GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES
MINOR IRRIGATION

TENDER DOCUMENT FOR P-1 CONTRACT

(BID DOCUMENT)

NAME OF THE WORK

Construction of Kumbhari-II Check Dam over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0

SUPERINTENDING ENGINEER
MINOR IRRIGATION DIVISION JEYPORE

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Check List For Submission Of Particulars

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ALL DOCUMENTS AND FORMS AS SHOWN BELOW ARE MANDATORY.

Scanned Copy in .pdf format

1. Documents (i) Tender fee,.
   (ii) Bid Security
   (iii) License
   (iv) PAN
   (v) GSTIN

2. Forms in
   (i) Annexure 'C (1)'
   Details of plants and equipments owned by the tenderer
   (ii) Annexure 'C (2)'
   No Relationship Certificate (Format given)
   (iii) Annexure ' E (1)'
   Affidavit (Format given)
   (iv) Annexure ' E (2)' (For Out Side State Bidders)
   Affidavit (Format given)

THE BID MUST BE ACCOMPANIED WITH THE MANDATORY DOCUMENTS AS MENTIONED IN THE CHECK LIST FAILING WHICH THE TENDER WILL BE REJECTED.

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SPECIAL CONDITION CONSEQUENT UPON AMENDMENT OF CODAL/ CONTRACTUAL PROVISION AS PER OFFICE MEMORANDUM NO. 12366 DT. 08.11.2013 OF WORKS DEPARTMENT, GOVT. OF ODISHA

1. **Amendment to Para-3.5.14 Note-I of OPWD Code, Vol-I by inclusion**

   Note-I:-if L1 bidder does not turn up for agreement after finalization of the tender, then he shall be debarred from participating in bidding for three years and action will be taken to blacklist the contractor. In that case, the L2 bidder, if fulfills, other required criteria would be called for drawing agreement for execution of work subject to the condition that L2 bidder negotiates at par with the rate quoted by the L1 bidder otherwise the tender will be cancelled. In case a contractor is blacklisted, it will be widely publicised and intimated to all department of Government and also to Govt. of India agencies working in the state.

2. **Amendment to Appendix-IX, Clause- 36 of OPWD Code, Vol-II by inclusion**

   Clause No.-36:-If the rate quoted by the bidder is less than 15% of the tendered amount, then such a bid shall be rejected and the tender shall be finalized basing on merits of the rest bids. But if more than one bid is quoted 14.99% (Decimals upto two numbers will be taken for all practical purposes) less than the estimated cost, the tender accepting authority will finalize the tender through a transparent lottery system, where all the bidders/ their authorisedrepresentatives , the concerned Superintending Engineer and DAO will remain present.

3. **Amendment to Para-3.5.18 Note-VIII of OPWD Code, Vol-I**

   Note VIII:-Before acceptance of tender the successful bidder will be required to submit a work programme and milestone basing on the financial achievement so as to complete the work within the stipulated time and incase of failure of the part of the agency to achieve the milestone liquidated damaged will be imposed.

Amendment of codal/contractual provisions

Ref: Works Department office memorandum Letter No.5288 Dated. 04.05.2016.

Annexure – I

Amendment to Para-3.5.5 (V) Note-III of OPWD Code ,Vol-I by modification

Note-III. For availing incentive clause in any project which is completed before the stipulated date of completion, subject to other stipulations it is mandatory on the part of the concerned Superintending Engineer to report the actual date of completion, of the project as soon as possible through fax or e-mail so that the report is received within 7 (Seven) days of such completion by the concern Superintending Engineer. Chief Engineer & the Administrative Department.

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 of work in all respect in the following scale.

Before 30% of contract period = 5% of Contract Value

Before 20% to 30% of contract period = 4% of Contract Value

Before 10% to 20% of contract period = 3% of Contract Value

Before 5% to 10% of contract period = 2% of Contract Value

Before 5% of contract period = 1% of Contract Value

ADDITIONAL CONDITIONS AFTER OPWD CODE AMENDMENTS AND INTRODUCTION OF GST.

1. **Additional performance Security shall be obtained from the bidder when the bid amount is less than estimated cost put to tender. In such an event, only the successful bidder who has quoted less bid price/ rates than the estimated cost put to tender shall have to furnish the exact amount of differential cost i.e. estimated cost put to tender minus the quoted amount as Additional performance Security (APS) in shape of Demand Draft/Term Deposit Receipt duly pledged in favour of the Divisional officer WITHIN SEVEN DAYS, otherwise the bid shall be cancelled and the security deposit shall be forfeited. Further, proceeding for black listing shall be initiated against bidder as per amendment to para 3.5.5 (V) of OPWD code volume-I vide office memorandum No. 14299 dt. 03.10.2017 of Govt. of Odisha work Dept.**
2. **The Bidder must provide the mobile No. and e-mail ID along with the tender documents to intimate regarding date of conducting the Lottery (in the event of number of lowest bidders is more than one). No Paper Correspondence shall be made in this regard to avoid delay in finalization of tender. Status of the tenders will be displayed in the Notice Board of Division Office. (THIS OFFICE WILL NOT BE HELD RESPONSIBLE FOR NON INTIMATION WITH OUT PROVIDING MOBILE NO./ e-mail ID.)**
3. **Copy of valid VAT Clearance and GSTIN shall be uploaded along with the Tender documents for considering the Tender Non furnishing of VAT & GSTIN will lead to REJECTION of Bid.**
4. **2% GST to be deducted from work bills where agreement value exceeds Rs 2.50 Lakh. (to be applicable as per Government Notification).**
5. **GST on works Contract as applicable at the time of payment shall be paid over and above the Gross amount of the Bill as per Odisha GST Act 2017.**
6. **Commercial invoice should be submitted by the Contractor at the time of preparation of the work Bill to the concerned Junior Engineer with a copy to the Division Office for enabling the Division to make necessary payment.**
7. **Agreement shall be drawn only after due verification of EMD & APSD of the successful bidder and if any illegitimate instruments are found, Criminal proceedings will be initiated against the defaulting bidder and action will be initiated for Blacklisting through the License issuing Authority.**

GOVERNMENT OF ODISHA
WORKS DEPARTMENT
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OFFICE MEMORANDUM

File No.07556900012016- 17254 /W, dated, 5.12.17

Sub: **Electronic Receipt, Accounting and Reporting of Cost of Tender Paper and Earnest Money Deposit on submission of bids.**

1. The State Government have been working on formulation of rules and procedures for Electronic receipt, accounting and reporting of the receipt of Cost of Tender Paper and Earnest Money Deposit on submission of bids through the e-procurement portal of Government of Odisha i.e. "https://tendersodisha.gov.in" for some time past.
2. Electronic receipt of cost of tender paper has been successfully tested through SBI payment gateway. Now it has been decided to introduce electronic receipt of **Cost of Tender Paper and Earnest Money Deposit on submission of bids** through payment gateway of designated banks such as SBI/ICICI Bank/HDFC Bank for all Government Departments, State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies etc. in phases(ANNEXURE-I). The process outline as well as accounting and reporting structure are indicated below:

a) It will be carried out through a single banking transaction by the bidder for multiple payments like **Cost of Tender Paper and Earnest Money Deposit on submission of bids**.
b) Various payment modes like Internet banking/ NEFT/RTGS of Designated Banks and their Aggregator Banks as well can be accessed by the intending bidders.
c) Reporting and accounting of the e-receipts will be made from a single source.
d) Credit of receipts into the Government accounts and to the designated Bank account of the participating entities indicated in Para 2 above would be faster.

