Engineer-in-Charge.

6.2.20 Curing

(A) **General**

The Contractor shall furnish all materials and perform all work required for curing concrete.

All concrete including bed and sides of canal lining shall be cured be water curing.

The precast slab for canal lining shall be cured by keeping them immersed in water for even days and by sprinkling water for another 21 days with straw canvass, hessian or similar cover.

The uniformed top surfaces of bridges deck shall be cured for 28 days with a damp sand cover or curing mat cover, the sand or curing mats shall be not be kept so wet as to allow water to drain from them stain other concrete. The sand or curing mats shall be removed after the expire of the curing period.

All concrete surfaces shall be treated as specified to prevent loss of moisture from the concrete until the required curing period elapsed or until immediately prior to placement of other concrete or backfill against those surface dry condition shall be allowed between discontinuance of curing and placement to adjacent concrete.

Forms shall be removed within 24 hours after the concrete has hardened sufficiently conforming to clause 10.3 of I.S. 456-2000 to prevent structural collapse or other damage by careful form removal. Where required, repair of all minor surface imperfection shall be made immediately after form removal and prior to curing, minor surface repair shall be completed within 2 hours after from removal and shall be immediately followed by the initiation of curing by the applicable method specified herein, Concrete surfaces shall be kept continuously moist after form removal, until initiation of curing.

(B) Materials

Concrete cured with water shall be kept wet for at least 28 days from the time the concrete has attained sufficient set to prevent detrimental efforts to the concrete surfaces. The concrete surfaces to be cured shall be kept wet covering them with water saturated materials by using a system of perforated pipes, mechanical sprinklers or porous hose, or by other methods which will keep all surface continuously (not periodically) wet, all curing methods are subject to approval of the Engineer-in-Charge.

(C) Cost

The cost of furnishing all materials and performing all work for curing concrete shall be included in the price bid in the bill of quantities for the concrete on which the particular curing methods are require.

6.2.21 Repair Concrete

Concrete shall be repaired in accordance with clause 5.7 of I.S. 3873-1978. Imperfections and irregularities on concrete shall be corrected in accordance with paragraph 6.3.13 and clause 5.7 of I.S. 3873-1978.

(A) Types of repair

All repair shall be made with concrete. Repairs to concrete surfaces and addition where required shall be made by cutting regular opening into the concrete and placing fresh concrete to the required lines. The chipped openings shall be sharp and shall not be less than 70mm in depth. The fresh concrete shall be reinforced and chipped and toweled to the surface of the openings. The mortar shall be placed in layers not more than 20 mm in thickness after being completed and each layer shall be compacted thoroughly. All exposed concrete surfaces shall be cleaned of impurities lumps of mortar or grout and unsightly stains.

(B) Cost

The cost of furnishing all materials and performing all work required in the repair of concrete shall be borne by the contractor.

6.2.22 **Measurement of Concrete**: Measurement for payment of concrete required to be placed directly upon or against surfaces of excavation will be made to the lines for which payment for excavation is made.

Measurement for payment of concrete in canal lining shall be made to the lines shown on the drawing. The unit of measurement will be in square meter to the thickness shown in the drawing measurement for payment of all other concrete will be made to the neat lines of structures, unless otherwise specifically shown on the drawing prescribed in the specification. The unit measurement will be cubic meter in measuring concrete for payment, the volume of all opening, fixtures. Embedded pipes and metal work, each of which is larger than 0.1 square meter in cross section will be deducted.

6.2.23 Payment for concrete

Payment for concrete in the various parts the work shall be made at the applicable unit price in there for in bill of quantities, which unit price include the cost of furnishing all materials and performing all works required for the concrete construction, except that payment or furnishing and placing reinforcement bars and from work shall be made at the respective unit prices bid therefore in the schedule.

Section 6.3 Special Requirements for Concrete Structures P.V.C. strips

The finished P.V.C. strips shall be manufactured with shapes conforming to dimensions shown on the drawing and shall be extruded from virgin, pigmented, P.V.C. the finished P.V.C. strip shall meet the requirement of table I and II of I.S. 9766-1981.

The P.V.C. water stops conforming to the above requirements shall be placed in the joint where shown in the drawings. The Contractor shall furnish and I.S.I Test certificate for the P.V.C. he proposes to use.

6.3.1 Elastomeric Bearing Pads

The Contractor shall furnish and place elastomeric bearing pads at the location shown on the drawings and in accordance with this paragraph. Elastomeric bearing pads shall be fastened to one concrete surface with rubber cement recommended by the manufacturer of the elastomeric bearing pads. Elastomeric bearing pads shall be stored at 75^0 F or less. Elastomeric bearing pads shall not be stored in open place or where they will opened to the direct rays of the sun.

The elastomeric compound shall be 100 percent virgin polychloroprence (neoprene).

The Contractor shall furnish an I.S.I Test certificate for the elastomeric bearing pads he proposes to use.

6.3.3. Placement of Kraft Paper

The top surface of masonry piers and abutments should be leveled and painted with brush, with asphaltic emulsion of 20/30 grade, such that the bearing surface is perfectly smooth and uniform. Over this surface, kraft paper of approved quality should be placed and the top painted with asphaltic emulsion of 20/30 grade. The unit price bid in the bill of quantities for this item shall include the cot of all materials and labour involved in the operations.

6.3.2 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 of such conduits or openings. No extra claim for such improvidence in construction shall be entertained.

6.3.3 Providing the Fixing R.C.C. Non-Pressure NP^2/NP^3 pipe as per Drawings with Spigot and Socket ends

(A) **Supply or Pipes**

Pipes shall be of specified diameter, non-pressure conforming to I.S. 458-1971. Maximum length of the pipe shall not be less than 2.5 m or otherwise directed by the Engineer-in-Charge. The Contractor shall order the pipes required for the work on the basis of the construction drawing supplied to him by the Engineer-in-Charge. Pipe marked with the following information one each type shall only be accepted for work.

a. Class of pipe
b. Date of manufacture
c. Name of manufacture or his trade mark of both
d. IS Specification mark

(B) **Handling and Laying or Pipes**

Work shall be done as per I.S. 783-1959 or its latest edition. Reasonable care shall be exercised in loading transporting could unloading of concrete pipes. Handling shall be such as to avoid impact. All pipes shall be inspected thoroughly before being laid. Broken or defective pipe shall not be used. Trench shall be of sufficient width to provide for free working space in minimum 30 cm on either side of the pipe. Pipes shall be lowered into the trenches by use of standard appliance. Pipe shall be laid true to line and as specified on the construction drawings. Laying of pipes shall be along proposed grade of the slope. The socket ends of pipe shall face upstream. The connections of the pipes shall be jointed together in such a manner that these shall produce perfect even surface along the inside of the pipe. In no case pipes shall be laid directly on rock or other hard material.

(C) **Joining Pipes**

The joints shall be filled with cement mortar (1:2) and then properly concerted with the grade of concerti as mentioned in the drawing with proper shape and size as per the direction of Engineer-in-Charge.

(D) **Backfilling Trenches**

a. Trenches shall be kept free from water until the material in the joints has hardened. Walking or working on the completed pipe shall not be permitted until the trench has been backfilled to a height of at least 45 cum over the pipe as may be necessary for backfilling and compaction.

b. Trenches shall be backfilled after pipe has been laid subject to the condition that jointing material has hardened. Only selected materials shall be used for backfilling. Filling of the trench shall be carried out simultaneously on both sides of pipe in such as manner that unequal pressure does not occur.

(E) **Measurement and Payment**

Measurement for payment shall be on running meter basis on the pipe line laid including joints. The rate per pipe in bill of quantities shall include the cost of pipes including loading unloading hauling, handling, string laying in position, cost of rubber rings jointing and curing including backfilling and other operations to complete the work as per the specification.

CHAPTER – V

5.0. FORM WORK

5.1. Scope of work: The Section covers Item No-

5.2. Description of Items

Refer items No. of Bill of Quantity.

5.3. Procedure for Form, Centering and temporary works.

5.3.1. All centering, for work and temporary works shall be constructed according to the approved drawing and specification.

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

5.3.3. 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.

5.3.4. After approval of the general scheme, the contractor shall prepare detailed design 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.

5.3.5. 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 centering and all temporary works for withstanding concreting and removal of form work after stipulated interval, 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.

5.3.6. The contractor is responsible to set the forms to line and grade, achieve tightness of forms and braced sufficiently to stay in alignment and strong enough to hold the concrete there should be no loss of mortar causing any honey-combing. Stability is a very important consideration in form work. Contractor shall ensure that the forms do not suffer from inadequate cross-bracing, inadequate horizontal bracing. Immediately before concrete is placed, the forms should be properly treated with suitable form oil or other suitable coating material to prevent sticking of the concrete. Joints between the form work and existing concrete structures shall also be grout tight. From work shall be arranged to facilitate removal of the various parts in correct sequence, without jarring or damaging the concrete. Fixing blocks, 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 structure below the required standard but the use of through bolts 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.

5.3.7. Forms shall overlap the hardened concrete in the lift previously placed by not more than 75 mm and shall be tightened smoothly against the hardened concrete in the lift previously placed by not more than

75mm. and shall be tightened smoothly 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 projection. No jute bags or other such materials be allowed to be used to make the joints of shuttering plates leak proof.

5.3.8. If a type of from does not consistently perform in an acceptable manner, as determined by the Engineer-in-charge, the type or form shall be changed and method of erection shall be modified by the contractor without any extra cost.

5.4. Re-use of Forms etc

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, 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.

5.5. Cleaning of Forms

5.5.1. All rubbish, shall be removed from the interior of the forms. The form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcement. Before concrete is placed, the surfaces of forms designated to produce f1 & f2 finished shall be oiled with commercial form oil that will effectively prevent sticking and will not stain the concrete surface. For timber forms, oil shall consist of pure refined, pale, paraffin mineral oil or approved form oil. For steel forms, form oil shall be mineral oil suitably compounded with one or more ingredients which are appropriate for the purpose. Care shall be taken to keep form oil out of contact with reinforcement.

5.5.2. Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms and request him to inspect and accept the form work as to their strength, alignment and general fitness, but such inspection shall not relieve the contractor of his entire responsibility of form work to withstand concreting and for safety of men, machinery and materials.

5.6. Removal of Forms.

5.6.1. The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike any form. Forms shall be removed as soon as the concrete has hardened sufficiently, thus facilitating satisfactory curing and earliest practicable repair of surface imperfections.

5.6.2. Forms on sloping surfaces of concrete, such as forms on the water sides, shall be removed as soon as the concrete has attained sufficient to prevent sagging. Any repair or treatment required on such sloping surface shall be performed at once and followed immediately by the specified curing.

5.6.3. Forms shall be removed with care so as to avoid damage to the concrete. Damaged concrete if any during form removal shall be repaired in accordance with the specification for Repair of Concrete.

5.6.4. The following minimum time intervals of form stripping as per specifications in IS-456-1978 will generally be followed while using ordinary Portland cement. (i) Walls, columns and vertical faces. By the

Engineer-in-charge 24 to 48 hours or as may be decided. (ii) Slabs (Prop left under) 3 days (iii) Beam Soffits (Prop left under) 7 days (iv) Removal of props under slabs Spanning up to 4.5 m. 7 days Slabs spanning over 4.5 m. 14 days (v) Removal of props under beam and arches spanning up to 6 m 14 days
Spanning over 6 m. 21 days Note: For other cement, the stripping time recommended for Ordinary Portland Cement may be suitably modified.

5.6.5. The number of props left under, their sizes and disposition shall be such as to be able to safely carry full dead load of slab, beams or arch as the case may be together with any live load likely to occur during the curing or further construction.

5.7. Finish of Formed Surfaces.

5.7.1. The classes of finish and requirements for finishing of concrete surface shall be as shown in the drawing or as hereinafter specified. In the event of finishing not being definitely specified herein or on the drawings, the finishes to be followed shall be as directed by the Engineer-in-charge. Finishing of concrete surface shall be performed only by skilled workmen.

5.7.2. Completed concrete surfaces will be tested where necessary to determine whether surface irregularities are within the limits herein specified.

5.7.3. Surface irregularities are classified as 'abrupt' or 'gradual'. Offsets caused by displaced form sheathing, or lining or form sections or by loose knots or otherwise defective will be considered as abrupt, other irregularities shall be considered as gradual irregularities and will be tested by use of template, consisting of a straight edge or the equivalent there of for curved surfaces. The length of the template shall be 150 cm. for testing of formed surfaces and 300 cm. for testing unformed surfaces.

5.7.4. Table for finish of form work

F1 finish F2 finish

1 Surfaces of the raft remaining below N.S.L

1 Deck of the Bridge

2 Block Joints 2 Piers

3 Key for Intermediate Construction

3 Abutment & flank wall (river side)

4 Cubes 4 Abutment & flank wall (river side)

5 Faces which are not exposed for public viewing.

5 Exposed surface of the profile of the barrage section, i.e. glacis, rigid apron, upstream side slope.

CHAPTER – VI

STONE WORK

7.1.1 Riprap and Coarse Gravel Protection

A. General

The Contractor shall furnish and place riprap and coarse gravel protection to the prescribed outlines and thickness provided in the drawings for the protection of the canals and structures and elsewhere as required

B. Materials

The stone required for riprap shall be in accordance with clause 4.1 of I.S. 8237 -1976 Indian code of practice for protection of slopes for reservoir embankments. The stones for riprap shall be hard and durable and shall not crumble on long exposure to water and air. The gravel protection shall be reasonably well graded and shall conform to clauses 5.15.1.1, 5.1.2, 5.1.3 and 5.2 of I.S 8237- 1976. The thickness of the stone to be used in the riprap shall be in accordance with clauses 6.3, 6.4.1 of I.S. 8237-1976, Indian code of practice for protection of slopes for reservoir embankments.

The Contractor shall unless otherwise specifically stated in the contract be responsible for payment wherever payable of all import duties, tools, octoroi duties, seignorages, quarry fees etc. on all materials and article that he may use.

(C) Placing :

The placing and laying of riprap with coarse gravel 'protection shall be, in accordance with clauses 6.1.6.2,6.2.1 and 6.2.2 of I.S. 8237-1985 in case the rip rap hand placed riprap, and in accordance with clause 7.1,7.2 of I.S. 8237-1976 in case the riprap is dumped riprap.

Minimum Thickness or Hand Placed Riprap

Expected Wave Height Meter	Minimum Thickness Cm
0 to 1.5	30
1.5 to 3.0	45
Larger than 3.0	60

Recommended Riprap Thickness and Gradation

Range of average Height meter	Minimum Average Rock size	Minimum Riprap Thickness cm
0 to 1.5	30	60
1.5 to 3.0	40	75
Above 3.0	70	100

(D) Measurement and Payment

Measurement and payment of riprap or. of coarse gravel protection shall be made to the outlines of the nominal thickness prescribed. Payment for riprap and coarse gravel protection shall be made at the applicable unit price per

cubic meter bid therefore in the bill of quantities for riprap and coarse gravel protection which unit price shall include the cost of procuring or furnishing, hauling and placing the rock for riprap or gravel for coarse gravel protection including the rock Spalls and gravel to fill the voids in the revetment.

7.1.2. Forming Dry Rubble Rock Toe

(A) General

The dry rubble rock toe along with filters shall be formed to the lines and graded as shown in the drawing. The forming of dry rubble rock toe filter consists of

i. Excavation of foundation trench 45cm. deep for laying filters and forming rock toe.

ii. Laying sand filters

iii. Laying graded metal filters and

iv. Forming dry rubble rock toe.