3. Only those bidders who successfully remit their **Cost of Tender Paper and Earnest Money Deposit on submission of bids would be eligible to** participate in the tender/bid process. The bidders with pending or failure payment status shall not be able to submit their bid. Tender inviting authority, State Procurement Cell, NIC, the designated Banks shall not be held responsible for such pendency or failure.

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4. **Banking arrangement:**

a) Designated Banks (SBI/ICICI Bank/HDFC Bank) payment gateway are being integrated with e-Procurement portal of Government of Odisha (https://tendersodisha.gov.in)

b) The Designated Banks participating in **Electronic receipt, accounting and reporting of Cost of Tender Paper and Earnest Money Deposit on submission of bids** will nominate a Focal Point Branch called e-FPB, who is authorized to collect and collate all e-Receipts. Each such branch will act as the Receiving branch and Focal Point Branch notwithstanding the fact that the bidder might have debited his account in any of the bank's branches while making payment.

5. **Procedures of bid submission using electronic payment of tender paper cost and EMD by bidder :**

a) The bidders have to log onto the Odisha e-Procurement portal (https://tendersodisha.gov.in) using his/her digital signature certificate and then search and then select the required active tender from the "Search Active Tender" option. Now, submit button can be clicked against the selected tender so that it comes to the "My Tenders" section.

b) **Uploading of Prequalification/Technical/Financial bid:** The bidders have to upload the required Prequalification /Technical/Financial bid, as mentioned in the bidding document and in line with Works Department office memorandum No.7885/W dt.23.07.2013.

c) **Electronic payment of tender paper cost and EMD :** Then the bidders have to select and submit the bank name as available in the payment options :

i. A bidder shall make electronic payment using his/her internet banking enabled account with designated Banks or their aggregator banks.

ii. A bidder having account in other Banks can make payment using NEFT/RTGS facility of designated Banks.

- Online NEFT/RTGS payment using internet banking of the bank in which the bidder holds his account, by adding the account number as mentioned in the challan as an interbank beneficiary.

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d) **Bid submission:** Only after receipt of intimation at the e-Procurement portal regarding successful transaction by bidder the system will activate the 'Freeze Bid Submission' button to conclude the bid submission process.

e) **System generated acknowledgement receipt for successful bid submission:** System will generate an acknowledgement receipt for successful bid submission. The bidder should make a note of **'Bid ID'** generated in the acknowledgement receipt for tracking their bid status.

6. **Settlement of Cost of Tender Paper:**

a) **Cost of Tender Paper** : In respect of Government receipts on account of **Cost of Tender Paper**, the e-Procurement portal shall generate a MIS for the State Procurement Cell (SPC). The MIS will contain an abstract of the cost of tender paper collected with reference to **Bid Identification Number**. The State Procurement Cell shall generate Bank-wise challans under the head of Account for **Cost of Tender Paper** and instruct the designated Banks to remit the money to the proper head of account of State Government. In respect of the cost of tender paper received through the e-procurement portal, the remittance to the Cyber Treasury account will be made to the Head of Account 0075-Misc. General Services-800-Other Receipts -0097-Misc. Receipts-02237-Cost of Tender Paper.

b) For the time being, the State Procurement Cell (SPC) will use over the counter payment facility of the Odisha Treasury portal. Thereafter, remittance through NEFT & RTGS will be facilitated through the Odisha Treasury portal.

c) Similarly, in case of State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies etc. **Cost of Tender Paper**, the e-Procurement portal shall generate a MIS for the State Procurement Cell (SPC). The MIS will contain an abstract of the cost of tender paper collected with reference to **Bid Identification Number**. The cost of tender papers will be credited to the registered Bank account of the concerned State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies etc

d) Bank will refund (in case the Tender Inviting Authority (TIA) issues such instructions) the tender fee and EMD to the bidder, in case the tender is cancelled before opening of Bid as per direction received from TIA through e-procurement system.

e) Back-end Transaction Matrix of Electronic receipt of Cost of Tender Paper and Earnest Money Deposit on submission of bids is enclosed in the **Annexure- I.**

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7. **Settlement of Earnest Money Deposit on submission of bids:**

a) The Bank will remit the **Earnest Money Deposit on submission/cancellation of bids** to respective bidders accounts as per direction received from TIA through e-procurement system.

8. **Forfeiture of EMD :**

Forfeiture of **Earnest Money Deposit on submission of bid** of defaulting bidder is occasioned for various reasons.

a) In case the **Earnest Money Deposit on submission of bid** is forfeited, the e-Procurement portal will direct the Bank to transfer the EMD value from the Pooling Account of SPC to the registered account of the tender inviting authority.

b) The Tender inviting authorities of the Government Departments will deposit the forfeited **Earnest Money Deposit on submission of bid,** in the State Government Treasury under the appropriate head (8782-Cash Remittances and Adjustments between the officers rendering accounts to the same Accounts Officer-102-P.W.Remittances-1683-Remittances-91028-Remittances into Treasury) after taking the amount as a revenue receipt in their Cash Book under the head 0075-Misc. General Services-00-101-Unclaimed Deposits-0097-Misc. Receipts-02080-Misc. Deposits and submit the detail account to D.A.G., Puri as a deposit of the Division.

c) By clicking submit button, system will initiate the forfeiture of EMD. System will not allow the evaluator to edit the initiation after clicking the submit button. Forfeiture option can be carried out in phased manner like one bidder at a time.

9. **Role of the Banks:**

a) Make necessary provision / customizations at their end to enable the provision for online payments / refunds as per this document.

b) Provide necessary real-time message to bidders regarding successful or unsuccessful transactions during online payment processes and redirect them to e-Procurement website with necessary transaction reference details enabling them to submit their bids.

c) The bank shall ensure transfer of funds from the pooling account to the Government Head/current account of PSUs/ULBs within the next bank working day as per the directions generated from e-Procurement portal.

d) Bank should provide timely reports and reference details to NIC enabling them to carry out their role as stated below.

e) Refund of amount to bidders as per the XML file provided by e-Procurement system on the next bank working day from the date of generation of the XML file and also provide a confirmation to NIC on the same.

10. Role of State Procurement Cell:

a) Communicate requirements of Government departments/ State PSUs/ Autonomous Bodies/ ULBs online payment requirements to National Informatics Centre / the authorised Banks for mapping/ customization.

b) In every working day, the State Procurement Cell shall generate MIS from the e-Procurement portal to ascertain the tender paper cost received in the e-Tendering process separately bank-wise for the Government Department and the PSUs/ULBs. The SPC shall generate bank-wise separate online challans from the Odisha Treasury portal and make the remittance through over the counter facility or NEFT/RTGS (as and when this functionality is available in Treasury portal) and issue instruction to the bank for remittance of the receipt to the State Government account.

c) The State Procurement Cell shall be responsible for providing challan details and MIS in respect of the remittance towards tender paper cost to the Tender inviting authorities for their record.

d) State Procurement Cell shall monitor the progress of e-Tendering by different Government Departments / State PSUs/ Autonomous Bodies / ULBs through MIS. State Procurement Cell shall monitor and send monthly progress reports to the Government.

e) The e-Procurement system will generate a consolidated refund & settlement XML file as an end of the day activity.

f) e-procurement system will provide a web service for Payment Gateway (PG) provider to pull the encrypted refund and settlement details in XML file against a day.

g) Similarly, Payment Gateway (PG) provider will provide a web service to pull the refund and settlement status against a day.

h) e-procurement system will update the status accordingly for reconciliation report.