(B) Materials

i. The filter materials should be composed of layers of fine sand coarse sand hard rock aggregates of thickness specified in plans and in schedule.

ii. The fine and coarse sand used shall be composed of clean sand, well graded, hard siliceous material, free from injurious amounts of dust lumps of clay, soft or flaky particles, shale, alkali, loam mica or other deleterious substance. If the same brought to the site is dirty it must be washed thoroughly cleaned with water so as to get rid of all soluble impurities. The sand shall be screened and the fine coarse stocked separately which materials shall confirm to the gradation specified hereunder.

iii. The aggregate of 10 mm to 75 mm size rock fragments shall consist' of broken stone which are hard, dense and durable. The rock fragments shall be free of disintegrated and decomposed stone, soft flaky, salt, alkali, vegetable, matter and other deleterious' substance like clay, lumps etc. They should be washed clean and stacked separately as per the gradation defined hereafter.

iv. Almost all the quantity of rock chips and spalls required for breaking the aggregate and which are obtained from the spoil of canal rock blasting will be available at site. It shall be incumbent upon the Contractor to first utilize these materials to the full and the recovery of cost of the material used from such spoils from canal excavation shall be fixed by the Engineer-in- Charge, which is binding on the Contractor.

v. The gradation each filter layer shall meet the following requirement with respect to the materials in the adjacent filter layer. Each successive layer of material shall be composed of particles such that the 15% size (15% smaller than and 85% larger than the diameter) is more that 5 times that of 15% size of the layer above.

vi. The requirement for grading of the filters shall be established by the field laboratory on the basis at mechanical analysis of the adjacent fill material. Mechanical analysis shall be performed on samples which have been compacted. The test is to be conducted by the Contractor at his cost in the presence of Department Engineers to be nominated by the Engineer-in-Charge.

vii. The following gradation is however tentatively and roughly indicated for the Contractor's information.

FINE SAND

At least 15% particles should be less than 0.3mm to 0.5mm in diameter.

COURSE SAND

At least 15% particles should be less than 2.50mm to 3mm in diameter.

AGGREGATE

10mm to 75mm rock aggregate: At least 15% particles could be less than 20mm in size.

viii. Representative samples of these filter materials should be submitted by the Contractor to the Engineer-in-Charge of the work so that the mechanical analysis of the same could be carried out in the field laboratory and its gradation got tested and declared as permissible. In the event of the samples not conforming with the required gradation, the Contractor shall take such steps and perform such operation as to result in obtaining the materials of the required gradation without claiming any extra consideration beyond his quoted rate.

(C) Rock Toe

i. The rock fill at the down stream toe of the bank shall be constructed to the finished lines and grades shown in the drawings.

ii. The rock fill shall be placed in layers not exceeding 0.30 meter thickness at the time. The large rock fragments shall be placed on the outer faces of rock toe and shall be closely and firmly set with hand with their broadest side down-wards and face normal to the finished slope. At least 25% of these stones on the outer faces, should be 300mm in depth in normal to the slope and to be well embedded in the mass and should be laid with breaking joints as far as possible, so as to secure a firm and stable rock mass. For the sloping surface away from the embankment interstices between the adjacent stone on the slope shall be well filled with stones of the proper size. and tightly wedged by wooden mallets or crowbars to ensure firm packing to result in a neat and well packed surface true to the finished slope. For earth side slope the surface stones need not be thus wedged with smaller stones so as to allow free drainage of the embankment. Profiles of strings and pegs should be used to ensure that rock toe is done true, straight and to confirm neatly to the designed slopes throughout

iii. Rock spalls and stones not less than 0.014 cum in volume shall then be dumped in the interior portion so as to claim a free draining. properly graded fill with the best practicable distribution of materials and prevent large unfilled spaces being left within the rock mass. The inclusion of rock spall in the mass to amount in excess of the required to fill the voids between the large stones shall be permissible. The stones used shall consist of sound dense and durable rocks and shall be reasonably well graded.

(D) Slope and Bed Filter to Rock Toe

i. Slope and bed filter should be laid for the rock toe consisting of filter materials of specified thickness and types shown in the drawings.

ii. The specification of the materials mentioned shall be the same as given in paragraph (B), above.

iii. The thickness of the various types of filter materials shall be specified in the plans.

(E) Measurement and Payment

Measurement and payment for filters shall be in the units of cubic meter. The payment shall be made on the relevant unit price bid in bill of quantities and the unit price shall include cost of furnishing, hauling of the materials and labour involved in all the operations specified for formation of filters.

7.1.3. Rough Stone Dry Packing for Aprons and Revetments

i. The bed or slopes to receive the packing shall first be provided as specified and passed by the Engineer-in-Charge. In case where the work. of preparation of bed and slopes such as cutting out high bund, filling in hollows, etc. or the digging of the well foundations is rather extensive, separate items should usually be provided for such subsidiary kinds of work in the schedule the agreement. But if the work involved in such subsidiary item is very little, no separate provision need made and in the absence of such provision the Contractor shall understand that his tender rate is inclusive of all such work without extra charge. If the backing is to be laid on made up ground which is objectionable it shall so far as possible, not to be laid till the ground has completely settled if a backing of gravel, quarry rubbish or other material is to be given, it will be specified in a separate schedule item.

The size of the stone to be used for dry stone revetment should be 225 mm. and 300 mm thick or as specified.

ii. The stone shall be perfectly sound, as regular in shape as Possible free from cracks and decay and with their lengths equal to the thickness of the required apron or revetments and each stone shall not be less in size than 0.05 cubic meter unless otherwise specified or ordered by the Engineer-in-Charge having required to the nature of the stone along quarried. The smaller size stones required for filling in interstice and wedging shall only be supplied to the actual requirements for the work as defined in clause (iv) below and shall not .be used in 2 or 3 layers as a substitute for the full thickness stone, specified in clause (ill) below. The stone shall be obtained from the quarry specified.

iii. The stones shall be laid closely in position on the prepared bed and firmly set with their broadest end downwards. So that they may meet all round their bases and with the top of the stone, level with the finished surface of packing. The stones shall be laid breaking joints so far as possible in the direction of the flow of water. The stones are to be placed perpendicular to the finished surface i.e., perpendicular to the slope for revetments.

iv. Interstices between adjacent stones shall be filled in with stones of the proper size, well driven in with crowbars to ensure tight packing and complete filling of all interstices. Such filling shall be carried on simultaneously with the placing in position of large stones and shall in no case be permitted to fall behind. The final wedging shall be done only after obtaining the orders of the Engineer-in-Charge. The final wedging shall be done with the largest size chip practicable, each chip being well driven home with a hammer so that no chip is possible of being picked up or removed by hand.

v. Profiles of strings and pegs are to be put up to ensure that the pitching is done true, straight and to the proper slope throughout and revetments are in all cases to be built up from the foot of the bund to be reverted. Care is necessary that a strong toe wall or other protection is always given to the revetment which protective measures shall be shown on the plans.

vi. On completion the surfaces presented by the apron or revetment shall be even throughout free from irregularities to the required length. breadth and slope as specified or shown on the plans.

Measurement and Payment

Measurement and payment for rough stone dry packing for apron and revetment will be in the units cubic meters. The payment will be made on the relevant unit price bid in bill of quantities and the unit price shall include cost of furnishing, hauling of all materials and labour involved in all the operation specified for rough stone dry packing.

STONE PITCHING.

7.2. General

Stone protection work for loose apron of the barrage bays beyond concrete cubes both in upstream and downstream and also below the cubes of upstream of barrage are to be provided as per relevant drawings. Rough stone pitching has to be provided on the river side slope of the afflux and guide bunds. The launching apron for these bunds in continuation of the revetment to abutment shall be constructed with random rubbles.

7.3. Material for Stone pitching.

7.3.1. The pitching material shall consist of the most durable rock fragments of approved quality selected for the purpose. Stones shall be procured from the approved quarries, and if required shall be subjected to inspection and approval by the Engineer-in-charge. The quality of individual stone shall be dense, sound and free from conglomerate, bands and other defects that would tend to increase their susceptibility to destruction by water and weathering action. Stones having thickness less than 50% of their maximum dimension shall not be used for pitching.

7.3.2. Size of Stone

Stone shall be of minimum 0.003cum (30 cm size & above size) in size. At least 15% of stones to be used for pitching shall have depth equal to the thickness of pitching. All stones to be used for apron shall have a minimum depth of 22.5 cm. No stones shall have any dimensions less than 20 cm. For construction of launching apron hard granite stone of size 0.30 m and above of approved quality are to be used.

7.4. Slope Cutting

The compacted embankment, the slope of which is to be protected with stone pitching, shall be trimmed to the lines and slopes as prescribed on the drawings or as directed by the Engineer-in-charge from time to

time. The earth obtained from this trimming shall be laid on top of the embankment if required or as directed by the Engineer-in-Charge.

7.5. Thickness of pitching

a) Pitching shall be hand placed on the water side slope of the embankment. The thickness of pitching shall be as indicated on the drawings. The thickness shall be measured normal to the slope of the embankment. b) Launching apron shall be hand placed in horizontal layers and its thickness shall be as indicated on the drawings.

7.6. Method of Placement.

a) Before laying the pitching or launching apron on level ground or on sides of the slope of afflux or guide bunds, the receiving surface shall be trimmed to the required slopes and profiles put by means of lines and pegs at regular intervals. Depressions shall be filled up and thoroughly compacted. Pitching on inverted filter, if any shall be started from the end and built in courses upwards. Stones shall be placed by derrick or by hand and so placed that the largest dimensions are perpendicular to the face of the slope. The large stones shall be placed in the bottom course and for use as headers for subsequent courses. b) All interests between adjacent stones shall be filled with spalls if proper sizes and wedged in with hammer to ensure tight packing.

7.7. Measurement and payment

Measurement for payment will be made on the basis of cubic meter of the finished works for the respective items as mentioned earlier after deduction of minimum 1/6th towards void. The unit rate is inclusive of trimming the earth to required profile, slopes and grade and/or preparing level strips at suitable interval as directed to have uniform base, cost, conveyance, royalty, DMF. EMF & Additional Charges and other taxes of materials, supply of equipments labour etc. complete as per direction of Engineer-in-charge.

CHAPTER-VII
ROAD WORK

GENERAL

1. Road shall be constructed to the lines, level and grade with sand and moorum fill having desired parameters of density cohesion, etc. so as to ensure the designed stability and performances of the whole road. The Quality Control Organization of the project may carry out requisite test for the suitability of construction materials well in advance and the contractor shall ensure that only approved materials are brought to place of fill and used for construction of Road.
2. The difference in elevation of the approach road during construction within each working length of not less than 50M shall not exceed 1.0M anywhere in the cross section unless specifically permitted by the Engineer-in-Charge placing of the layers for the road portion programmed for construction in the season shall be continuous and approximately horizontal. In case the whole length of road is not constructed simultaneously, the incomplete end of the road shall be kept at slope not steeper than 1 in 4.
3 No materials shall be placed in any section of the road until the road seat for that section has been dewatered, suitably prepared and approved by the Engineer -in-Charge. All portions of excavation made for test pits or other sub-surface investigations, all holes, hollows, and all other existing cavities found within the area to be covered and which extend below the established lines of excavation for road seats, shall be filled with suitable earth fill of the corresponding zone of the road and suitably compacted.
4 Pools of water shall not be permitted in the foundation for road and such water shall be drained and cleared prior to placing the first layer of road materials.
5 The contractor shall construct and maintain good diversion in case the existing communication are disturbed. Precautionary measures such as night lamp, danger fencing signals shall be provided by the contractor at his cost to avoid accidents on the communication lines because of contacts activities.

SETTING OUT OF THE WORK

1 In the vicinity of the road, there are permanent Bench Marks fixed by Survey of India. Temporary Bench Marks shall be set up by the department at every 1.0 km interval at convenient locations along the road to serve as control points. The contractor shall establish sufficient numbers of reference Bench Marks for facilitating the setting out and taking levels for measurement of work with the approval of the Engineer-in-Charge at his own cost. The Bench Mark shall be 30cmX 30cm X 75cm with concrete pillar, which shall be embedded 55cm into firm ground and 20cm projecting above the ground. The Bench Marks shall be constructed in plain c.c. M-10. These pillars shall be well protected from being disturbed. The word B.M. showing value of R.L. shall be conspicuously carved and painted on the Bench Mark.
2 Before starting any work and during execution (if required) the contractor shall erect reference Bench Marks, reference lines and check profiles at convenient locations as per the direction of the Engineer- In-Charge. The center line of the road and the reference line for all alignments for demarcation purpose shall be laid by properly dug-belled on the ground.
3 The Check profiles shall be located at 30M. apart or closer as directed by the Engineer-In-Charge so as to ensure execution of all slopes, steps and elevations, to the profile as indicated in the approved drawings. All important levels and all control points with respect to Bench Marks and reference lines shall be fixed and co-related by the Engineer-In-Charge.

4 To ensure correctness of execution the edges of cutting, the lines of the road and those of spoil bank shall be marked carefully with pegs at close enough intervals so as to obtain a layout in plan free from banks. The pegs shall then be connected by stretching string from peg to peg and dug belling into ground along the strings. The lines so connected shall be corrected whenever necessary to provide a stream lined plan of the features. Special care shall be taken at curves to ens':1re uniform curvature of the alignment. The layout of the structures shall have to be given in appropriate manner with pegs & pillars. ;

5. All materials and labour for settings out works including construction of reference Bench Marks, reference lines check profiles and surveys, as may be required at the various stages of the construction, shall be supplied by the contractor at his own cost. The cost of such works shall be deemed to have been included in the costs of items in schedule.

PREPARATION OF SITE

1 CLEARING THE SITE

(a) The contractor shall clear the entire area required for setting out, of all tree stumps, bushes, jungles, roots, brushwood, rubbish of all kinds, loose stones and all other objectionable materials. The ownership of all the useful materials so removed from clearing site and or excavation shall rest with the department. The contractor shall have to remove all the stumps and roots of trees for which no additional payment will be made. The roots of the trees shall be grubbed to full depth. The contractor shall dispose off all such materials within 1 km. or as directed by the Engineer-in-Charge. All operations in connection with clearance of jungle and bushes shall be subject to provision of forest acts and rules.

(b) No separate payment will be made to the contractor for the complying the requirements of this paragraph and all cost shall be deemed to have been included in the rates quoted in schedule for the items of excavation.

2 RECORDING OF CROSS SECTION

After clearing the site the area is to be stripped of objectionable materials after which the initial cross sections shall be taken at every 30 m interval or closer depending on nature of the ground upto sufficient distance outside the limit if work. Levels on these cross sections shall be taken at 5 m. or closer intervals as directed by the Engineer-in-Charge and recorded in the field and level books in the presence of the contractor or his authorised agent shall sign the field work/level book in the token of acceptance. These c.s. shall form the basis of all future measurement and payment. The original c.s. duly signed by contractor and the Engineer in charge shall be preserved. Such dimension shall be measured to the nearest 0.01 M. any dimension greater than 25 mm. shall be measured to 0.01 M. Area shall be computed to 0.01 M^2, volume shall be computed to 0.01 M^3.

FOUNDATION PREPARATION

1 SOIL FOUNDATION

Soil foundation under the seat of road shall be scarified and loosened by means of a plough, fipper or other means to a depth of about 15 cm .to 20 cm .to the satisfaction of the Engineer-in-Charge. Roots and other debris turned up during scarifying shall be removed from entire foundation area for the fill. Before placing of fill materials, the stripped slat of the road is to be initially compacted. The first few layers of fill for the road shall be of depth of 10 cm to 15 cm and shall be carefully placed, ensuring uniform compaction and a satisfactory intimate bond between the foundation soil and fill materials. Heavy rubber type rollers or vibratory rollers may be used for compaction because they will follow the irregular surface and not bridge over small low areas as other type of rolling equipments will do. Power Road Rollers shall be used for compaction of impervious

soil and preferably vibratory type roller shall be used for compaction of all other soil and rock. Separate payment shall not be made for preparation of foundation as above and it shall be deemed to have been included in the unit rate quoted for respective item of road.

2 SAND FOUNDATION

Sand met with in foundation shall be tested for it's lateral relative density. In reaches where the relative density is less then 70% the foundation sand shall be compacted by any of the approved methods to obtain a minimum relative density of 70%. Until the foundation has been tested and the relative density found to exceed 70%, fill shall not be allowed to be placed. This is necessary to minimize the effect of any structural readjustment in a loose foundation.

BORROW AREA

1 GENERAL

All materials required for the construction of road shall be obtained from borrow areas duly approved by the Engineer-in-Charge in consultation with quality control unit. The contractor has to arrange borrow area for necessary testing and approval of Engineer-in-Charge to borrow sand &moorum at his own cost and responsibility. No compensation whatsoever for change in limits and locations of the borrow areas and depth of cut for getting suitable road materials shall be paid to the contractor. No excavation is permitted within a distance of ten times the height of road from the outer toe. Borrow pits shall be operated so as not to impair the usefulness or mar, the appearance of any part of the work or any other property. The surface of wasted materials shall be left in a reasonably level and even condition. Adequate lighting arrangement should be provided by the contractor at the borrow area if required.

2 PREPARATION OF BORROW AREA

All areas required for borrowing sand for road shall be cleared of all tree stumps, roots, bushes, rubbish and other objectionable materials. Particular care shall be taken to exclude all organic matter from the materials to be placed in the approach road. All cleared organic materials shall be burnt to ashes or disposed off as directed. The cleared areas shall be maintained free of vegetable growth during the progress of the work. No payment shall be admissible for preparation of the borrow areas indicated above as this is deemed to have been included in unit bid price.

3 STRIPPING OF BORROW AREAS

Borrow areas shall be stripped of top soil, and any other objectionable materials to the required depth I as directed by the Engineer-in-Charge. The work may be done manually or with suitable machine. Stripping operations shall be limited only to designated borrow areas. Materials from stripping shall be disposed of in exhausted borrow areas or in the approved adjacent areas as directed. No extra payment shall be admissible for stripping the borrow areas as this is deemed to have been included in the unit bid price.

HAUL ROADS ANDAPPROACH ROADS

Construction and maintenance of approach roads and haulage roads will be the responsibility of the contractor. The department will have full right of way to those roads for inspection purposes. Proper road sign as directed have to be provided for safety. For haulage of road materials, the contractor shall construct ramps and haulage and of sufficient width along the shortest but most practical route and shall maintain and illuminate them to a

satisfactory manner. Watering of the haul road shall be done by the contractor as often as necessary to prevent raising of dust, formation of cuts and consequent deterioration of the surface. Whenever service roads meant for public thorough fare traverse through or run close to the borrow areas, the contractor shall direct his excavation and haulage operation in such manner as to ensure uninterrupted use of the service road and safety to the public. At the haul road and the service road crossing, the contractor shall install necessary check gates and road signs. No extra payment is admissible as this is deemed to have been included in the unit bid price for the earth work item being contingent to the main work.

WEATHERCONDITIONS

Road materials shall be placed only when the weather conditions are satisfactory to permit accurate control of the moisture content in the road materials. Before closing work on road, the top surface shall be graded and rolled with a smooth wheeled roller to facilitate run off. Prior to resuming work, the top surface shall be scarified and moistened or allowed to dry as necessary and approved by the Engineer-in-Charge for resumption. The contractor shall provide suitable protection works to protect the slope from erosion due to rainwater. No payment whatsoever shall be made for providing such protection work and rectifying of monsoon damages.

WATERING

(i) Adequate watering to the sand fills it to be done to facilitate proper compaction. Similarly water content to moorum is to be controlled for proper compaction. No compensation will be made to the contractor due to held up of work for rain, fog and moisture content in the working process.

COMPACTION

1 GENERAL

(a) Having decided on the filling materials to be used, standard compaction test shall be made on the materials proposed for road to indicate broadly which are the most suitable type of equipment to be used and the moisture content at which compaction should be undertaken and also to determine the effects of soil moisture content, thickness of layer and number of passes.

(b) Having decided on the thickness of layer and range of moisture contents, tests should be made with different type of equipment available and the required number of passes should also be determined.

(a) In all this work, the state of compaction should be measured in terms of dry density.

(b) Density tests if felt necessary by Engineer-in-Charge shall be made after rolling in that case. Standard proctor density test shall be carried out at regular intervals to account for variations in the borrow area materials as well as that in situ excavated materials.

(c) The contractor shall supply all materials labour machinery and equipment at his cost for the work.

(d) No extra payment shall be made for these operations as this shall be deemed to have been included in the price bid in schedule of Quantities for the respective item of work.

ROLLING

When each layer of materials has been prepared so as to have the proper moisture, content uniformly distributed throughout the materials it shall be compacted by passing the vibrating roller or P. R .R .The exact number of passes for each layer to obtain specified density shall be designed by the field laboratory after necessary test, the layer shall be compacted in strips over tapping not less than 0.6 m. Rolling shall commence at edges and progress towards centre longitudinally. The rollers of loaded vehicle shall travel in a direction parallel to the axis of the road. Turns shall be made carefully to ensure uniform compaction. Rollers shall always be pulled. Density tests shall be made after rolling and dry density attained shall satisfy the compaction standards specified in relevant I.S. Codes.

COMPACTION OF COHESIONLESS MATERIALS

Where compaction of cohesion less free draining materials such as sand and gravel is required, the materials shall be deposited in horizontal layers and compacted to the relative density specified. The excavation and placing operations shall be such that the materials when compacted shall be blended sufficiently to secure the highest practicable unit weight and best stability. Water shall be added to the materials as may be required to obtain the specified density by method of compaction being used.

The thickness of the horizontal layers after compaction shall not be more than 10 cm, if compaction is performed by tampers and more than 15cm, if by rollers.

DRESSING SLOPES

The slopes of road shall be neatly dressed to lines and grade as shown on the drawing as the placing of fill progress, compaction shall extend over the full width of the road and materials in slopes shall be compacted as for the rest of the road. To ensure proper compaction of the edges, the cross section of the fill during construction shall be kept suitable wider as directed by the Engineer-in-Charge and cross section shall be dressed to the designed requirement after compaction for which no extra payment shall be made as it is deemed to have been included in unit bid price for item of schedule of Quantities. Materials used to fill depression shall be of same type as used in the road and shall be thoroughly compacted and bonded to the original surface. Slopes shall be maintained until final completion and acceptance. Any material that is lost by rains, weathering or other causes shall be replaced at the cost of the contractor till completion of the works and taking over by the department.

SETTLEMENT ALLOWANCES

(i) In the fill road, settlement allowances of 2% will be provided. Accordingly extra height shall be provided but payment for design height will be made. The base width of the road will not be increased to maintain the design slopes indicated in the drawing for the additional height as settlement allowances, but the following procedure will be adopted, settlement allowances will be calculated at various levels where the slopes is to be changed and the elevations including settlement allowances will be derived keeping the road widths of the designed levels unchanged. The edges of road at the increased elevations (including settlement) when joined with the point 1 where the slope has changed earlier bellow, shall give the slope to be adopted for constructions.

(ii) If the road is raised in more than one season, provision for settlement shall be made in the last season's construction as described above.

MEASUREMENT AND PAYMENT

(a) All works shall be measured by levels.

(b) For payments the level books, field books, the cross section sheets and calculations sheets shall be treated as adjuncts to the measurement books.

(c) All linear measurements shall be in meters, correct to 0.01 meters, area worked out in square meter correct to 0.01 m^2 and volume work-out in cubic meters correct to 0.01 m^3.

(d) The quantities between the levels taken after stripping and cross sectional levels taken after construction of consolidated road with the available useful excavation soils. It shall be clearly understood that construction of road to extra width as specified and extra height formed for settlement allowance as specified earlier will not include for payment. The measurement will be limited to within design section.

(e) Final measurement and levels shall be taken at the cross sections of the completed compacted bank design section after the slopes dressed to ensure that work is completed as shown in the drawing plus

settlement allowances. The measurements for computation of quantity shall not include the extra section provided for compaction of sand fill upto lines of finished slope and for settlement allowances.

RATE FOR PAYMENT

The rate for Construction of road under item provides all costs for labour, materials, tools and plants, machinery, excavation, transportation and incidental operations required for carrying out and completing the item of work in accordance with the specification, drawing and as directed by the Engineer-in-Charge including (i) Site clearance (ii) Setting out works (iii) Marking out, providing and forming model section, locks spitting, strings and stakes as may be considered necessary by the Engineer-in-Charge to guide the contractor in road construction (iv) compacting the original ground including preparation of seat under road (v) Scarifying and benching etc.(vi) Clearing trees stumps and bushes, stripping of the borrow area upto required depth (vii) Maintaining borrow area free from vegetation growth, drainage arrangement and moisture control including watering (viii) Loading, conveyance from designated borrow area, unloading and spreading of suitable materials including rehandling (ix) Construction and maintenance of approach roads and haul roads (x) Cutting and trimming as specified in dressing of slopes (xi) Restricted working near sites of structures (xii) Settlement allowance (xiii) Spreading in thinner layers at required places (xiv) Compaction with suitable compactors (xv) Removal of materials like bushes, roots, sods, other perishable materials and pebbles etc. from the fill materials (xvi) Providing labour and testing charge for testing of samples (xvii) All drainage and dewatering as required (xviii) The section of all work to be maintained in good order during execution and also in rainy season (xix) All safety measures.

SCOPE OF WORK

This specification covers items for construction of road work starting from sub-base preparation to pre- coated seal coat over premix asphalt carpeting including earth work in excavation or trimming for laying sub base, preparation of sub-base with moo rum and sand mix laying and compacting I.R.C. Gr .I (40mm to 90mm. size) and I.R.C. Gr. III (25 to 40mm size) metaling with hard granite hand broken metal premix; asphalt carpeting and precoated seal coat. The work covers providing all materials, labour, conveyance of materials with all leads, lifts and delifts, stacking at site, spreading, rolling, watering including royalty, DMF, EMF & Additional Charges and all taxes.

GENERAL

(i) All works performed shall conform to lines, grade, cross sections, levels and dimensions shown in the drawing with necessary super elevation and extra width at curves for roads and as directed by the Engineer-in-Charge.

(ii) Proper care shall be taken to avoid any interference with or damage to works of other discipline such as water supply, sewerage, electricity etc.

(iii) The Contractor shall submit sequence of operation which he proposes to follow to the Engineer- in-Charge and shall obtain approval to it prior to commencing work and shall adhere to the agreed sequence after modification if any by the Engineer-in-Charge.

(iv) The methods and plants and equipments to be used by Contractor is subject to approval of Engineer-in-Charge .

(v) Sign boards for construction activities, overtaking signals, diversion of road etc. is to be displayed by Contractor at his own cost.

(vi) The Contractor shall at all time carry out work in a manner creating least interference to the traffic during execution. The Contractor shall provide and maintain during execution a passage for traffic either along or as part of existing way under construction or a separate diversion road at his own cost.

(vii) Quality of all materials should be approved by Engineer-in-Charge prior to collection at site.

(viii) Construction traffic shall not be allowed to use the newly prepared surface without prior permission from Engineer-in-Charge. Any damage arising out of such use shall however be made good by the Contractor at his own cost.

(ix) All measurement a 00 computations unless otherwise indicated shall be carried out to the following limit

(i) Length and breadth –10 mm .

(ii)Height, depth or thickness of earthwork, Sub base and base course-5mm.

(iii) Areas - 0.01 sqm.

(iv) Cubic content - 0.01 cum.

(x) Materials found inferior and rejected shall be removed from site immediately by the Contractor at his own cost.

(xi) Works rejected by the Engineer-in-Charge on ground of poor quality or workmanship shall be dismantled and redone by the Contractor at his own cost.

(xii) Complete stacking of materials like sand, moorum, H.G. chips: as per requirement shall be carried out in 2Km. length before spreading, The collection shall always commence at one end and be carried continuously towards the other unless the Engineer-in-Charge directs otherwise.

(xiii) Till utilization, the Contractor will be responsible to protect the materials collected at the work site at his own cost.

(xiv) The unit rates for different items of work shall be for payment in full for completing the work to the requirement of specification including full compensation for all the operations detailed in relevant section of specification and in schedule. The rates are considered for finished work covering all labour, tools, equipment, wastage, Temporary works, hire and running maintenance of plant and equipments, watch and ward, overhead charges and profit as well as general liabilities, obligations and risk arising out of the contract for the work.

EXCAVATION (OR) TRIMMING FOR LAYING SUB-GRADE

(i) The road or surface to the full width of the pavement is to be excavated or trimmed to designed level for laying the sub-grade.

(ii) The excavated material to be disposed off by laying on the berms or slope of road finished smooth or as directed by Engineer-in-Charge.

(iii) Measurement for payment shall be made on cubic meter basis. The volume will be measured by level section limited to designed sections, lines and grade.

MATERIALS

1 MOORUM

The moorum shall have plasticity index not less than 6 as determined in accordance with I.S. 2720 (part v) .It shall be free from all rubbish, dust and organic materials as well as clods of clay / black cotton soil. The moorum should be granular and gritty.

2 SAND

Sand shall consist of hard, dense, durable and uncoated silicious gritty materials. Sand to be used shall be natural as obtained from river bed from specified quarries. It shall be free from all rubbish, dust and organic materials as well as clods of earth loam and other deleterious substances.

3 STONE AGGREGATE

3.1 METAL

(a) The hard granite crusher broken stone metal shall be obtained from rock excavation if available or quarries as approved by the Engineer-in-Charge prior to collection. 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, round, elongated or flaky materials shall be rejected. No round or along pebbles or angular chips, longer or smaller than the specified size shall be allowed. The size of the metal shall be 40mm to 90mm for I.R.C. Grade-I and 45mm to 63mm, for I.R.C. Grade-II and it shall be machine crushed.

(b) Samples metals, collected from the approved quarries shall be get tested by the Contractor at his cost in the laboratory. The test results shall conform to the standard requirement laid down for metal to be used for this work.

(c) The physical requirement for standard size metal shall conform to the test results in the Table in next page.

Type of construction	Test	IS for test method	Requirement
Base	(i) Los Angels abrasion value	IS: 2386 (Part iv)	50% Maximum
	(ii) Aggregate impact value	IS: 2386 (Part iv) or IS: 5640	40% Maximum
	(iii) Flakiness	IS: 2386 (Part-I)	15% Maximum.
	(iv) Water absorption	IS: 2386 (Part iii)	2% Maximum.

(d) Grading requirement of coarse aggregates :

The coarse aggregate shall conform to one of the gradings as given in table below provided, however the use of grading No. I shall be restricted to sub-base coarse only.

Table: Grading requirement of coarse aggregates.

Grading No.	Size Range.	Sieve Designation	Percentage by weight passing
I.R.C.-I, Metal	90 mm to 45 mm	125 mm	100
		90 mm	90-100
		63 mm	25-60

	40 mm	0-5
I.R.C.-II, Metal 63 mm to 45 mm	90 mm	100
	63 mm	90-100
	40 mm	25-60
	20 mm	0-10

CHIPS

(a) Stone chips shall consist of regular fragments of clean hard, tough and durable rock of uniform quality throughout by crushing granite rock, and shall be free of elongated and flaky pieces, soft and disintegrated materials, and vegetable or deleterious matter. They shall satisfy the physical requirements set-forth as under.