11. Role of National Informatics Centre :

a) Customize e-Procurement software and web-pages of Government of Odisha (https://tendersodisha.gov.in) to enable the provision for electronic payment.

b) The NIC, Odisha will modify / rectify the errors in electronic data relating to the Chart of Account.

c) NIC will provide an interface to organisations to download the electronic receipt data.

d) Enable automatic generation of daily XML files from e-Procurement system and ensure delivery of the same to the authorised Banks for enabling automatic refund/settlement of funds.

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e) NIC shall enable the e-Procurement portal to generate MIS as required for the State Procurement Cell in order to make remittance of the tender paper cost to the State Government account using the Odisha Treasury Portal.

12. Role of Cyber Treasury :

a) The cost of the tender paper deposited by the SPC using the Odisha Treasury Portal which will be accounted for by the Cyber Treasury and it shall submit the accounts to A.G. (O) as per the established process.

b) The Cyber Treasury will provide MIS as required to the SPC for the purpose of accounting and reconciliation of the electronic remittances made to the State Government account.

13. Redressal of Public grievances :

a) The State Procurement Cell, Odisha, National Informatics Centre, Odisha and the e-FPB will have an effective procedure for dealing with, public complaint for e-Receipt related matters. In case, any mistake is detected by any of the stakeholders in reporting of receipt of tender paper cost and EMD, either suomoto or on being brought to its notice, the State Procurement Cell, Odisha, National Informatics Centre, Odisha unit, Cyber Treasury and the bank will promptly take steps for rectification. The e-Focal Point Branch of the participating Banks, National Informatics Centre, Odisha and the State Procurement Cell, Odisha will notify the contact number and address of the Help Desk for resolution of any dispute regarding e-Receipt.

14. Applicability and modification of existing rules / orders:

The modalities prescribed in this Office Memorandum for downloading of tender paper, submission and rejection of bid, acceptance of Bids as well as refund and forfeiture of earnest deposit will be applicable for electronic submission of bids through e-procurement portal. Existing provisions regulating cost of Tender Paper and Earnest Money Deposit in OPWD Code and OGFR would stand modified to the extent prescribed in this Office Memorandum.

15. These arrangements would be made effective after signing of MoU between the designated Banks and the State Procurement Cell, firming up of Banking arrangements and technical integration between designated Bank and e-Procurement Portal.

1. This shall take effect from the date of issue of this Office Memorandum.
2. Accordingly, relevant existing codal / contractual provision exist vide Office Memorandum No.6785/W dt.09.05.2017 of Works Department stands modified to the above extent.
3. This has been concurred in by the Finance Department vide their UOR No.-39-WF-I dt.09.11.2017.

5/11/17

E.I.C-cum-Secretary to Government
(P.T.O.)

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ANNEXURE-I

Back-end Transaction Matrix of Electronic receipt and remittance of Cost of Tender Paper and Earnest Money Deposit on submission of bids.

	Cost of Tender Paper	Earnest Money Deposit on submission of bids
Government Departments	I. The *payment* towards the **cost of Tender Paper,** in case of Government Departments, shall be collected in separate pooling accounts opened in Focal Point Branch called e-FPB of respective designated banks [as stated in Para 2] at Bhubaneswar on T+1 day.	I. In case of tenders of Government Departments, amount towards **Earnest Money Deposit** on submission of bids shall be collected in a pooling account opened for this purpose at Focal Point Branch called e-FPB of respective designated banks at Bhubaneswar, and the banks will remit the amount to respective bidder's account within two working days on receipt of instruction from TIA through refund and settlement of e-procurement system.
	II. With reference to the Notice Inviting Tender/ Bid Identification Number, the amount so realised is to be remitted to Government Account under the Head of Account 0075-Misc. General Services-800-Other Receipts -0097-Misc. Receipts-02237-Cost of Tender Paper through Odisha Treasury Portal after opening of the bid.	II. In case of forfeiture of **Earnest Money Deposit** on submission of bids, the e-Procurement portal will direct the Bank to transfer the EMD value from the Pooling Account of SPC to the registered account of the tender inviting authority within two working days of receipt of instruction from TIA.
State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies	I. In case of State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies etc. the amount towards **Cost of Tender Paper** on submission of bids shall be collected in separate pooling accounts opened in Focal Point Branch called	I. Amount towards **EMD** on submission of bids shall be collected in a separate pooling account of Focal Point Branch called e-FPB of respective designated banks at Bhubaneswar and the banks will remit the amount to respective bidder's

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	e-FPB of respective designated banks at Bhubaneswar on T+1 day.	account on receipt of instruction from TIA through refund and settlement of e-procurement system within two working days from receipt of such instruction.
	II. The **Paper cost** will be transferred to the respective current accounts of concerned State PSUs, Statutory Corporations, Autonomous Bodies and Local Bodies etc. after opening of bid.	II. In case of forfeiture of **Earnest Money Deposit** on submission of bids, the e-Procurement portal will direct the Bank to transfer the EMD value from the Pooling Account of SPC to the registered account of the tender inviting authority within two working days of receipt of instruction from TIA.

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CONTRACTOR SUPERINTENDING ENGINEER

Government of Odisha
Works Department

RESOLUTION

File No.07556900142018- 16262 /W, dated, 30-10-2018

Sub:- Grant of Concession (s) to Scheduled Caste and Scheduled Tribe Contractors.

Government have extended certain concessions to the Scheduled Caste and Scheduled Tribe Contractors regarding award of P.W.D. Works vide Resolution No.27748/W dt.11.10.1977. On the basis of the recommendation of Codes Revision Committee, it has now been decided to modify the aforesaid Resolution and allow the following facilities to the individual Scheduled Caste and Scheduled Tribe contractors for execution of P.W.D. Works.

1. The Scheduled Caste and Scheduled Tribe applicants desirous of enrolling themselves as Contractors are required to deposit 50% of the amount specified for various Classes of Contractors under Rule-7 of Appendix VIII (P.W.D. Contractors' Registration Rules, 1967) of O.P.W.D. Code, Volume-II.

2. The concessions / facilities for 10% Purchase Preference shall be allowed only to the individual registered contractors belonging to Scheduled Caste and Scheduled Tribe having Registration Certificate up to "B" Class.

3. If the Tender of the individual registered contractors belonging to Scheduled Caste and Scheduled Tribe is within 10% of the rate quoted by the lowest tenderer for any work, the work may be considered for award to him/her at the lowest tendered rate in relaxation of Rule-18 of Odisha General Financial Rules (O.G.F.R.), Volume-I and Para-3.5.14 of O.P.W.D. Code, Volume-I.

4. The Security Deposit (Earnest Money, Initial Security and Performance Security) at half the usual rate may be deposited/realized by/from the Scheduled Caste or Scheduled Tribe Contractors coming under the Categories up to "B" Class only as against the prescribed percentage under Rule-13 of Appendix-VIII (P.W.D. Contractors' Registration Rules, 1967) of O.P.W.D. Code, Volume-II.

5. The above concession will take effect from the date of issue of this Resolution.

6. This order shall supersede Works Department Resolution No.27748/W dt.11.10.1977.

7. This has been concurred in by the Finance Department vide their U.C.R.No.93/WF-I dt. 09.10.2018.

EIC - cum- Secretary to Government

Memo No. 16263 /W, dated, 30-10-2018

Copy forwarded to Principal Secretary to Hon'ble Chief Minister, Odisha / P. S. to Hon'ble Minister, Works, Odisha for information and necessary action.

FA - cum- Addl. Secretary to Government

(P.T.O.)

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Memo No. 16264 /W, dated, 30-10-2018

Copy forwarded to OSD to Chief Secretary, Odisha / Sr. P.S. to Development Commissioner-cum-Additional Chief Secretary, Odisha / Sr. P.S. to Additional Chief Secretary, Finance Department for information and necessary action.

FA - cum- Addl. Secretary to Government

Memo No. 16265 /W, dated, 30-10-2018

Copy forwarded to the Principal Accountant General (A&E), Odisha, Bhubaneswar / Principal Accountant General (E & S R Audit), Odisha, Puri Branch, Puri for information and necessary action.

FA - cum- Addl. Secretary to Government

Memo No. 16266 /W, dated, 30-10-2018

Copy forwarded to All Departments / Managing Director, CB & CC Ltd., Bhubaneswar / Managing Director, CCC Ltd., Bhubaneswar for information and necessary action.

FA - cum- Addl. Secretary to Government

Memo No. 16267 /W, dated, 30-10-2018

Copy forwarded to EIC (Civil), Odisha / All Chief Engineers, Odisha / All Superintending Engineers / All Executive Engineers (under Works Department) for information & necessary action and wide circulation among subordinate offices.

FA - cum- Addl. Secretary to Government

Memo No. 16268 /W, dated, 30-10-2018

Copy forwarded to OSWAS Control Room with a request to upload it in the web-site of Works Department.

FA - cum- Addl. Secretary to Government

Memo No. 16269 /W, dated, 30-10-2018

Copy forwarded to the Director, Printing, Stationery & Publication, Odisha, Cuttack by e-mail [illegible] for publication of this Office Memorandum in the next issue of Odisha Gazette and supply 30 (Twenty) copies to this Department for official use.

FA - cum- Addl. Secretary to Government

Memo No. 16270 /W, dated, 30-10-2018

Copy forwarded to A/C-I Section / A/C-II Section / Road Section / Plan Section / Building Section / Budget Section / N.Hs. Section / FC & AA Section / PPP Cell / EAP Cell, Works Department for information and necessary action.

FA - cum- Addl. Secretary to Government

GOVERNMENT OF ODISHA
WORKS DEPARTMENT

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File No. 07554600032022- 1499 **/W., dated.** 01.02.2023

OFFICE MEMORANDUM

Sub:- Amendment to Para-3.5.19 (a) (b) of the OPWD Code, Volume-I.

After careful consideration, Government have been pleased to make amendment to Para-3.5.19 (a) (b) of the Odisha Public Works Department Code, Volume-I with the following modification.

"Security for the due fulfilment of a contract should invariably be taken. The security may be taken in shape of N.S.C./ Post Office Savings Bank Account/ Post Office Time Deposit Account/ Kisan Vikas Patra/ Bank Guarantee in favour of the Divisional Officer from any Nationalized Scheduled Bank in India counter guaranteed by its local Branch at Bhubaneswar/ e-Bank Guarantee executed on the National e-Governance Services Limited (NeSL) Digital Document Execution Portal towards E.M.D/initial Security Deposit/ any other security deposit from the contractor or supplier."

1. This shall take effect from the date of issue of this Office Memorandum.
2. This has been concurred in by Finance Department vide their OSWAS File No. FIN-WF1-MISC-0033-2022.

By order of the Governor

(Vir Vikram Yadav, IAS)
Principal Secretary to Government

Memo No. 1500 /W., Dated, 01.02.2023

Copy forwarded to Private Secretary to Hon'ble Chief Minister, Odisha / Private Secretary to Hon'ble Minister, Works, Steel & Mines, Odisha for kind information of Hon'ble Chief Minister, Odisha & Hon'ble Minister, Works, Steel & Mines, Odisha.

01/02/2023
FA-cum-Additional Secretary to Government

Memo No. 1501 /W., Dated, 01.02.2023

Copy forwarded to OSD to Chief Secretary, Odisha / Sr. Private Secretary to Development Commissioner-cum-Additional Chief Secretary to Govt. / Sr. Private Secretary to Principal Secretary to Govt., Finance Department for kind information of Chief Secretary / Development Commissioner-cum-Additional Chief Secretary/ Principal Secretary, Finance Department.

01/02/2023
FA-cum-Additional Secretary to Government

CONTRACTOR SUPERINTENDING ENGINEER

Memo No. 1502 /W., Dated, 01.02.2023

Copy forwarded to the Principal Accountant General (A&E), Odisha, Bhubaneswar / Principal Accountant General (E&RSA), Odisha, Puri Branch, Puri for information and necessary action.

01/02/2023
FA-cum-Additional Secretary to Government

Memo No. 1503 /W., Dated, 01.02.2023

Copy forwarded to All Departments of Government / EIC-cum-Managing Director, OB&CC Ltd., Bhubaneswar / Managing Director, OCC Ltd., Bhubaneswar / Managing Director, OSPH&WC, Bhubaneswar for information and necessary action.

01/02/2023
FA-cum-Additional Secretary to Government

Memo No. 1504 /W., Dated, 01.02.2023

Copy forwarded to EIC (Civil), Odisha / EIC, Water Resources, Odisha / EIC (Rural Works), Odisha / All Chief Engineers, under the Administrative Control of Works Department, R.D. Department, Water Resources Department and H&UD Department /All CEEs (under Works Department) / All Superintending Engineers (under Works Department) / All Executive Engineers (under Works Department) for information.

01/02/2023
FA-cum-Additional Secretary to Government

Memo No. 1505 /W., Dated, 01.02.2023

Copy forwarded to OSWAS Control Room with a request to upload in the web-site of Works Department.

01/02/2023
FA-cum-Additional Secretary to Government

Memo No. 1506 /W., Dated, 01.02.2023

Copy along with soft copy forwarded to Gazette Cell, Commerce & Transport (Commerce) Department, Bhubaneswar with a request to publish Notification in extra ordinary issue Gazette and supply 10 (Ten) copies to this Department for official use.

01/02/2023
FA-cum-Additional Secretary to Government

Memo No. 1507 /W., Dated, 01.02.2023

Copy forwarded to Accounts-I Section / Accounts-II Section / Road Section / Plan Section / Building Section / Budget Section / NHs Section / FC & AA Section / EAP Section for information and necessary action.

01/02/2023
FA-cum-Additional Secretary to Government

Subject: Performance SecuritySubject: Bid Security / Earnest Money Deposit (EMD)

1.To ensure due performance of contract **Performance Security** is to be obtained from the successful bidder which is awarded the contract at the rate of **five to ten per cent** of the value of the contract as per para-22 of FDOM No 4939/F Dated 13.02.2012.

2. On account of slowdown in economy due to the pandemic, the State Government is in receipt of many representations that there is acute financial crunch among many commercial entities and contractors, which in turn is affecting timely execution of the contracts. It has also been represented that this may affect the ability of contractors to bid in tenders and hence reduce competition. Requests are being received for reduction in quantum of Security Deposits in the Government contracts. Besides, Government of India have also reduced the rate of Performance Security from **five to ten per cent** to three per cent of the value of the contract.

3. In view of the above, **the State Government is pleased to reduce Performance Security from existing five to ten per cent to three per cent of the value of the contract for all existing contracts.** However, the benefit of the reduced Performance Security will not be given in the contracts under dispute wherein arbitration/ court proceedings have been already started or are contemplated.

4. All tenders / contracts issued/ concluded till **31.12.2021** should also have the provision of reduced Performance Security.