Test	IS for Test Method	Requirements.
(i) Los Angels Abrasion value	IS:2386 (Part-IV)	35% Maximum
(ii) Aggregate impact value	-do-	30% Maximum
(iii) Flakiness index	IS:2385 (Part-l)	30% Maximum
(iv) Stripping value	IS:624	25% Maximum
(v) Water Absorption	IS:3386 (Part-lll)	2% Maximum.

(b) Size of the stone chips shall be as under :

(i) For premix carpet 13.2mm to 5.6mm size: Passing through proper sieve and retained on 10 mm sieve.

(ii) For precoated seal coat 6mm and down graded size: passing 10mm sieve and retained on 2.36mm. sieve.

(c) Samples of stone chips collected from the approved quarries shall be got tested by the Contractor at his cost in laboratory. The test results shall confirm to the standard requirement as laid down herein.

(i) Control on quality of material will be exercised by the Engineer-in-Charge by carrying out the following tests at frequencies shown against each.

Type of construction material	Test	Frequency
Chips for carpet and seal coat.	i) Aggregate impact value	One test per 100 M^3 of aggregate
	ii) Flakiness index of aggregate.	-do-
	iii) Stripping value and water absorption of aggregates.	Initially, one set of 3 representative specimens for each source of supply subsequently when warranted by changes in the quality of aggregates.
	iv) Grading of aggregates	One test for 100 m^3 of aggregates.

3.2 BITUMEN

Bitumen of 80/100 grade conforming to IS:73,217 or 454 as applicable of other approved cut back approved by the Engineer-in-Charge, in writing shall be utilized in the work. Procurement of the bitumen will be made by the Contractor his own cost from reputed manufacturers on approval by the Engineer-in-Charge. The contractor is to produce test certificate to be issued by manufacturer for each consignment separately.

CONSTRUCTION PROCEDURE

1 SUB-BASE BELOW PAVEMENT

(i) Moorum and sand stacked separately shall be conveyed and mixed properly to make an admixture of moorum and sand in proportion as per direction of Engineer-in-charge.

(ii) The formation after excavation or trimming shall be dressed to required camber and grade.

(iii) The admixture of moorum shall be spread in subbase and also side shoulders in layers not exceeding 15cm. in thickness and should be adequately watered.

(iv) Immediately following spreading of spreading of admixture moorum rolling will be started with three wheeled roller of 8 to 10 tones capacity or equivalent vibratory roller. The rolling shall begin from edges firmly compacted and then progress gradually from edges to center, parallel to the center line of the road and over lapping uniformly each preceding rear wheel track by one half width and shall continue until the entire area of the course has been rolled by the rear wheel. In case of superelevated portions rolling shall proceed from inner edge to the outer edge. Rolling to continue till the admixture of moorum is thoroughly keyed. During rolling sprinkling of water is to be done as required for a dense compacted mix layer .

(v) The rolled surface to be checked transversely and longitudinally and any irregularities, ruts and soft yielding places be corrected by loosening surface, adding or removing amount of admixture moorum and rolling entire surface to conform desired grade and camber of 1 in 50 (not flater than 1 in 72).

2 I.R.C. GRADE-I AND I.R.C. GRADE-II METALING

2.1 SPREADING OF COARSE AGGREGATE

i) The quality and grading of I.R.C. Grade-I metal (size 90mm to 45mm) and I.R.C. Grade-II metal (size 45mm to 63mm .) shall satisfy criteria described under sub-head criteria “materials" (Chapter 11.6.3).

ii) Stacking for Gr.-II shall be done after the spreading of Gr.-I metal.

iii) The surface to receive I.R.C. Gr-I or Gr.-II water bound macadam course (metaling) shall be made free from dust and other extraneous material.

iv) The respective grade metals shall be spread uniformly to specified nominal thickness of 11.5cm. and 10 cm for I.R.C. Grade-1 and I.R.C Grade-II metaling respectively or as directed by Engineer- in-charge.

v) The spreading shall be done from stacks along the side of the roadways or approved stock yards. In no case shall aggregates be dumped in heaps directly on the surface prepared for the metaling nor shall hauling over un compacted or partially completed base be permitted. No segregation of large or fine particles shall be allowed.

The surface of the aggregates shall be carefully checked with Templates and all high or low spots remedied by removing or adding aggregates as may be required by hand packing the same to proper grade and camber.

(vi) The bunds of earth or moorum one on either side shall be made along the outer edge of metaling prior to or simultaneously with spreading of metal. In addition where over required turf edging are to be provided. These bunds and turf edging are required to prevent loose metal from spreading out beyond width of road to be metaled.

No extra payment will be made for the bunding or turf edging as the same are deemed to be / included in the unit rate of respective items.

(vii) The course aggregate shall normally be spread more than 3 days in advance of the subsequent / operation.

(viii) Spreading of metal shall proceed only 200m. in advance of rolling operation.

2.2 CONSOLIDATION

(a) Immediately following the spreading of the coarse aggregates, rolling shall be started with three wheeled power roller of 8 to 10 tonne capacity or equivalent vibratory roller. The weight of the roller shall depend upon the type of the aggregate and shall be as indicated by Engineer-in-charge.

(b) Except on superelevated portions where the rolling shall proceed from inner edge to outer rolling shall begin from the edges gradually progressing towards the center. First the edge/edges shall be compacted with roller moving forward and backward. The roller shall then move inwards parallel to the center line of the road, in successive passes uniformly lapping preceding tracks by at least one half wheel width.

(c) Rolling shall continue until the aggregate is thoroughly keyed and the creeping of the aggregate ahead of the roller is no longer visible. During, rolling slight sprinkling of water may be done, if necessary. Rolling shall not be done when the sub-grade is soft or yielding or when it causes a wave like motion in the sub-grade or sub-base course.

(d) The rolled surface shall be checked transversely and longitudinally with Templates and any irregularities corrected by loosening the surface, addition or removing necessary amounts of aggregates and re rolling till the entire surface conforms to desired camber and grade. In no case shall use of screenings be permitted to make up depression.

(e) Moorum as blinding material shall be applied, successively in two or more thin layers at a slow and uniform rate. After each application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms or mechanical brooms to fill the voids properly, and rolled, during which water shall be applied to the wheels of the rollers, if necessary to wash down the blinding materials sticking to them. These operations shall continue until the resulting slurry after filling the voids, forms a wave ahead of the wheels of the moving roller.

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

(g) Material which crushed excessively during compaction or becomes segregated shall be removed & replaced with suitable aggregate.

(h) It shall be ensured that shoulders are built up simultaneously along with water bound macadam courses.

2.3 CONSUMPTION OF MATERIALS

Consumption of material for specified thickness of pavement in case of both I.R.C. Gr.I and I.R.C. Gr. III metaling shall be as follows:

	I.R.C. Gr.I	I.R.C. Gr.II
Over all (Nominal) thickness of layer laid	121 mm.	100 mm.
Compacted thickness	100 mm	75mm.
Consumption of metal	0.121 cum/sqm	0.100 cum/sqm
Consumption of moorum as blinding	0.030 cum/sqm	0.022cum/sqm material.

Note : Quantity of metal and moorum is after deduction of void from stacked measurement.

2.4 PREMIX CARPET AND SEAL COAT

(a) This work shall consist of laying an open graded carpet of 25mm thickness in a single course and 6mm thick precoated seal coat composed of suitable small sized aggregate premixed with bituminous binder on a previously prepared approved base.

(b) The quality and grading of materials shall satisfy provisions under sub-head materials.

(c) Carpet shall not be laid during rainy weather or when the base course is dam of wet of when the atmospheric temperature under shade is 160C or below.

(d) The underlying base on which the bituminous carpet is to be laid shall be scraped with wire brushes, swept clean with brooms and finally dust removed with sacks as found necessary.

(e) Tack Coat

This work shall consist of application of a single coat of low viscosity bituminous material to under lying road surface duly cleaned preparatory to bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160^0 to 175^0C. Bitumen shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-Charge. The rate of spread in terms of straight run bitumen shall be 0.98kg. (Say 1kg) per square meter area for untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. The tack coat shall be applied just ahead of bituminous construction.

(f) Mixing

Bitumen Mixers of approved type shall be used for fixing aggregates with the bituminous binder. The binder shall be heated to the temperature raising from 150^0C to 175^0C as approved by the Engineer-in-Charge, avoiding local over heating and ensuring a continuous supply. Aggregates shall be dry before they are placed in the mixer. After about 15 seconds of dry mixing the heated binder shall be distributed over the aggregates at the rate specified. Kerosene to an extent of 4% to 6% of asphalt shall be provided by the Contractor according to the requirement at his cost. Mixing of binder with chips shall be continued until all chips are uniformly coated with the bitumen and a homogeneous mixture is obtained. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in transit, if so directed by the Engineer-in-charge.

(e) Spreading

The mix shall be spread on the road surface with rakes to the required thickness and camber, or distributed event with the help of a drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out to prepare the surface to specified line, grade and camber.

(f) Rolling

As soon as sufficient length of bituminous material has been laid, rolling shall commence. When the roller has passed over the whole area once, any high spots or depressions that become apparent shall be corrected by removing or adding premixed materials. The rolling will be done with a set of 8 to 10 tonne three wheel tandem rollers or equivalent suitable pneumatic roller as approved by Engineer-in-

Charge. The roller speed will not be exceeding 5km. per hour. The roller wheels shall be kept damp to prevent the mix from adhering to them but in no case shall lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edges and progress towards the centre except that in super-levated portion, it shall progress from lower to upper edge parallel to the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimize the pushing of the mix and each pass of the roller uniformly over laps not less than one third of the track made in the proceeding pass. Rolling shall continue until the entire surface has been rolled and all the roller marks eliminated. The contractor shall provide necessary labour for keeping the roller wheels damp during rolling so as to prevent the premix from adhering to the wheels and being picked up. The edges along and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate bitumen before the new mix is placed against.

(g) Seal Coat

6mm thick precoated seal coat shall be applied immediately after laying of the bituminous course of carpet. Before application the surface shall be cleaned free of any dust or other extraneous matter. Mixing of chips and bitumen, laying the mix to proper thickness and rolling will be done similar to procedure for premix carpet described above.

Blinding of rolled asphalt surface with course clean sand at the rate of 0.003 cum per Sqm shall be done by the contractor at his own cost as the same is included in the unit price.

(h) Traffic

Traffic may be allowed only after final rolling when the premix material has cooled down to surrounding temperature.

(i) Consumption of Material

(j)

	Material		**Consumption/Sqm of Surface**
A.	20mm thick premix carpet		
	1) 20mm to 12mm size H.G. chips		
	Nominal 20mm	0.015 Cum	
	-do- 10mm	0.008 Cum	
	Total	**0.023 Cum**	0.023 Cum
	2) Bitumen – 80/100 grade		
	Tack coat -	0.907 Kg.	
	Precoating chips	1.270 Kg.	
	Misc. and Wastage	0.091 Kg.	
	Total	**2.268 Kg.**	2.268 Kg
B.	6mm thick precoated seal coat.		
	1) 6mm and down graded H.G. chips		0.006 Cum

	2) Bitumen – 80/100 grade		
	Precoating chips	0.680 Kg.	
	Misc. and Wastage	0.010 Kg.	
	Total	**0.690 Kg.**	0.690 Kg.
	3) Sand (for blinding)		0.003 Cum

2.5 BUILT-UP SPRAY GROUT

(a). Scope

This work shall consist of a two-layer composite construction compacted crushed coarse aggregates with application of bituminous binder after each layer, and with key aggregates placed on top of the second layer, in accordance with the requirements of these Specifications, to serve as a base course and in conformity with the lines, grades and cross-sections shown on the drawings or a directed by the Engineer. The thickness of the course shall be 75mm.

Built-up spray grout shall be used in a single course in a pavement structure.

Base and Surface Courses (Bituminous)

(b), Materials

(i) Bitumen: Clause 504.2.1, shall apply, Where permitted by the Engineer, an appropriate grade of emulsion complying with IS 8887 may be used.

(ii) Aggregates: The coarse aggregate shall conform to Clause 504.2.2.

The aggregate shall satisfy the physical requirements set out in Table 500-3. The coarse and key aggregates for built-up spray grout shall conform to the grading given in Table 500-7**.**

TABLE-500-7, GRADING REQUIREMENTS FOR COARSE AND KEY AGGREGATES FOR BUILT-UP SPRAY GROUT.

Is Sieve Designation (mm)	Cumulative per cent by weight of total aggregate passing	
	Coarse Aggregate	Key Aggregate
53.0	100	-
26.5	40-75	-
22.4	--	100
13.2	0-20	40-75
5.6	--	0-20
2.8	0-5	0-5

(c) Construction Operations

Weather and seasonal limitations: The provisions of Clause 501.5.1 shall apply.

506.3.2. Equipment: The provisions of Clause 505.3.2 shall apply.

506.3.3. Preparation of base: The base on which the built-up spray grout coarse is to be laid shall be prepared, shaped and compacted to the specified lines, grades and cross-sections in accordance with Clauses 501 and 902 as appropriate. A prime coat shall be applied in accordance with Clause 502 with approved primer as directed by the Engineer.

506.3.4. **Tack coat:** A tack coat shall be applied in accordance with the procedure described in Clause 503. as directed by the Engineer.

506.3.5. Spreading and rolling coarse aggregates for the first layer: Immediately after the application of prime or tack coat, the clean, dry and dust free coarse aggregates shall be spread uniformly and evenly by mechanical means, at the rate of 0.5 cum per 10 Sq.m. area.

Immediately after spreading of the aggregates, the entire surface shall be rolled with an 8-10 tonnes smooth wheel steel roller. Rolling shall commence at the edges and progress towards the centre except in super elevated and un-directional cambered portions where it shall proceed from the lower edge to the higher edge, Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass.

The surface of the layer shall be carefully checked, after rolling, with a template and straight edge and shall be within the tolerances specified and any deficiencies corrected by reworking and recompacting the layer.

Care shall be taken not to over-compact the layer.

506.3.6 Application of binder – first spray: The binder shall be heated to the temperature appropriate to the grade of bitumen approved by the Engineer and sprayed on the aggregate at the rate of IS Kg/10 Sq.m. (measured in terms of residual bitumen content) at a uniform rate of spray be mechanical sprayers capable of spraying bitumen uniformly at the specified rates and temperatures. Excessive deposites of binder caused by stopping or starting of the sprayers or through leakage or for any other reason shall be removed and made good.

506.3.7 Spreading and rolling of coarse aggregate for the second layers: Immediately after the first application of the binder, the second layer or coarse aggregates shall be spread and rolled in accordance with the procedure detailed in Clause 506.3.5

506.3.8. Application of binder – second spray: The second aggregate layer shall then be sprayed with binder at the rate of 15 Kg/10 Sq.m. (measured in terms of residual bitumen content) in accordance with Clause 506.3.6.

506.3.9. Application of key aggregate: Immediately after the second application of binder, key aggregates shall be spread uniformly and evenly, preferably by mechanical means, at the rate of 0.13 cu.m./10 Sq.m. so as to cover the surface completely. The key aggregate shall be clean, dry and free from dust and deleterious matter. If necessary, the surface shall be swept to ensure uniform application of the key aggregates. The entire surface shall then be rolled with an 8-10 tonnes smooth wheel steel roller in accordance with Clause 506.3.5. While rolling is in progress, additional key aggregates, where required, shall be spread by hand. Rolling shall continue-until the entire course is thoroughly compacted and the key aggregates are firmly in position.