5. In all contracts where Performance Security has been reduced to 3%, in view of above stipulations, the reduced percentage of Performance Security shall continue for the entire duration of the contract and there should be no subsequent increase of Performance Security even beyond **31.12.2021.** Similarly, in all contracts entered into with the reduced percentage of Performance Security of 3%, there will be no subsequent increase in Performance Security even beyond **31.12.2021.**

6. Wherever, there is compelling circumstances to ask for Performance Security in excess of three per cent as stipulated above, the same should be done only with the approval of the next higher authority to the authority competent to finalise the particular tender. Specific reasons justifying the exception shall be recorded.

7. These instructions will be applicable for all kinds of procurements viz. Goods, Consultancy, Works, Non-consulting Services etc.

8. These instructions shall be deemed to be part of Odisha General Financial Rules.

9. Works Department shall make suitable amendment in the relevant provisions of OPWD Code.

CONTRACTOR SUPERINTENDING ENGINEER

Subject: Bid Security / Earnest Money Deposit (EMD)

1. To safeguard against a bidder's withdrawing or altering its bid during the bid validity period, Bid Security (also known as Earnest Money Deposit) is obtained from bidders except those who are exempted from paying Bid Security as per para-21 of FDOM No 4939/F Dated 13.02.2012. Besides, the State Government have exempted Micro and Small Enterprises (MSEs) as defined in Odisha MSME Development Policy, 2016 and Start-ups as defined under Odisha Start-ups Policy, 2016 from payment of Bid Security while participating in tenders vide FDOM No. 27928/F Dated 16.10.2020.

2. The State Government is in receipt of many representations that on account of slowdown in economy due to the pandemic, there is acute financial crunch among vendors, which in turn is affecting timely execution of the contracts. It has also been represented that this may affect the ability of vendors to bid in tenders and hence reduce competition. Besides, Government of India have made provision in rule-171 of General Financial Rule, 2017 asking the bidders for executing a **"Bid Security Declaration"** in lieu of Bid Security with stipulation that if they withdraw or modify their bids during period of validity etc., They will be suspended for the time specified in the tender documents.

3. Considering the difficulties faced by the vendors and to facilitate competition in wake of slowdown of the economy due to Covid-19 pandemic, it is hereby decided that **no provisions regarding Bid Security should be kept in the Bid Documents and only provision for "Bid Security Declaration" Should be kept.** Further, wherever, there are compelling circumstances to ask for Bid Security, the same should be done only with the approval of the next higher authority to the authority competent to finalize the tender.

4. These instructions shall be applicable for all kinds of procurements viz Goods, Consultancy, Non-consultation and Works.

5. These instructions shall be deemed to be a part of Odisha General Financial Rules.

6. Works Department shall make suitable amendment in the relevant provisions of OPWD Code.

7. **The above instructions will be applicable for all the tenders issued till 31.12.2021.**

Subject:- Additional Performance Security in case of Abnormally Low Bids (ALBs).

1. Additional Performance Security (APS) is being obtained from the Successful Bidder when the Bid amount is less than estimated cost put to tender to the extent of exact amount of differential cost i.e. estimated cost put to tender minus the quoted amount in shape of Term Deposit Receipt pledged in favour of Divisional Officer / Bank Guarantee in favour of the Divisional Officer from any Nationalized / Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar within seven 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

GOVERNMENT OF ODISHA

WORKS DEPARTMENT

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OFFICE MEMORANDUM

No. 07764600022025 173 /W., Bhubaneswar Dt. 03/01/26

Sub:- Amendment of Codal & Contractual Provisions.

After careful observation, Government has been pleased to abolish the extant provisions of threshold negative bid caps (14.99%) introduced in Appendix-IX, Clause 36 of OPWD Code Volume-II in the procurement of works undertaken by the Govt of Odisha and its agencies to ensure the procurement process results in a viable and successful manner with adoption of following incremental **Additional Performance Security(APS)** system:

1. 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.

CONTRACTOR SUPERINTENDING ENGINEER

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.

2. These amendments shall take effect from the date of issue of the O.M.

3. Accordingly, the relevant existing codal/contractual provision stands modified with effect from the date of issue of this O.M.

4. This has been concurred in by the Finance Department vide **File No. FIN-WF1-MISC-0102-2025**

By order of the Governor

Principal Secretary to Government

Memo No. 174 /W, dated 03/01/26

Copy along with soft copy forwarded to Gazette Cell, Commerce and Transport (Commerce) Department, Bhubaneswar, for information and necessary action.

They are requested to publish the Office Memorandum in the extraordinary issue of the Gazette and supply 20 (twenty) copies to this Department.

03.01.26

EIC-cum-Special Secretary to Government

Memo No. 175 /W., Dt. 03/01/26

Copy forwarded to the P.S. to the Hon'ble Chief Minister, Odisha for the kind information of the Hon'ble Chief Minister.

03.01.26

EIC-cum-Special Secretary to Government

CONTRACTOR SUPERINTENDING ENGINEER

Memo No.176/W., Dt. 03/01/26

Copy forwarded to the P.S. to the Hon'ble Minister, Law, Works, Excise, Odisha for the kind information of the Hon'ble Minister.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.177/W., Dt. 03/01/26

Copy forwarded to the OSD to the Chief Secretary, Odisha, for the kind information of the Chief Secretary, Odisha.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.178/W., Dt. 03/01/26

Copy forwarded to Sr. P.S. to the DC-cum-ACS, Odisha, for the kind information of the DC-cum-ACS, Odisha.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.179/W., Dt. 03/01/26

Copy forwarded to Principal Accountant General (A&E), Odisha, Bhubaneswar/ Principal Accountant General (E & SR Audit), Odisha, Puri Branch, Puri for kind information and necessary action.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.180/W., Dt. 03/01/26

Copy forwarded to P.S. to the Principal Secretary to Govt., Finance Department/ H & UD Department for the kind information of the Principal Secretary, Finance Department/ H & UD Department respectively.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.181/W., Dt. 03/01/26

Copy forwarded to P.S. to the Commissioner-cum-Secretary to Govt., RD Department/ PR&DW Department for the kind information of the Commissioner-cum-Secretary, RD Department/ PR&DW Department respectively.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.182/W., Dt. 03/01/26

Copy forwarded to the Finance Department/ H & UD Department/ RD Department/ PR&DW Department/DoWR/ all other Departments for information and necessary action.

03.01.26

EIC-cum-Special Secretary to Government

CONTRACTOR SUPERINTENDING ENGINEER

Memo No.183 /W., Dt. 03/01/26

Copy forwarded to the FA-cum-Special Secretary to Government, Works Department for kind information and necessary action.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.184 /W., Dt. 03/01/26

Copy forwarded to all Collectors & DMs for information and necessary action.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.185 /W., Dt. 03/01/26

Copy forwarded to EIC(Civil-cum-Roads), Odisha /EIC, Water Resources, Odisha/ EIC, Rural Works, Odisha/ EIC (PH), H&UD Department/ EIC (RWSS) PR&DW Department/ EIC, DPQ, Odisha/ EIC, NHs, Odisha/ EIC-cum-Managing Director, OB & CC Ltd., Bhubaneswar, Odisha/ Chief Engineer, Roads-I & II, Odisha / Chief Engineer, Buildings-I & II, Odisha / Chief Engineer, NHs, Odisha/ Chief Engineer, Bridges, Odisha / Chief Engineer, P&IP, Odisha / Chief Engineer, RD &QP, Odisha /Chief Engineer, RW- I & II, Odisha / Chief Engineer, PH (Urban), Odisha / Chief Engineer, Electricity, Odisha / Managing Director, OCC Ltd., Bhubaneswar/ all State PSUs for kind information and necessary action.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.186 /W., Dt. 03/01/26

Copy forwarded to all CCEs/ SEs/ EEs of the Works Department for kind information and necessary action.