506.4. Surface Finish and Quality Control.

The surface finish of construction shall conform to the requirements of Clause 902. All materials shall comply with the requirements of the relevant provisions in Section 900 of the Specifications.

Base and surface courses (Bituminous) **Section 500**

506.5. Final Surfacing.

The built-up-spray-grout shall be provided with final surfacing within a maximum of forty-eight hours. If there is to be any delay, the course shall be covered by a seal coat to the requirement of Clause 513 before it is open to traffic. Where the seal coat is required as a result of the selected method of performing this operation, then it shall be considered incidental to the work and shall not be paid for separately.

506.6. Arrangements for Traffic.

During the period of construction , arrangements for traffic shall be made in accordance with the provisions of Clause 112 of the Ministry's Specification for Road and Bridge works (third revision) 1995.

506.7. Measurement for payment.

Built-up spray grout shall be measured as finished work in square meters.

506.8. Rate

The contract unit rate for built-up spray grout shall be payment in full for carrying out the required operations as specified. The rate shall include for but not necessarily by limited to the components listed in Clause 50 L8.8.2(i) to (xi).

3. SHOULDER CONSTRUCTION

(i) The shoulders or berms on either side of the pavement over the embankment to be constructed with rolled moorum layer in conformity with the lines, grades and cross sections as per approved drawing and as directed by the Engineer-in-charge.

(ii) Moorum shall be conveyed from the road side heaps or from stockyard and spread on the prepared base to lines and grade.

(iii) Rolling will be done with 8 to 10 tone capacity three wheeled rollers as per similar to procedure laid for sub base.

ROAD DIVERSION

(a) The Contractor shall Construct and maintain the road diversion for the traffic with necessary sign boards working signal during construction period as approved by the Engineer-in-charge at his own cost.

(b) The Contractor shall take all necessary measures for the safety of traffic during construction and provide, direct and maintain such barricades including sign, marking, light and flagmen as may be required by the Engineer-in-charge for the information and protection of traffic approaching and passing through the section of the road or highway under construction. Before taking up any construction, phased programme for the Control of traffic on the road or highway shall be drawn up in consolation with the Engineer-in-charge.

(c) The barricades erected on either side of the portion of the carriage way closed to traffic shall be strong to resist violation and painted with alternate black and white strips. Red lantern or warning lights of similar type shall be mounted on the barricades at night and kept there through out from sunset to sunrise. At the points where traffic is to deviate from its normal path, the channel for traffic shall be clearly marked with the aid of pavement marking and painted drums are to be kept through out the channel. At night the passage shall be lighted with lanterns or other suitable light sources.

(d) One way traffic operation shall be established whenever the traffic is to be passed of the carriage way inadequate for two lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns lights on both sides, suitable regulatory/warning signs shall be installed for the guidance for the road users on each approach at least two sign shall be put up one close to the point where transition of carriage way begins and the other 120 meters away. The sign shall be of approved design and of reflector type, if so directed.

MEASUREMENT AND PAYMENT

(i) Providing and stacking moorum, H.G. metal (I.R.C. Gr.I and lll), Moorum, metal and Chips shall be stacked in standard box heaps of 1.5 M.x1 .5M.x O.5M.to be measured as 1 Cum. Sand shall be stacked in regular stacks or box heaps of 1.5Mx 1.5 Mx 0.5M as per direction of engineer-in-charge.

The unit rate for respective items includes excavating, collecting procurement, conveying to work site including loading, unloading, stacking the same at approved stack yard beyond trafficable berm in regular box heaps or stacks as directed by the Engineer-in-charge with all leads, lifts and delifts, including royalty, DMF, EMF & Additional Charges, all taxes and incidental charges like watch and ward till utilization.

(ii) Subbase preparation with moorum Measurement for conveying from stacks, laying moorum and watering and rolling for subbase below pavement shall be based on cubic meter content of moorum based on premeasurement of iltems as actually utilized in the work after deduction of void.

The rate shall include Labour and T & P required for conveying moorum from stacks measured previously collection paid separately) spreading the moorum to required thickness, watering, rolling, turfedging with all leads, lifts and delifts, hire and running charges of P.R.R., cost, conveyance of turf and water including royalty, DMF,.EMF & Additional Charges and all other taxes, incidental charges etc .complete for finished item of work to lines and grade as per drawing, specification and as directed by the Engineer-in-charge.

(iii) R .C Grade-I and Gr. II metaling courses will be based on cubic meter content of metals utilized in work after deduction of void from stacked measurement. Volume of moorum used as binding material will not be added to the cubic meter content of I.R.C. Gr.l or Gr. II metaling for payment. The rates shall be for finished items of work to lines and grade (excluding cost of H.G. stone, metal and moorum measured and paid separately) including labour and T & P. required for conveying from stacks and spreading hard granite crusher broken metal to specific thickness, packing voids with small size metals uniformly, hand packing to proper camber, conveying from stacks and spreading of moorum of specified grade and quantity over the metal surface to fill of interstices, watering and consolidation with P.R.R. including hire and running charges of P.R.R. and other equipments, turf edging, cost and conveyance of turf and water with all leads, lifts and delifts including royalty, DMF, EMF & Additional Charges and all other taxes, incidental charges etc. Complete as per specification and as directed by the Engineer-in-charge.

(iv) Premix carpet and seal coat

The stacking of chips of size 12mm to 6mm and 6mm down for premix carpet and seal coat respectively should be stacked in the box for pre-measurement before use. Open graded premix carpet and precoated seal coats shall be measured as work finished to required thickness, line and grade in square meters. The sand for blinding should be stacked in standard stacks and used in work.

The unit rate for the items shall include cost of all materials of required quantity, conveyance to site of work with all leads, lifts and delifts, conveying from stacks, mixing with required quantity bitumen duly heated, application of tack coat, spreading mix to specific thickness, hand packing to proper camber, consolidation with P.R.R. including Labour charges, hire and running charges of P.R.R., bitumen

mixture, tar boiler and all other equipment complete as per approved specification and as directed by the Engineer-in-Charge.

In case of seal coat the rate also includes blinding the surface with course clean sand as per specification

(iv) Shoulder construction

Measurement for conveying moorum from stacks and spreading to required thickness, watering and rolling shall be based on cubic meter content of moorum, after deduction of void, actually utilized in the work.

The rate shall be for finished items of work including labour charges with all leads, lifts, delifts, hire and running charges of P.R.R. and other equipments, turf edging, cost and conveyance of turf and water but excluding cost of moorum measured and paid separately.

CHAPTER-VIII

TURFING

DESCRIPTION OF ITEMS

Fine dressing and turfing the slopes of canal banks with compacted dub grasses including cutting & conveying the turf by mechanical means & placing the turf with all leads, lifts and delifts including watering up to full size growth of the grass and all other incidental charges etc. complete as per direction of the Engineer-in-charge. (Full payment will be made only after survival of the turf)

GENERAL

The turf shall be of good approved quality 'Dub grass' not less than 15cm size. The contractor shall have to arrange the 'Dub grass' at his own cost. The contractor shall have make good the damages to the slopes of the embankment due to rain cuts etc. and bringing it to proper profile before the tuft is laid. The turf shall be laid to finished designed slope and profile rammed for compaction and be watered up to green growth of the grass. There will be deduction of 20% quantity of earthwork if the agency fails to complete the turfing work.

MEASUREMENT & PAYMENT

Measurement for payment of turfing shall be made after full and satisfactorily growth of the turf. Measurement shall be made on square meter basis and the unit rate shall be 1 sqm of the area. The rate include cost of all labour, cost, conveyance including cost of watering and all other incidental charges to complete the work as per specification and direction of Engineer-in-charge.

CONTRACTOR **SUPERINTENDING ENGINEER**

Hume pipe

Section 6.3 Special Requirements for Concrete Structures

6.3.4 P.V.C. strips

The finished P.V.C. strips shall be manufactured with shapes conforming to dimensions shown on the drawing and shall be extruded from virgin, pigmented, P.V.C. the finished P.V.C. strip shall meet the requirement of table I and II of I.S. 9766-1981.

The P.V.C. water stops conforming to the above requirements shall be placed in the joint where shown in the drawings. The Contractor shall furnish and I.S.I Test certificate for the P.V.C. he proposes to use.

6.3.5 Elastomeric Bearing Pads

The Contractor shall furnish and place elastomeric bearing pads at the location shown on the drawings and in accordance with this paragraph. Elastomeric bearing pads shall be fastened to one concrete surface with rubber cement recommended by the manufacturer of the elastomeric bearing pads. Elastomeric bearing pads shall be stored at 75^0 F or less. Elastomeric bearing pads shall not be stored in open place or where they will opened to the direct rays of the sun.

The elastomeric compound shall be 100 percent virgin polychloroprene (neoprene).

The Contractor shall furnish an I.S.I Test certificate for the elastomeric bearing pads he proposes to use.

6.3.4. Placement of Kraft Paper

The top surface of masonry piers and abutments should be leveled and painted with brush, with asphaltic emulsion of 20/30 grade, such that the bearing surface is perfectly smooth and uniform. Over this surface, kraft paper of approved quality should be placed and the top painted with asphaltic emulsion of 20/30 grade. The unit price bid in the bill of quantities for this item shall include the cot of all materials and labour involved in the operations.

6.3.6 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 of such conduits or openings. No extra claim for such improvidence in construction shall be entertained.

6.3.7 Providing the Fixing R.C.C. Non-Pressure NP^2/NP^3 pipe as per Drawings with Spigot and Socket ends

(A) **Supply or Pipes**

Pipes shall be of specified diameter, non-pressure conforming to I.S. 458-1971. Maximum length of the pipe shall not be less than 2.5 m or otherwise directed by the Engineer-in-Charge. The Contractor shall order the pipes required for the work on the basis of the construction drawing supplied to him by the Engineer-in-Charge. Pipe marked with the following information one each type shall only be accepted for work.

a. Class of pipe

b. Date of manufacture

c. Name of manufacture or his trade mark of both

d. IS Specification mark

(B) **Handling and Laying or Pipes**

Work shall be done as per I.S. 783-1959 or its latest edition. Reasonable care shall be exercised in loading transporting could unloading of concrete pipes. Handling shall be such as to avoid impact. All pipes shall be inspected thoroughly before being laid. Broken or defective pipe shall not be used. Trench shall be of sufficient width to provide for free working space in minimum 30 cm on either side of the pipe. Pipes shall be lowered into the trenches by use of standard appliance. Pipe shall be laid true to line and as specified on the construction drawings. Laying of pipes shall be along proposed grade of the slope. The socket ends of pipe shall face upstream. The connections of the pipes shall be jointed together in such a manner that these shall produce perfect even surface along the inside of the pipe. In no case pipes shall be laid directly on rock or other hard material.

(C) **Joining Pipes**

The joints shall be filled with cement mortar (1:2) and then properly concerted with the grade of concerti as mentioned in the drawing with proper shape and size as per the direction of Engineer-in-Charge.

(D) **Backfilling Trenches**

c. Trenches shall be kept free from water until the material in the joints has hardened. Walking or working on the completed pipe shall not be permitted until the trench has been backfilled to a height of at least 45 cum over the pipe as may be necessary for backfilling and compaction.

d. Trenches shall be backfilled after pipe has been laid subject to the condition that jointing material has hardened. Only selected materials shall be used for backfilling. Filling of the trench shall be carried out simultaneously on both sides of pipe in such as manner that unequal pressure does not occur.

(E) **Measurement and Payment**

Measurement for payment shall be on running meter basis on the pipe line laid including joints. The rate per pipe in bill of quantities shall include the cost of pipes including loading unloading hauling, handling, string laying in position, cost of rubber rings jointing and curing including backfilling and other operations to complete the work as per the specification.

CHAPTER – IX

OTHER ITEMS

WEEP HOLES:-

7.1 Item No.10

Providing weep holes and placing in position 10cm dia. Poly Vinyl Chloride pipes with non- corroding jalli as per design and drawings.

7.1.1 General:

a) Weep holes of the size as shown on the drawings shall be provided and they shall extend through the full width of the masonry with a slope of about 1 vertical to 20 horizontal towards the draining face to drain moisture from the backfilling, the spacing of holes shall be as per the drawings in either direction staggered. The sides and bottom of weep holes in the interior shall be made up in the stones/concrete having fairly plain surface as channel so formed slabbed over with stones/concrete lintels not less than 150mm and each side, including centering and shuttering. In stone masonry, generally the height of weep holes shall be the same as the height of the course in which they are formed. Filters behind weep holes with jally shall be provided to the dimensions and grades as shown on the drawings with inverted backing of approved quality filter materials in back filling side.

b) In case, the length of the pipe falls short of the standard length of the pipe, it shall be joined with necessary collars in cement mortar 1:3 or as per the instruction of the Engineer to form continuous hole in the body of wall. Defective pipes or defective work shall not be measured and paid. These shall be removed and replaced by the Contractor. The interior of all pipes shall be free from sand, mortar or dirt and other foreign matter. Care shall be taken to prevent entrance of any foreign matter into the pipes during progress of work.

Superintending Engineer
Bhanjangar Irrigation Division,
Bhanjangar

Additional Chief Engineer
Rushikulya Bahuda Basin, Brahmapur

SECTION-6
FORMS

FORM – A

NO RELATION CERTIFICATE

Certified that I / We am / are not related to any officer of Water Resources Department of the rank of Assistant Engineer and above or any officer of the rank of Under Secretary and above.

CONTRACTOR

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM – B

STRUCTURE AND ORGANISATION

1. Name of Tenderer ……..

2. Nationality of Tenderer ……..

3. Office Address ……..

4. Telegraphic Address ……..

   Telephone/ Fax No ……..

   Mobile No ……..

   Telex Number/ e-mail ID ……

5. Location of establishment ……

   And from date

6. The tenderer is

   a. An individual

   b. A proprietary firm.

   c. A limited company or limited corporation

   d. A member of a group of companies (If yes, give names, address and present description of other companies.)

   e. A subsidiary of large organization

      (If yes, give names, address of the present organization)

   f. If the company is subsidiary, state what involvement if any, will the parent company have in the project.

Attach the organization chart showing the structure of the organization including the names of the Directors position of officer.

7. Number of year of experience

   a. As a prime contractor

      I. In own country

      II. Other country (specify country)

   b. In a Joint venture

      I. In own country

      II Other country (specify country)

8. Name & the address of any associates that the tenderer has in India, who are knowledgeable in the procedure of customs, immigration etc. and other information necessary to do work.

9. How many years has your organization been in business under your present name? Add what were your fields were initially and when you established your organization. When did you add new field (if any)?

10. Have you ever required for suspending construction for a period of more than six months continuously after you started? If so, give the names of project and reason for suspension or failure.

11. Have you ever not completed any work awarded to you? If so give name of project and reasons for not completing the work.

12 In how many projects you have been imposed with penalties for delay? Please give name of the projects and detail reasons.

13. In which fields of Civil Engineering construction do you claim specialization and interest.

14. Give details of your experience in modern concreting / Earth work and quality control.

15 Give details of your material testing laboratory.

Signature of Contractor

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM-C

FINANCIAL STATEMENT

(Must be given separately for each partner in case of joint venture)

1. Name of Firm/ Contractor.

2 Name of partner /Directors

3 Capital

a. Authorized

b. Issued and paid-up

4 a. Details of the work completed and bidder's performance record for last three years.

(Vide Annexure-A)

b. Details of work on hand and bidder's performance record for last five years.

(Vide Annexure-B)

5. Furnish Balance sheet and profit & loss statement with auditor's reports for the

Last five years, it should include the following information.

i Working capital

ii Foreign investment.

iii a. Turnover for 2021-2022

b. Turnover for 2022-2023

c. Turnover for 2023-2024

d. Turnover for 2024-2025

e. Turnover for 2025-2026

f. Turnover for 2026-2027

iv Gross income

a. Turnover for 2021-2022

b. Turnover for 2022-2023

c. Turnover for 2023-2024

d. Turnover for 2024-2025

e. Turnover for 2025-2026

f. Turnover for 2026-2027 Total liabilities

Current ratio

a. Current assets to current liabilities

b. Total liabilities to net worth.

6 What is the maximum annual value of work that you can handle?

7 Have you ever been denied tendering facilities by any Government Department/

Public sector undertaking? (Give details)

8 List your sources of finance

CONTRACTOR **SUPERINTENDING ENGINEER**

a. Own resources

b. Bank credit.

c. Other sources-specify, if any?

9 Certificate of financial soundness by Bank (To be signed by the Senior Manager of a Nationalized Bank)

10 Name and address of Bank from whom reference can be obtained.

Name :

Address :

Telephone No:

Fax No :

11 Have you ever been declared bankrupt?

(If yes, please give details)

Signature of Contractor

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM-D

RESOURCES PERSONNEL

Details of key Technical and Administrative personnel, who could be assigned with the work, are to be mentioned in the following proforma.

A. Details of the Board of Directors.

1. Name of the Director.
2. Organization
3. Address
4. Remarks

B. Key Technical and Administrative personnel

1. Individual Name
2. Qualification
3. Present position of Office
4. Professional experience and details of works
5. Years with the tenderer
6. Languages known
7. Remarks

Signature of Contractor

FORM – E

RESOURCES PLANT AND EQUIPMENT

1. Details of the plants and equipments owned by the tenderer which may be used for this work.

(Proof of ownership to be attached)

(*Separate sheet for each type of equipment)*

I. Name of Equipment_____

II. Number of units_____

III. Kind and make_____

IV. Capacity_____

V. Normal life specified by the manufacturer_____

VI. Number of actual working hour put in by the machine_____

VII. Present location_____

VIII. Remarks

2. Give details, how the additional plants and equipments, which may be required by the tenderer for the work, would be obtained.

(*Separate sheet for each type of equipment)*

Particulars of Machinery	(a) To procure in India	(b) To hire in India	(c) Owned
I. Name of Equipment			
II. Number of units			
III. Kind and make			
IV. Country			
V. Capacity			
VI. Approximate cost in rupees			
VII. Remarks			

Signature of Contractor

FORM – F

EXPERIENCE; GEOGRAPHICAL

Give summary of experience in INDIA in similar work (Add pages if necessary)

Signature of Contractor

FORM – G

ADDITIONAL INFORMATION

1. Please add any further information which the tenderer considers relevant in regard to his capabilities .

2. Please give a brief note including why the tenderer considers himself eligible for technical bid for the work (For details please see information and instruction to tenderers.)

Signature of Contractor

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM – H

FORMAT FOR PERFORMANCE RECORD OF CONTRACTORS

1. Name of the Contractor :
2. Registration No. and Date :
3. Class of Contractor :
4. Licensing Authority :
5. License valid up to :
6. Details of works executed :

Sl. No.	Jobs executed	Agreement amount	Date of Commencement	Stipulated Date of Completion/ Actual date of completion	Whether work is executed as per the programme?	Reasons for delay , if any
1	2	3	4	5	6	7

7. Whether the Contractor has requisite machineries & personnel deployed in the work (Details of machinery and personnel deployed) :
8. Whether the quality of construction is satisfactory :
9. Whether he has capability to make good the loss in time :
10. Whether the Contractor has abandoned any work in the past three years, if yes, the details thereof.
11. Whether the Contractor has entered in to any litigation in the past, if yes, the details thereof.

Name of the Certifying Officer

With official seal

Signature of Contractor

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM – I

Details of the works in hand and performance for last five years as on the date of submission of this document in the following proforma.

(Separate sheet for each work)

1. Name of work_____
2. Place and Country_____
3. Total tendered cost of work _____
4. Brief description of works including principal features and quantities of main items._____
   _____
5. Details of works in hand
   i. Percentage of physical completion and amount billed for the work completed.
   ii. Cost of work remaining to be executed.
   iii. Stipulated date of completion.
   iv. Anticipated date of completion.
6. Explain for non-completion of work within stipulated time limit if so.
7. Were there any penalties /fines / stop notice / compensation /liquidated damages imposed?

   Yes or No.
   If yes, give amount and explanations

8. Were there any fines, claims or stop notice filed by the employer?
   (Yes or No.)
   (If yes, give amount and explanation)

Signature of Contractor

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM – J

AFFIDAVIT

I, Mr/ Mrs/ M/S……. Aged……. year Son /Daughter/ Wife of Sri…… …… ……at present residing At……P.O…… P.S…….. Dist…….. Pin…….do here by solemnly a affirms follows.

i) That /We possess a valid license for execution of works contract issued by*……..belongs to……Class & is valid upto**----------

I am submitting tenders before the **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Ganjam, Odisha** for execution of following works in response to e-procurement Notice No. ACE, RBB -04/26-27

1. ……. ***

2. ……Etc.

ii) I am the authorized signatory on behalf of contractor for the tender for the work /works mentioned above.

iii) I am swearing this affidavit that all tender documents and accompanying papers including all information those being submitted by me before the **Additional Chief Engineer, Rushikulya Bahuda Basin, Brahmapur, Ganjam, Odisha** including E.M.D.in any shape are all authentic and bonafied documents in the eyes of the law of the land.

That the fact state in the affidavits is true to the best of my knowledge and belief.

Note :

* Mention the license issuing authority.

** Mention the date up to which the license is valid.

*** Mention name of works for which tender is being submitted.

Signature of Tenderer /Authorized Signatory

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM – K

AFFIDAVIT

I, Sri……..... Aged ……...years

Son/ Daughter/ Wife of Sri……..... at present residing At……..... P.O.....

P.S…….....Dist……(State/Country) Pin……

do here by declare that, I have not registered under the GST act in the state of Orissa as I have not started any business in the state and I have no liability under the act.

In the event of this contract is awarded to me, I will register my-self in the GST Act in the State of Orissa and I will produce the GST clearance certificate in prescribed form before drawl of agreement.

That the facts stated in the affidavit are true to the best of my knowledge and belief.

Signature of Contractor /

Authorized Signatory

Note:

This certificate is required to be furnished by the outside contractors who have not started any business in the state of Orissa.

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM – L

CERTIFICATE TO BE ISSUED BY THE EXECUTIVE ENGINEER UNDER WHOM MECHANERIES / EQUIPMENTS ARE DEPLOYED

(Not issued prior to 90days of received of the tender)

Sl. No.	Name of the Machineries / Equipments	Identification No. Engine / Chassis No.	Capacity	Year of Purchase	Condition (Working / Breakdown)	Since when deployed under Him	When it is likely to be released from current assignment
1	2	3	4	5	6	7	8

Certified That

1. I have verified ownership documents with the identification no of the Machineries / equipments.
2. Machines are currently utilized exclusively for the work under the Division.

The facts provided are true as on the date of issue of this documents to the best of my knowledge

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM-M

DETAILS OF OTHER WORKS TENDERRED FOR AND WORKS IN HAND ON THE DATE OF SUBMISSION OF THE TENDER

Sl No.	Name of works with No. & Date of agreement & Division / Dept. concerned	Place & Country	Work in Hand			Work Tendered for			Remarks
			Tendered cost	Cost of work remaining to be executed	Anticipated date of completion	Amount put to Tender	Date when decision is expected	Stipulated date & period of completion	
1	2	3	4	5	6	7	8	9	10

CONTRACTOR **SUPERINTENDING ENGINEER**

FORM-N

DETAILS OF WORK OF SIMILAR TYPE AND MAGNITUDE CARRIED ON BY THE CONTRACTOR IN THE PAST

Sl No.	Name of works with No. & Date of agreement & Division / Dept. Concerned	Place & Country	Tendered cost	Final cost of completion	Stipulated period of completion	Period of actual completion	Principal Features
1	2	3	4	5	6	7	8

CONTRACTOR **SUPERINTENDING ENGINEER**

CHECK LIST

SL. NO.	DOCUMENTS	SUBMITTED OR NOT
1. Form A	No relation Certificate	Yes/No
2. Form B	Structure and Organization	
3. Form C	Financial Statement	Yes/No
	a) Balance sheet of last five years	Yes/No
4. Form C	Banker's certificate regarding tenderers Financial soundness True copies of Income Tax & Sales Tax /GST clearance certificate for the last three years for domestic contractors.	Yes/No
5. Form D	Resources / Personnel	Yes/No
6. Form E	Plant/Equipment	Yes/No
7. Form F	Experience Geographical	Yes/No
8. Form G	Additional information	Yes/No
9. Form H	Format for performance record of contractors	Yes/No.
10. Form I	Separate Sheet for each work	Yes/No
11. Form J	AFFIDAVIT	Yes/No
12. Form K	AFFIDAVIT	Yes/No
13. Form L	Certificate to be issued by the Executive Engineer used Whom machineries/ equipments are deployed	Yes/No
14. Form M	Details of other works tendered for and works in hand on the Date of submission of the tender	Yes/No
15. Form N	Details of similar type and magnitude carried on by the contractor In the past	Yes/No

Signature of Contractor

CONTRACTOR SUPERINTENDING ENGINEER

Section-7

Drawing

ALL EXECUTING DRAWINGS CAN BE HAD FROM OFFICE OF THE SUPERINTENDING ENGINEER, BHANJANAGAR IRRIGATION DIVISION, BHANJANAGAR

CONTRACTOR **SUPERINTENDING ENGINEER**

LINING OF UNLINED CANALS

Construction of C.C.Lining work to Daha Left Distributary from RD 390m. to 2535m under Dahalrrigation Project.

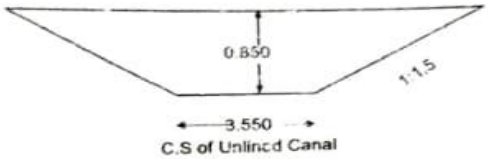
...tributary from RD 390 M to RD 2535m Under Daha Irrigation Project Length as detailed = 2145 M

...particulars

...Discharge (Q) = 1.702 Cumecs

...ulation of Discharge in the existing Unlined canal:-

...m (B)	=	3.550 M	
...(D)	=	0.850 M	
...board	=	0.500 M	
...Surface Slope (S)	=	0.000300	
...sity Co-efficient (n)	=	0.0250	For Earthen surface
...Slopes (Z):- V:H			
...Cutting	=	1 : 1	
...Filling	=	1 : 1.5	



C.S of Unlined Canal

...Area (A) = B x D + Z x D^2	=	4.101 Sqm
...ted Perimeter (P) = B + 2 √(Z+1) x D^2	=	6.615 M
...draulic Mean Depth (R) = A / P	=	0.620 M
...ocity (V) = 1/n x R^2/3 x S^1/2	=	0.504 M/Sec
...charge (Q) = A x V	=	2.066 Cumecs

...Determination of Discharge in the revised Slope Lined canal:-

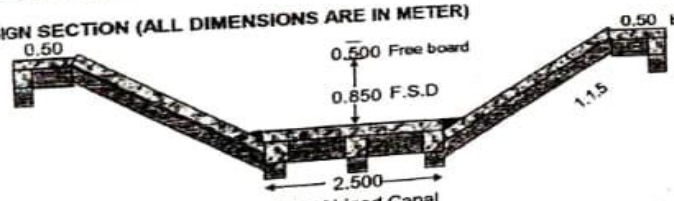
...width (B)	=	2.500 M	Assumed
...D (D)	=	0.850 M	
...e board	=	0.500 M	
...er Surface Slope (S)	=	0.00030	Remain unchanged
...osity Co-efficient (n)	=	0.018	For Concrete surface finished smooth
...e Slopes (Z):- V:H			
Cutting	=	1 : 1 H	
Filling	=	1 : 1.5 H	

APPROVED DRAWING NO. 26(1)
DATED 27-11-2025
OF CE & BM, RBVN, BAM

...a of canal (A) = B x D + Z x D^2	=	3.209 Sqm
...ted Perimeter (P) = B + 2 √(Z+1) x D^2	=	5.565 M
...draulic Mean Depth (R) = A / P	=	0.577 M
...ocity (V) = 1/n x R^2/3 x S^1/2	=	0.667 M/Sec
...charge (Q) = A x V	=	2.139 Cumecs > Design discharge (1.702)

...ence the assumed bed width of the canal is sufficient.

...ESIGN SECTION (ALL DIMENSIONS ARE IN METER)



C.S of Lined Canal

Total bed & Slope length	=	7.36	m
Berms 2 x 0.50	=	1.00	m
Total	=	8.36	m

Specifications :-

(1) 75mm thick C.C.M15using 20mm down HG Chips

(2) 300 mm thick CNS soil well watered & compacted

Notes:-

(i) In foundation, If black cotton soil is encountered, then it should be brought to the notice of approving authority before execution

(ii) The panel width of lining should be 3m (Max) and span of less than 3m shall be adjusted at end panel.

(iii) In-Situ sleepers in bed and sides shall be provided under the joints

(iv) Concrete used for sleepers shallbe of same grade as for lining

(v) Construction and contraction joints

(VI LDPE Film used below the bed & sides of lining shall be of 150 micron having tensile strength 17.5 N/mm2 & tear resistance 9.5 N/mm2

Govt.of Odisha, Deptt. Of Water Resources

Construction of C.C.Lining work to Daha Left Distributary from RD 390m. to 2535m under Dahalrrigation Project.

O/o:-

Drawn	Designed	Submitted	Checked	Recommended	Approved
22/10/25	22/10/25 AEE, Daha 2nd. Sub Divn.	22/10/25	27/11/25	27.11.25	27/11/25

FILE NO :- DRAWING NO :-

Chief Engineer & Basin Manage
RBVN Basin, Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

LINING OF UNLINED CANALS

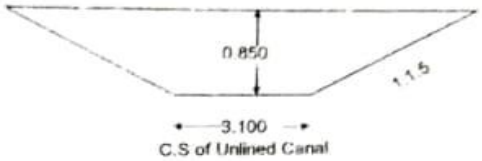
Construction of C.C.Lining work to Daha Left Distributary from RD 2535m. to 4140m under Dahalrrigation Project.