03.01.26

EIC-cum-Special Secretary to Government

Memo No.187 /W., Dt. 03/01/26

Copy forwarded to Roads Section/ A/C-I Section /A/C-II Section/ Plan Section / Building Section / Budget Section / N.H. Section / FC & AA Section, Works Department for information and necessary action

03.01.26

EIC-cum-Special Secretary to Government

CONTRACTOR SUPERINTENDING ENGINEER

GOVERNMENT OF ODISHA
OFFICE OF SUPERINTENDING ENGINEER
MINOR IRRIGATION DIVISION, JEYPORE

E-mail ID: -mijeypore @yahoo.co.in

NOTICE INVITING TENDER

E-Procurement Notice

Bid Identification No. **MIDJEY –06/2026-27**

Letter No. 1511 **Dt.08.09.26**

The Superintending Engineer, Minor Irrigation Division, Jeypore on behalf of Governor of Odisha invites **Percentage rate** bids in **Single & Double cover** system through **Online Mode**. The bid documents consisting of work, Estimated Cost, Cost of Tender Paper, Time of Completion, Class of Contractor, set of terms and conditions of the contract and other necessary documents can be seen in e-procurement portal https://tendersodisha.gov.in

1.	Name of the work	:	Construction of Check Dam under MATY 3.0 Scheme and Critical Scheme 2026-27.
2.	Total Number of work	:	14 (Fourteen) Nos.
3.	Estimated cost	:	Approximately from Rs. 25.17 to Rs. 66.03 lakh.
4.	Period of completion	:	03(Three), 04(Four) & 05(Five) Calendar Months
5.	Class of Contractor	:	"B"&"C" Class Contractor
6.	Date and time of availability of bid documents in the portal	:	From 10.00 A.M of 14.09.2026 to 5.00 PM of 29.09.2026
7.	Last date /time for receipt of bids in the portal	:	5.00 pm on 29.09.2026
8.	Date of opening of bid	:	At 11.00 am on 30.09.2026 in website (www.tendersorissa.gov.in)
9.	Submission of Bids	:	Online mode
10.	Name of the Officer inviting Bid	:	Superintending Engineer, Minor Irrigation Division,Jeypore
11.	Further details can be seen from the Government of Odisha Web-site:www.tendersorissa.gov.in		

12 Superintending Engineer, Minor Irrigation Division, Jeypore on behalf of Governor of Odisha invites Percentage rate bids in **Single & Double Cover** system through Online Mode for the works as detailed in the table below. The bids should be submitted online in the website www.tendersodisha.gov.in by eligible Contractors with CDMS registration as mentioned in Column-6 of table below registered with the State govt. and contractors of equivalent grade / Class registered with Central govt / MES / Railway for execution of works. The registered bidders of outside Odisha can also participate in this process after necessary Portal Enrolment, but shall have to subsequently undergo

registration with the appropriate authority of the State Government within a month of acceptance of bids.

13 The bidder may submit bids for the following works.

Sl. No.	Name of Work	Approx value of work in (Lakhs)	Bid Security @1% in Rs.	Cost of Bid documents in Rs.	Class of Bidder	Period of completion
1	2	3	4	5	6	7
1	Construction of Jiraguda-II Check Dam over Bamunijodi Nalla near village Jiraguda in Kundra Block of Koraput District Under MATY 3.0	65.87	Rs.65900/-	Rs.10000/-	"B"	5 (Five) Calender month
2	Construction of Kurlujodi Check Dam over Local Nalla near village Kusumguda in Kundra Block of Koraput District Under MATY 3.0	57.88	Rs.57900 /-	Rs.10000/-	"B"	5 (Five) Calender month
3	Construction of Mundaguda Check Dam over Local Nalla near village Mundaguda in Boipariguda Block of Koraput District Under MATY 3.0	42.25	Rs.42300 /-	Rs.6000/-	"B"	4 (Four) Calender month
4	Construction of Dhepaguda-I Check Dam over Local Nalla near village Dhepaguda in Dasmanthpur Block of Koraput District Under MATY 3.0	66.03	Rs.66100 /-	Rs. 10000/-	"B"	5 (Five) Calender month
5	Construction of Balighat Check Dam over Shakaigarh Nalla near village Malichallar in Koraput Block of Koraput District Under MATY 3.0	60.61	Rs.60600 /-	Rs.10000 /-	"B"	5 (Five) Calender month
6	Construction of Chapsil-I Check Dam over Local Nalla near village Chapsil in Koraput Block of Koraput District Under MATY 3.0	33.58	Rs.33600/-	Rs.6000/-	"C"&"B"	4 (Four) Calender month
7	Construction of Rajnipadar Check Dam Over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0	48.34	Rs.48400/-	Rs.6000/-	"B"	4 (Four) Calender month
8	Construction of Kumbhari-II Check Dam over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0	59.81	Rs.59900/-	Rs.10000/-	"B"	5 (Five) Calender month
9	Repair to Purunapani MIP in Borigumma Block of Koraput District under Critical Scheme 2026-27.	25.17	Rs.25200/-	Rs.6000/-	"C"&"B"	3 (Three) Calender month
10	Construction of Protection wall of Toyaput MIP in Laxmipur Block of Koraput District under Critical Scheme 2026-27.	25.25	Rs.25300/-	Rs.6000/-	"C"&"B"	3 (Three) Calender month
11	Repair to Lendrimaliguda MIP in Koraput Block of Koraput District under Critical Scheme 2026-27.	25.43	Rs.25500/-	Rs.6000/-	"C"&"B"	3 (Three) Calender month
12	Re-Construction of Acqueduct at RD 1325m of Left Main Canal of Mandiaguda MIP in Narayanpatna Block of Koraput District under Critical Scheme 2026-27.	50.39	Rs.50400/-	Rs.10000/-	"B"	4 (Four) Calender month
13	Improvement to Dandabadi MIP in Bandhugaon Block of Koraput District under Critical Scheme 2026-27.	25.17	Rs.25200/-	Rs.6000/-	"C"&"B"	3 (Three) Calender month
14	Improvement to Khilua MIP in Nandapur Block of Koraput District under Critical Scheme 2026-27.	25.17	Rs.25200/-	Rs.6000/-	"C"&"B"	3 (Three) Calender month

CONTRACTOR SUPERINTENDING ENGINEER

14. The cost of Tender Paper /Bid documents (Non-refundable) in the column No. 5 of above table shall be received online along with the bids as per guideline issued by Works Dept O.M No 6785 dated 09.05.2017 and No 17254 dated 05.12.2017. The procedure of bid submission using electronic payment of tender paper cost by the bidder is as per the notification of Works Dept O.M No 17254 dated 05.12.2017 which has been added to the DTCN.

15. The Bidders shall have to remit the EMD / Bid Security amount @ 1% (One percent) of the value of work put to bid online as part of the Performance Security Deposit. Bidders desirous to hire machineries or equipments from outside the State or owned but deployed outside the state are required to remit online additional one percent (1%) EMD/ Bid Security. However, the bidder claiming for exemption/ relaxation of EMD amount must submit an Affidavit separately for such purpose along with the documentary proof of the claim. Bids uploaded online without Bid Cost and Bid Security in the prescribed mode shall be rejected.