Distributary from RD 2535 M to 4140m Under Daha Irrigation Project Length as detailed in scope sheet = 1605 M

Discharge (Q) = [illegible] Cumecs

Determination of Discharge in the existing Unlined canal:-

Bed width (B)	=	[illegible] M
F.S.D (D)	=	[illegible] M
Free board	=	0.500 M
Water Surface Slope (S)	=	[illegible]
Rugosity Co-efficient (n)	=	[illegible] For Earthen surface
Side Slopes (Z):- V:H		
Cutting	=	1 : 1
Filling	=	1 : 1.5



C.S of Unlined Canal

Wetted Area (A) = B x D + Z x D^2	=	3.719 Sqm
Wetted Perimeter (P) = B + 2 √(Z+1) x D^2	=	6.165 M
Hydraulic Mean Depth (R) = A / P	=	0.603 M
Velocity (V) = 1/n x R^2/3 x S^1/2	=	0.503 M/Sec
Discharge (Q) = A x V	=	1.870 Cumecs

Determination of Discharge in the revised Slope Lined canal:-

Bed width (B)	=	2.100 M	Assumed
F.S.D (D)	=	0.850 M	
Free board	=	0.500 M	
Water Surface Slope (S)	=	0.00031	Remain unchanged
Rugosity Co-efficient (n)	=	0.018	For Concrete surface finished smooth
Side Slopes (Z):- V:H			
Cutting	=	1 : 1 H	
Filling	=	1 : 1.5 H	

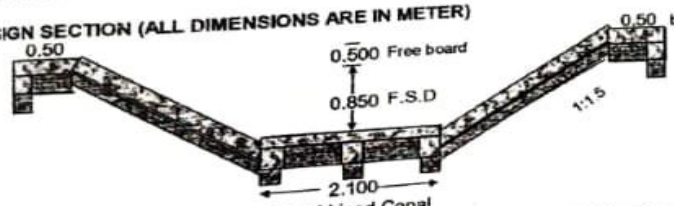
Area of canal (A) = B x D + Z x D^2	=	2.869 Sqm	
Wetted Perimeter (P) = B + 2 √(Z+1) x D^2	=	5.165 M	
Hydraulic Mean Depth (R) = A / P	=	0.555 M	
Velocity (V) = 1/n x R^2/3 x S^1/2	=	0.661 M/Sec	
Discharge (Q) = A x V	=	1.896 Cumecs	> Design discharge (1.5)

Hence the assumed bed width of the canal is sufficient.

APPROVED DRAWING NO. 26(2)
DATED.- 27.11.2025
OF CE & BM, RBVN. BAM.

Total bed & Slope length	=	6.96	m
Berms 2 x 0.50	=	1.00	m
Total	=	7.96	m

DESIGN SECTION (ALL DIMENSIONS ARE IN METER)



C.S of Lined Canal

Specifications :-

(1) 75mm thick C.C.M15using 20mm down HG Chips

(2) 300 mm thick CNS soil well watered & compacted

Notes:-

(i) In foundation, If black cotton soil is encountered, then it should be brought to the notice of approving authority before execution
(ii) The panel width of lining should be 3m (Max) and span of less than 3m shall be adjusted at end panel.
(iii) In-Situ sleepers in bed and sides shall be provided under the joints
(iv) Concrete used for sleepers shallbe of same grade as for lining
(v) Construction and contraction joints
(vi) LDPE Film used below the bed & sides of lining shall be of 150 micron having tensile strength 17.5 N/mm2 & tear resistance 9.5 N/mm2

Govt.of Odisha, Deptt. Of Water Resources

Construction of C.C.Lining work to Daha Left Distributary from RD 2535m. to 4140m under Dahalrrigation Project.

O/o:-

Drawn	Designed	Submitted	Checked	Recommended	Approved
[illegible] 22/10/25	22/10/25 A.E.E. Daha Irr. Sub Divn	22/10/25	27/11/25	[illegible]	29/11/25

FILE NO :- DRAWING NO :-

Chief Engineer & Basin Manager
RBVN Basin, Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

LINING OF UNLINED CANALS

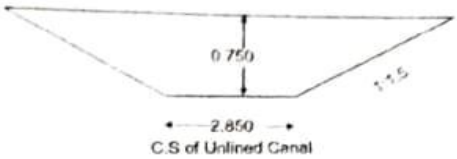
Construction of C.C.Lining work to Daha Left Distributary from RD 4140m. to 6300m under Dahalrrigation Project.

Left distributary from RD 4140 M to 6300m Under Daha Irrigation Project Length as detailed In scope sheet = 2085 M

Cumecs

Existing Unlined canal

Bed width (B)	=	M
F.S.D (D)	=	M
Free board	=	0.500 M
Water Surface Slope (S)	=	
Rugosity Co-efficient (n)	=	For Earthen surface
Side Slopes (Z) - V:H		
Cutting	=	1 : 1
Filling	=	1 : 1.5



C.S of Unlined Canal

Wetted Area (A) = B x D + Z x D^2	=	2.981 Sqm
Wetted Perimeter (P) = B + 2 √(Z+1) x D^2	=	5.554 M
Hydraulic Mean Depth (R) = A / P	=	0.537 M
Velocity (V) = 1/n x R^2/3 x S^1/2	=	0.465 M/Sec
Discharge (Q) = A x V	=	1.367 Cumecs

(b) Determination of Discharge in the revised Slope Lined canal:-

Bed width (B)	=	2.100 M	Assumed
F.S.D (D)	=	0.750 M	
Free board	=	0.500 M	
Water Surface Slope (S)	=	0.00031	Remain unchanged
Rugosity Co-efficient (n)	=	0.018	For Concrete surface finished smooth
Side Slopes (Z):- V:H			
Cutting	=	1 : 1 H	
Filling	=	1 : 1.5 H	

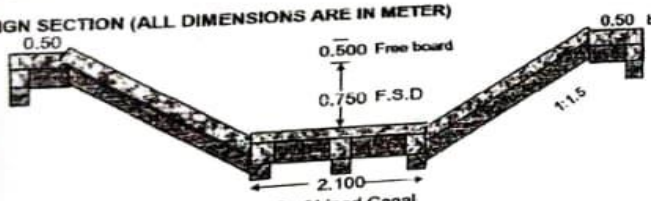
APPROVED DRAWING NO.26(3)
DATED.- 27.11.2025
OF CE & BM, RBVN. BAM.

Area of canal (A) = B x D + Z x D^2	=	2.419 Sqm
Wetted Perimeter (P) = B + 2 √(Z+1) x D^2	=	4.804 M
Hydraulic Mean Depth (R) = A / P	=	0.503 M
Velocity (V) = 1/n x R^2/3 x S^1/2	=	0.619 M/Sec
Discharge (Q) = A x V	=	1.497 Cumecs > Design discharge (1.266)

Hence the assumed bed width of the canal is sufficient.

Total bed & Slope length	=	6.6 m
Berms 2 x 0.50	=	1.00 m
Total	=	7.60 m

DESIGN SECTION (ALL DIMENSIONS ARE IN METER)



C.S of Lined Canal

Specifications :-
(1) 75mm thick C.C.M15using 20mm down HG Chips

(2) 300 mm thick CNS soil well watered & compacted

Notes:-
(i) In foundation, If black cotton soil is encountered, then it should be brought to the notice of approving authority before execution
(ii) The panel width of lining should be 3m (Max) and span of less than 3m shall be adjusted at end panel.
(iii) In-Situ sleepers in bed and sides shall be provided under the joints
(iv) Concrete used for sleepers shallbe of same grade as for lining
(v) Construction and contraction joints
(VI LDPE Film used below the bed & sides of lining shall be of 150 micron having tensile strength 17.5 N/mm2 & tear resistance 9.5 N/mm2

Govt.of Odisha, Deptt. Of Water Resources

Construction of C.C.Lining work to Daha Left Distributary from RD 4140m. to 6300m under Dahalrrigation Project.

O/o:-

Drawn	Designed	Submitted	Checked	Recommended	Approved
	27/11/25 AEE. Daha Jr. Sub Divn	22/10/25	27/11/25		29/11/25

Chief Engineer & Basin Manager,
RBVN Basin, Berhampur

FILE NO :- DRAWING NO :-

CONTRACTOR SUPERINTENDING ENGINEER

LINING OF UNLINED CANALS

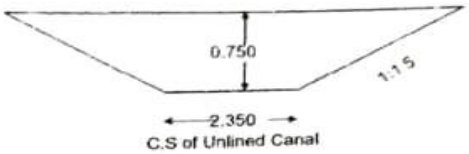
Construction of C.C.Lining work to Daha Left Distributary from RD 6300m. to 7380m under Dahalrrigation Project.

Left Distributary from RD 6300M to 7380m Under Daha Irrigation Project Length as detailed In scope sheet = 1155 M

Hydraulic particulars
Designed Discharge (Q) = 1.050 Cumecs

(a) Determination of Discharge in the existing Unlined canal:-

Bed width (B)	=	2.350 M	
F.S.D (D)	=	0.750 M	
Free board	=	0.500 M	
Water Surface Slope (S)	=	0.000335	
Rugosity Co-efficient (n)	=	0.0250	For Earthen surface
Side Slopes (Z):- V:H			
Cutting	=	1 : 1	
Filling	=	1 : 1.5	



C.S of Unlined Canal

Wetted Area (A) = B x D + Z x D^2	=	2.606 Sqm
Wetted Perimeter (P) = B + 2 √(Z+1) x D^2	=	5.054 M
Hydraulic Mean Depth (R) = A / P	=	0.516 M
Velocity (V) = 1/n x R^2/3 x S^1/2	=	0.471 M/Sec
Discharge (Q) = A x V	=	1.227 Cumecs

(b) Determination of Discharge in the revised Slope Lined canal:-

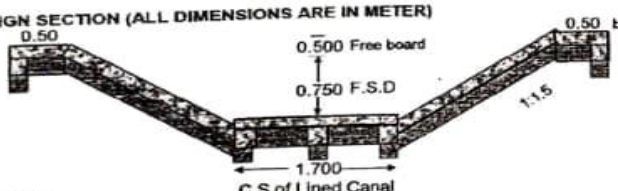
Bed width (B)	=	1.700 M	Assumed
F.S.D (D)	=	0.750 M	
Free board	=	0.500 M	
Water Surface Slope (S)	=	0.000335	Remain unchanged
Rugosity Co-efficient (n)	=	0.018	For Concrete surface finished smooth
Side Slopes (Z):- V:H			
Cutting	=	1 : 1 H	
Filling	=	1 : 1.5 H	

APPROVED DRAWING NO. 26(4)
DATED.- 27.11.2025
OF CE & BM, RBVN. BAM.

Area of canal (A) = B x D + Z x D^2	=	2.119 Sqm
Wetted Perimeter (P) = B + 2 √(Z+1) x D^2	=	4.404 M
Hydraulic Mean Depth (R) = A / P	=	0.481 M
Velocity (V) = 1/n x R^2/3 x S^1/2	=	0.624 M/Sec
Discharge (Q) = A x V	=	1.323 Cumecs > Design discharge (1.050)

Hence the assumed bed width of the canal is sufficient.

DESIGN SECTION (ALL DIMENSIONS ARE IN METER)



C.S of Lined Canal

Total bed & Slope length	=	6.2	m
Berms 2 x 0.50	=	1.00	m
Total	=	7.20	m

Specifications :-
(1) 75mm thick C.C.M15using 20mm down HG Chips

(2) 300 mm thick CNS soil well watered & compacted

Notes:-
(i) In foundation, If black cotton soil is encountered, then it should be brought to the notice of approving authority before execution
(ii) The panel width of lining should be 3m (Max) and span of less than 3m shall be adjusted at end panel.
(iii) In-Situ sleepers in bed and sides shall be provided under the joints
(iv) Concrete used for sleepers shallbe of same grade as for lining
(v) Construction and contraction joint
(VI) LDPE Film used below the bed & sides of lining shall be of 150 micron having tensile strength 17.5 N/mm2 & tear resistance 9.5 N/mm2

Govt.of Odisha, Deptt. Of Water Resources

Construction of C.C.Lining work to Daha Left Distributary from RD 6300m. to 7380m under Dahalrrigation Project.

O/o:-

Drawn	Designed	Submitted	Checked	Recommended	Approved
22/10/25	22/10/25 AEE, Daha I/M. Sub Divn	22/10/25	27/11/25	27.11.25	27/11/25

FILE NO :- DRAWING NO :-

Chief Engineer & Basin Manager,
RBVN Basin, Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

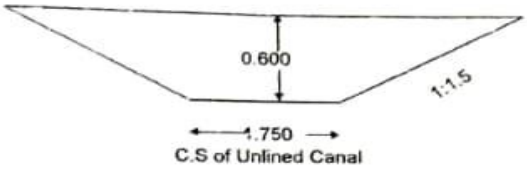
LINING OF UNLINED CANALS

Name of Work:- Construction of C.C.Lining work to Daha Left Distributary from RD 650m. to 7500m under Dahalrrigation Project.

Distributary from RD 7380M to 8820m Under Daha Irrigation Project Length as detailed in scope sheet = 1440 M

Determination of Discharge in the existing Unlined canal:-

Width (B)	=	1.750 M	
D (D)	=	0.600 M	
Board	=	0.500 M	
Surface Slope (S)	=	0.000360	
Co-efficient (n)	=	0.0250	For Earthen surface
Slopes (Z):- V:H			
Cutting	=	1 : 1	
Filling	=	1 : 1.5	



C.S of Unlined Canal

Area (A) = B x D + Z x D^2	=	1.590 Sqm
Perimeter (P) = B + 2 √(Z+1) x D^2	=	3.913 M
Mean Depth (R) = A / P	=	0.406 M
(V) = 1/n x R^2/3 x S^1/2	=	0.416 M/Sec
(Q) = A x V	=	0.662 Cumecs

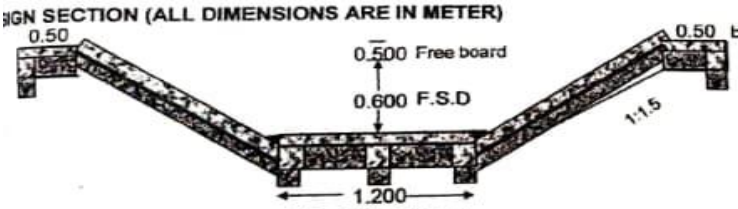
Determination of Discharge in the revised Slope Lined canal:-

Width (B)	=	1.200 M	Assumed
D (D)	=	0.600 M	
Board	=	0.500 M	
Surface Slope (S)	=	0.000360	Remain unchanged
Co-efficient (n)	=	0.018	For Concrete surface finished smooth
Slopes (Z):- V:H			
Cutting	=	1 : 1 H	
Filling	=	1 : 1.5 H	

of canal (A) = B x D + Z x D^2	=	1.260 Sqm	
Perimeter (P) = B + 2 √(Z+1) x D^2	=	3.363 M	
Mean Depth (R) = A / P	=	0.375 M	
(V) = 1/n x R^2/3 x S^1/2	=	0.548 M/Sec	
(Q) = A x V	=	0.690 Cumecs	> Design discharge (0.525)

The assumed bed width of the canal is sufficient.

SIGN SECTION (ALL DIMENSIONS ARE IN METER)



C.S of Lined Canal

Total bed & Slope length	=	5.16 m	
Berms	2 x 0.50 =	1.00 m	
Total	=	6.16 m	

Specifications :-

(1) 75mm thick C.C.M15using 20mm down HG Chips

(2) 300 mm thick CNS soil well watered & compacted

Notes:-

(i) In foundation, If black cotton soil is encountered, then it should be brought to the notice of approving authority before execution

(ii) The panel width of lining should be 3m (Max) and span of less than 3m shall be adjusted at end panel.

(iii) In-Situ sleepers in bed and sides shall be provided under the joints

(iv) Concrete used for sleepers shallbe of same grade as for lining

(v) Construction and contraction joints

(VI) LDPE Film used below the bed & sides of lining shall be of 150 micron having tensile strength 17.5 N/mm2 & tear resistance 9.5 N/mm2

Govt.of Odisha, Deptt. Of Water Resources

Construction of C.C.Lining work to Daha Left Distributary from RD 650m. to 7500m under Dahalrrigation Project.