16.The successful bidder who has quoted less bid price/rate below 10% (decimal up to two numbers will be taken for all practical purposes) or more than the estimated cost put to tender/project cost put to bid, then such bidder shall have to furnish Additional Performance Security (APS) computed as per Works Department Memorandum No. 173/W dated 03.01.2026 in shape of N.S.C / Post Office Saving Bank Account / Post Office Time Deposit Account / Kisan Vikash Patra / Bank Guarantee in favour of the Divisional Officer as per the details mentioned in the table below from any Nationalized Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar/ e-Bank Guarantee executed on the National e-Government Service Limited (NeSL) Digital document execution portal within Seven (Working) 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 as per amendment to para 3.5.5(v) of OPWD Code, Volume-I vide Works Department Office Memorandum No. 14459/W dated 20.09.2018.

SL. No.	Range of Different between the estimated cost put to tender and Bid amount	Additional Performance Security to be deposited by the successful bidder
1	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.
2	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.
3	Where the bid price is 20% or more below 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.

17. Bids shall be received online in the Government Portal www.tendersodisha.gov.infrom 10.00 A.M of 14.09.2026 to 5.00 PM of 29.09.2026.

18. The Bids will be opened on Dt.30.09.2026 from 11:00 hours in the Office of the undersigned in presence of the Bidders or their authorized representatives with authorization letter who wish to attend. If the office happens to be closed on the date of opening of the bids as specified, then the bids will be opened on the next working day at the same time and venue unless otherwise notified in the Government Portal www.tendersodisha.gov.in.

Note :The Date for Transparent Lottery (if required) will be intimated later on. All correspondences shall be made with email ID given by the agency. So they are instructed to provide separately the correct and active personal mail id, contact no, failing which, the tender is liable for REJECTION. This Office will not be held responsible for non receipt of mail/message due to incorrect mail ID / Contact No.

19. It is mandatory that the Bid should be accompanied with clear scanned copies of tender paper cost, Undertaking regarding No Relationship , Valid Contractor Registration Certificate, active GST Certificate , PAN, Affidavit regarding correctness / authenticity of document for each work separately, Affidavits for claiming / availing of price preference in case of SC/ ST Contractors, the e-mail ID & contact no. details along with the Bid documents for smooth facilitation in communication facility to the concerned bidder regarding Tender Status. Due to incorrect personal e-mail ID & contact No. non receipt of information regarding Tender process this office is not responsible.

20. Submission of fake APS Documents shall be liable for rejection of Bids and criminal action shall be initiated against the concerned bidders. The agreement of the 1st.lowest bidder after transparent lottery shall be executed after necessary verification of APS Documents from the concerned Bank/ Post Office.

21. Penalty will be imposed if the agency fails to complete the work and abandon the work as per clause2(b)(i) r/w Para 3.5.5(V) of OPWD Code Vol.-I. Furthermore, Liquidated Damages/Compensation will be imposed on the agency at the time of approval of Extension of Time Application as per clause2(a) of the P1 Agreement if the agency fails to complete the work within the stipulated time period and the reasons for delay are wholly or partially attributable to the contractor.

22. The single valid tender received in 1st call shall be cancelled without opening the bid.

23. The contractor is to furnish Labour License & EPF Registration under section -12 of the CL(RA) Act, 1970 and Registration Certificate under Section–7 of the B&OCWW (RE & CS) Act, 1996 as per the relevant Labour Act and rules in force before signing the agreement, failing which execution of agreement will not be entertained.

24. If the rate quoted by the SC and ST Category Contractors is within 10% of the rate quoted by the lowest tenderer (decimal up to two numbers will be taken for all practical purposes) for any work after availing Price Preference, as per Works Department Resolution No. 16262 dated. 30.10.2018, the tender shall be finalized by the tender accepting authority through a transparent lottery system along with other categories of contractors. [Ref: Works Department O.M. No. 632/W dated 09.01.2026]

25. Other details can be seen in the bidding documents.

26. The Bidder must possess compatible Digital Signature Certificate (DSC) of Class-II or ClassIII.

27. Any addendum / corrigendum / cancellation of the Bid can only be seen in the Government Portal https://tendersodisha.gov.in

CONTRACTOR SUPERINTENDING ENGINEER

28. The Authority reserves the right to verify all original statements/credentials furnished along with the bid by the bidder and also reserves the right to defer/reject/accept any or all the bids without assigning any reason whatsoever. The Authority shall in no way be held liable for such action nor will make any obligation to inform the bidder, the ground for the same.

Sd/-

Superintending Engineer
M.I. Division, Jeypore

Memo No 1512 / Dt. 08.09.26

Copy in duplicate submitted to the Deputy Director (Adv), I & P.R. Department, Odisha, Bhubaneswar, 751001 with a request to get the notice published in two local Oriya daily and a local English dailynewspaper before 16.06.26 for wide publication. The complimentary copy of the News Papers containing the tender call notice may be sent to this office for reference and record.

Sd/-

Superintending Engineer

Memo No. 1513 / Dt. 08.09.26

Copy submitted to the Head Portal Group, I.T centre, Department of IT, North Annexe of the state Secretariat Ground Floor, Bhubaneswar, 751001 with a request to publish the notice in the website of Govt. of Odisha.

Sd/-
Superintending Engineer

Memo No 1514 / Dt. 08.09.26

Copy submitted to the Director, Printing Stationary and Publication, Odisha, Madhupatna Cuttack, 753010 with request to get the notice published in next issue of Odisha Gazettee.

Sd/-
Superintending Engineer

Memo No. 1515 / Dt. 08.09.26

Copy submitted to the Engineer-in-Chief, Department of Water Resources, Bhubaneswar,751001 for exhibiting the notice in the Web site of the Government for favour of kind information and necessary action.

Sd/-

Superintending Engineer

Memo No. 1516 / Dt. 08.09.26

Copy submitted to the Chief Engineer, Minor Irrigation, Odisha, Bhubaneswar / Additional Chief Engineer, K.B.K.-II, M.I. Circle, Jeypore forfavour of kind information and necessary action.

Sd/-

Superintending Engineer

Memo No 1517 / Dt. 08.09.26

Copy submitted to the Collector & District Magistrate, Koraput/ Superintendent of Police, Koraput for favour of kind information and necessary action.

Sd/-

CONTRACTOR SUPERINTENDING ENGINEER

Superintending Engineer

Memo No 1518 / Dt. 08.09.26

Copy forwarded to the Superintending Engineer, R&B Division,Jeypore/ RW Division-I & II, Jeypore / RWSS Division, Jeypore/ Irrigation Division, Jeypore/ M.I.Division, Rayagada/ Malkangiri for information with a request to display the tender notice on the notice board for wide circulation.

Sd/-

Superintending Engineer

Memo No. 1519 / Dt. 08.09.26

Copy to DeGM, Collectorate,Koraput with a request to publish the notice in the District website.

Sd/-
Superintending Engineer

Memo No 1520 / Dt. 08.09.26

Copy forwarded to the Assistant Executive Engineer (Estimator) / Divisional Accounts Officer / Inspector-in-Charge, Town Police Station, Jeypore / Concerned Works File / Notice Board of this Division for reference and circulation.