Plo:- checked

Drawn	Designed		Recommended	Approved
Sankar Kr Sahu 22/10/25			22/10/25	

Bande 25/11/25

25/11/25

Asst to Addl Chief Engineer

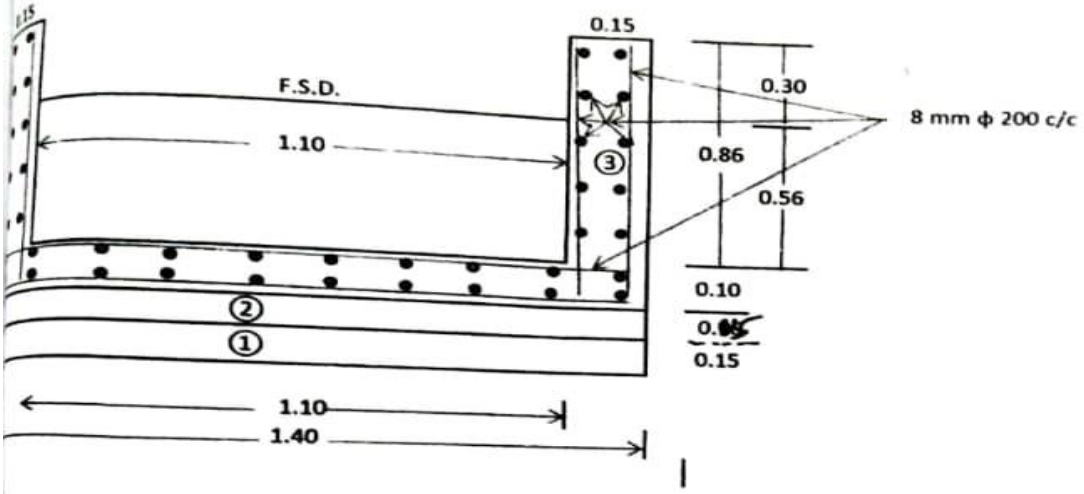
Additional Chief Engineer Rushikulya Basin Berhampur

FILE NO :- 3-15

DRAWING NO :- 127/2025

CONTRACTOR SUPERINTENDING ENGINEER

...ction for Construction of R.C.C.Lining work to Mahaguda Minor from RD 00m. to 1150m under Dahalrrigation Project.



...ations

(1) 0.15M thick coarse sand well compacted.
(2) CC M15 using 20 mm & downgrade size C.B.H.G.aggregates
(3) RCC M20using 20 mm & downgrade size C.B.H.G.aggregates
(4) Epansation joint at 40m interval

Designed

Assistant Executive Engineer
Daha Irrigation Sub-Division
Bhanjanagar

Recommended

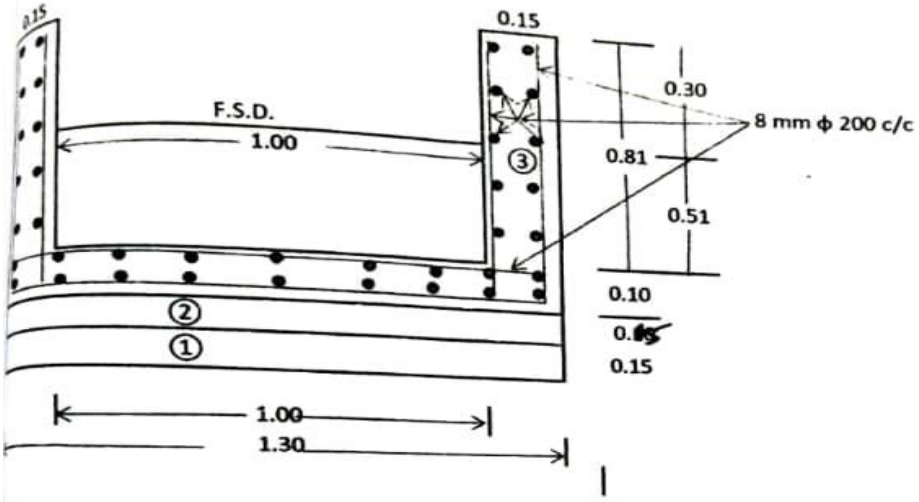
22/10/25
Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

Approved.

Additional Chief Engineer
Rushikulya Bahuda Basin,Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

Construction of R.C.C.Lining work to Mahaguda Minor from RD 1150m. to 2130m under Dahalrrigation Project.



15M thick coarse sand well compacted.
C M15 using 20 mm & downgrade size C.B.H.G.aggregates
CC M20using 20 mm & downgrade size C.B.H.G.aggregates
pansation joint at 40m interval

Designed

Assistant Executive Engineer
Daha Irrigation Sub-Division
Bhanjanagar

Recommended

22/10/25

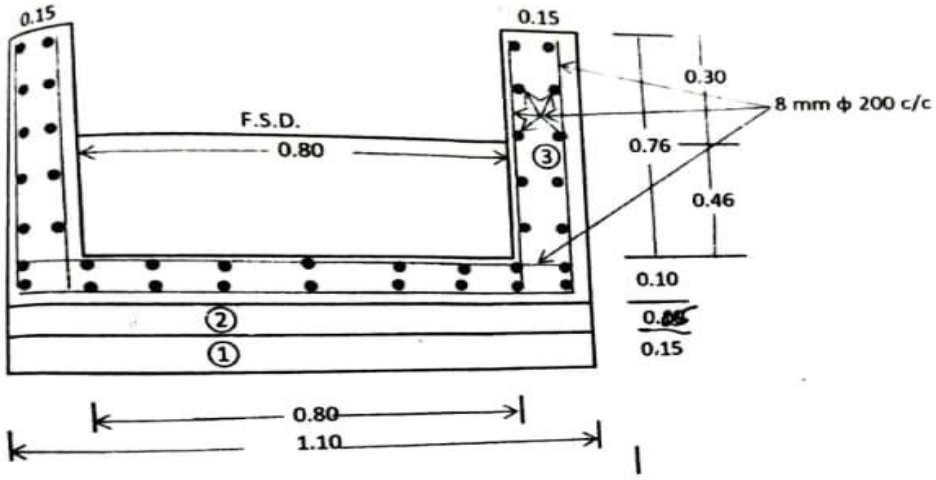
Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

Approved.

Additional Chief Engineer
Rushikulya Bahuda Basin,Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

Construction of R.C.C.Lining work to Mahaguda Minor from RD 2130m. to 3230m under Dahalrrigation Project.



ations

(1) 0.15M thick coarse sand well compacted.
(2) CC M15 using 20 mm & downgrade size C.B.H.G.aggregates
(3) RCC M20using 20 mm & downgrade size C.B.H.G.aggregates
(4) Epansation joint at 40m interval

Designed

22/12/25

Assistant Executive Engineer
Daha irrigation Sub-Division
Bhanjanagar

Recommended

22/10/25

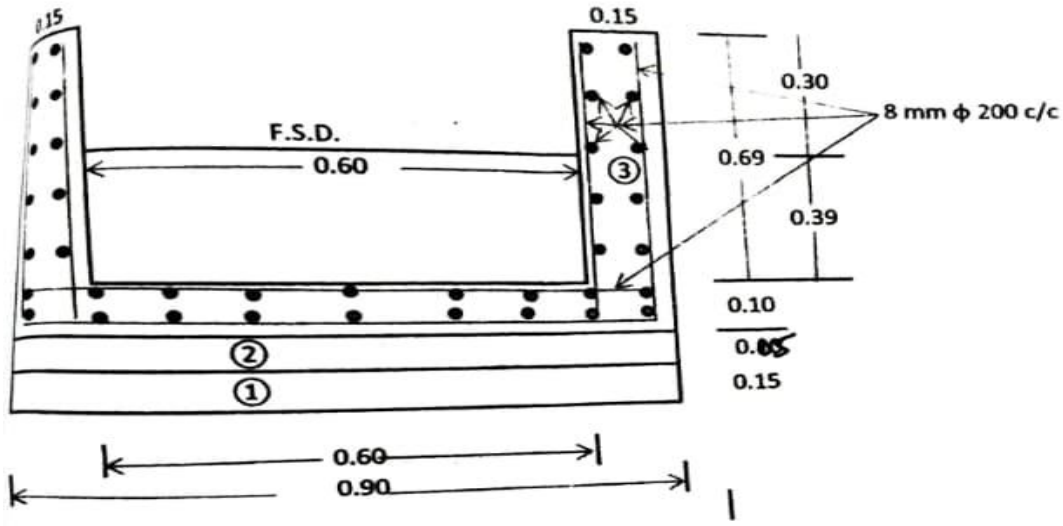
Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

Approved.

Additional Chief Engineer
Rushikulya Bahuda Basin,Berhampur

CONTRACTOR **SUPERINTENDING ENGINEER**

Construction of R.C.C.Lining work to Mahaguda Minor from RD 3230m. to 3674m under Dahalrrigation Project.



ions

1) 0.15M thick coarse sand well compacted.
2) CC M15 using 20 mm & downgrade size C.B.H.G.aggregates
3) RCC M20using 20 mm & downgrade size C.B.H.G.aggregates
4) Epansation joint at 40m interval

Designed

Assistant Executive Engineer
Daha irrigation Sub-Division
Bhanjanagar

Recommended

24/02/25

Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

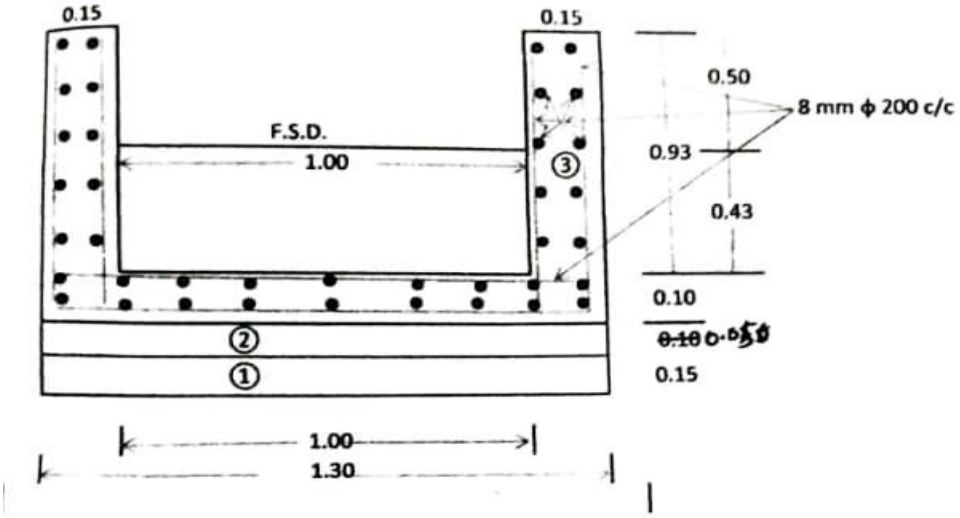
Approved.

Additional Chief Engineer
Rushikulya Bahuda Basin,Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

...Construction of C.C.Lining work to Daha Left Distributary from RD 650m. to 7500m under Dahairrigation Project.

...from RD 10200 M to 10880m Under Daha Irrigation Project



...ations

(1) 0.15M thick coarse sand well compacted.
(2) CC M15 using 20 mm & downgrade size C.B.H.G.aggregates
(3) RCC M20using 20 mm & downgrade size C.B.H.G.aggregates
(4) Epansation joint at 40m interval

Designed

Assistant Executive Engineer
Daha Irrigation Sub-Division
Bhanjanagar

Recommended

Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

Approved.

Additional Chief Engineer
Rushikulya Bahuda Basin,Berhampur

CONTRACTOR SUPERINTENDING ENGINEER

CONTRACTOR SUPERINTENDING ENGINEER

HYDRAULIC PARTICULARS			(NOT TO SCALE)
1.Discharge(cumec)-	1303	ROAD DATA:-	
2.Bed level(m)	:- RL 90.323	1.Type of road :- Village Road.	
3.F.S.D(m)	:- 0.75	2.Angle of crossing(degree):- 90°	
4.F.S.L(m)	:- RL 91.073	3.Formation level (m):- 92.120	
5.Free Board(m)	:- 0.500	4.Formation width (m):-5.050	
6.T.B.L(m)	:- RL 91.573	5.N.S.L (m):- 92.120	
7.Bed width(m)	:- 2.10	6.Load I.R.C. Class-A	
8.Side slope(C/F):-	1.5:1/1.5:1		
9.Bank width(L/R)(m):-	1.505.00		
10.Velocity(m/sec):-	0.619		
11.W.S.slope:-	0.000335		

REFERENCE TO CODES OF B.I.S		
CEMENT	OPC	IS 455-1989
	PPC	IS 1489(Pt.1)-1991/IS 1489(Pt.2)-1991
AGGREGATE	FA	IS 383-1970/2116-1965/1542-1977
CONCRETE	PCC	IS 456-2000
	RCC	IS 456-2000
STEEL	STEEL SHALL BE OF Gr. Fe 415 CONFORMING TO I.S-1786-1985	

SPECIFICATION

1.Cement concrete M-15 with hard granite crusher broken coarse aggregate of maximum nominal size of 40mm and down graded.

2.Cement concrete M-20 with hard granite crusher broken coarse aggregate of maximum nominal size of 20mm and down graded.

3.RCC M-25 with hard granite crusher broken coarse aggregate of maximum nominal size of 20mm and down graded, as per IS-383

NOTES

1. All items of work shall be executed conforming to the relevant codes of bureau of Indian Standard.
2. Should any discrepancy be noticed during/before execution between the data on which this approved drawing is prepared and those actually verified at site or should it be felt necessary to effect change in the approved drawing to suit the altered site condition, then the fact should immediately be brought to the notice of the approving authority and no change whatsoever be made in the approved drawing, without prior written approval of the approving authority.
3. Unless otherwise specified all dimensions are in mm and levels are meter.
4. No dimension should be measured from the drawing.
5. Back filling behind the abutment, head walls, wing walls and return walls should be done with suitable material in layers not exceeding 0.15M well watered and rammed to achieve minimum 95% compaction.
6. The S.B.C of soil shall be tested at site before execution of structure.If the S.B.C of foundation soil found less than 15TSQM reference must be made to the approving authority for necessary suggestions.
7. Development length & lap length shall be provided as per I.S 456-2000.
8. Mixing, placing & compaction of all concrete works should be done in accordance with I.S 456-2000.
9. Weep holes should be provided in abutment, wing walls, & return walls at suitable interval in accordance with B.I.S.

GOVERNMENT OF ODISHA

WATER RESOURCES DEPARTMENT

BHANJANAGAR IRRIGATION DIVISION, BHANJANAGAR

ADDITIONAL VRB AT R.D. 5690 M OF LEFT DISTRIBUTARY OF DAHA IRRIGATION PROJECT.

PREPARED	SUBMITTED
ASSISTANT EXECUTIVE ENGINEER DAHA IRRIGATION SUB-DIVISION BHANJANAGAR	SUPERINTENDING ENGINEER BHANJANAGAR IRRIGATION DIVISION BHANJANAGAR
RECOMMENDED	**CHECKED**
ADDITIONAL CHIEF ENGINEER RUSHIKULYA BAHUDA BASIN BRAHMAPUR	EXECUTIVE ENGINEER O/O CE&BM RBVN BRAHMAPUR
APPROVED	
CHIEF ENGINEER & BASIN MANAGER RUSHIKULYA BAHUDA/VANSADHARA NAGAVALI BASIN BRAHMAPUR	
FILE NO.	ORG.NO.

CONTRACTOR SUPERINTENDING ENGINEER

CONTRACTOR

SUPERINTENDING ENGINEER

QUARRY MAP

Assistant Engineer
Daha Irrigation Section
Daha

Assistant Executive Engineer
Daha Irrigation Sub Division
Daha

Superintending Engineer
Bhanjanagar Irrigation Division
Bhanjanagar

CONTRACTOR SUPERINTENDING ENGINEER