Sd/-
Superintending Engineer

ARTICULARS OF TENDER

CONTRACTOR SUPERINTENDING ENGINEER

1.	Name of the work	:	Construction of Kumbhari-II Check Dam over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0
2.	Estimated Cost	:	**`59,81.496/-**
3.	E.M.D.	:	**`59,900/-**
4.	Period of Completion.	:	**05**(Five) Calendar Months including monsoon.
5.	Class of Contractor	:	**"B" Class** Registered under Govt. of Odisha and other eligible classes registered elsewhere mentioned in Tender Call Notice.
6.	Cost of tender document	:	**`10,000**/-
7.	Availability of Bid document.	:	From**14.09.2026** at **10.00 Hrs** upto **29.09.2026** at **17.00Hrs** in web site only.
8.	Date of receipt of Bid document.	:	Up to **17.00hours** of **29.09.2026**
9.	Date of opening of bid documents	:	**At 11.00** hours of **30.09.2026** in the Office of the Superintending Engineer MI Division, Jeypore

INFORMATION AND INSTRUCTION TO BIDDERS

1. E - Procurement

The bidders desirous to participate in "**on-line**" bidding must possess compatible **Digital Signature Certificate of Class II or Class III**. The web site for on-line bidding is **http://tendersorissa.gov.in.**

2. General

Forms for bid and letter of Transmittal are attached herewith. All information required, for the enclosed forms should be furnished. If any particulars query is not relevant it should be stated as 'Not applicable'. However, the tenderers are cautioned that giving incomplete information in the tender or making any change in the prescribed forms may render the tender non-responsive.

Reference information and certificates furnished along with the tender for the respective owner certifying the suitability, technical know how or capability of the tender should be signed by the owner.

The tenderer is to attach any additional information which he thinks are necessary in regard to his capabilities. No further information will be entertained after submission of bid document unless it is called for by the Government of Odisha

The condition of this bid document shall eventually be a component of Agreement.

3. Project Out Line

The project site located at near village at Kumbhari of Cons. Of Kumbhari-2 Check Dam of Koraput District. The site is about **08 KM** from Narayanpatna Block H.Q.

Scope of work

The work under present tender involves Cons.of Kumbhari-2 CD in Narayanpatna Block of Koraput District.

Site Visit

The Project site may be inspected by the tenderer or his authorized representative at his own cost with prior appointment with the Superintending Engineer, Minor Irrigation Division, Jeypore.

4. General Specification

The work is to be executed in accordance with the Odisha standard specification & Technical specification mentioned in financial Bid documents. Quality Standards of Bureau of Indian standard specification are to be followed.

5. Language of bid documents

All information as called for in the bid documents shall be furnished in English. All literature and correspondences in connection with bid shall also be in English. In case of amount, it has to be shown in both word and figures in English.

6. Preparation of bid

The intending bidders shall upload the scanned copy of documents, certificates, deposit receipts, affidavits form duly digitally signed for the bid. All the information called for should be furnished. No change to the forms will be accepted. Over writing or corrections must be initialed by the intending tenderer.

7. Bid Prices

In case of 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 download that particular excel sheet and fill in the rates in figures at the appropriate locations. The line item total in words and the total amount in case of item rate tenders shall be calculated automatically and shall be visible to the bidder. In case of percentage tender, the bidder will only fill in the designated cell and activate “less” or “excess” to indicate whether his/her price offer is how much excess or less than the estimate amount. The bidder is not supposed to change or modify the format of the excel sheet in any form. The Bidders shall quote the percentage up to one decimal point only.

8. Method of submission of bid Documents

The original copy of documents, certificates, deposit receipts, affidavits, should be physically produced before the Office inviting Tender on being declared as successful after opening of the bid. They should digitally sign on all statements, documents, certificates uploaded by them, owning responsibility for their correctness/ authenticity. The authority reserves the right to verify the authenticity of documents incase of any doubt or complain.

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

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

8.3 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 technical bid documents.

8.4 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

8.5 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.

9. Opening of bid Documents

The bid documents will be opened by the Superintending Engineer MI Division, Jeypore on the date and time notified in the tender notice in the presence of tenderer or his representative who chose to be Present.

10. Final Decision making authority

The competent authority reserves the right to accept or reject bid without assigning any reasons and its decision shall be final.

11. Further Clarification

The Superintending Engineer, Minor Irrigation Division, Jeypore may be contacted during office hours on any working days for any further clarification regarding bid criteria

LETTER OF TRANSMITAL

CONTRACTOR SUPERINTENDING ENGINEER

To

The Superintending Engineer
MI Division, Jeypore.

Sub : Submission of bid for the work " Construction of Kumbhari-II Check Dam over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0 "

Sir,

Having examined the details given in invitation and bid for the work "Construction of Kumbhari-II Check Dam over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0 "

I/we hereby submit the bid information and relevant documents.

2. We hereby certify that all the statements made as information supplied in the enclosed forms and Annexure are true and correct.

3. We have furnished all information and details necessary as per check list for bid and have no further pertinent information to supply.

4. We submit the requisite certified liquid asset/ credit facility certificate and authorize the Superintending Engineer, Minor Irrigation Division, **Jeypore** to approach the Bank issuing the Liquid asset/credit facility certificate to verify the correctness thereof. We also authorize the Superintending Engineer, Minor Irrigation Division, **Jeypore** to approach individuals, employers, firms and corporations to verify our competence and general reputation.

5. We submit the following certificates in support of our suitability, technical knowledge, and capability for having successfully completed the following works.

6. We submit requisite affidavit as mentioned in Tender Call Notice.

Name of work. Client / Owner

1.

2.

3.

Enclosures:

Signature of Tenderer

Seal of Tenderer
Date of submission

ANNEXURE – C (1)

Details of plants and equipments owned by the Bidder
which may be used for construction work

(Proof of ownership to be attached)

1. Name of Equipment ……

2. Number of units ……

3. Kind and make ……

4. Capacity ……

5. Normal life specified by the manufacturer ……

6. Number of actual working hour put in by the machine ……

7. Present location ……

8. Remarks ……

Signature of Bidder

ANNEXURE – C (2)

(No Relationship Certificate)

I/We hereby certify that I/We* am/are* **related/not related** (*) to any officer of Water Resources Department of the rank of Assistant Engineer & above and any officer of the rank of Assistant / Under Secretary and above of the Water Resources Department of I/We* am/are* aware that, if the facts subsequently proved to be false, my/our* contract will be rescinded with forfeiture of E.M.D and security deposit and I/We* shall be liable to make good the loss or damage resulting from such cancellation. I//We also note that, non-submission of this certificate will render my / our tender liable for rejection.

Signature of Tenderer

ANNEXURE- E (1)

AFFIDAVIT

I, Sri..... Aged ..... Years, Son/ Daughter/ Wife of Sri ..... at present residing At..... P.O .....P.S .....Dist ..... Pin ..... do here by solemnly affirm as follows.

i) That, I / We posses a valid license for execution of works contract issued by *…….. belongs to …… Class & is valid up to * *……

I am submitting tenders before the Superintending Engineer MI Division, Jeypore for execution of following works in response to Tender Call Notice No. …….

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 those being submitted by me before the Superintending Engineer MI Division, Jeyporeincluding E.M.D. in any shape are all authentic and bonafied documents in the eyes of the law of the land.

That the facts stated in the affidavit are true to the best of my knowledge and belief.

Signature of Contractor /
Authorized Signatory

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.

ANNEXURE- E(2)

AFFIDAVIT

I, Sri……..... Aged …….. Years,
Son/ Daughter/ Wife of Sri……..... at present residing At ……..... P.O.....
P.S……..... Dist……..... Pin……
……. do here by declare that , I have not registered under the VAT act in the state of Odishaas 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 VAT Act in the State of Odisha and I will produce the VAT clearance certificate in form VAT 612 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 contractor who has not started any business in the state of Odisha.

PART-II

CHAPTER – I

CONTRACT FOR WORKS

ODISHA PUBLIC WORKS DEPARTMENT (FORM F-2)

Item Rate Tender and Contract for works

General Rules and Directions for the Guidance of Contractor.

1. All works proposed for execution by contract will be notified in a form of invitation to tender pasted on a board hung up in the office and signed by the Sub-divisional Officer / Superintending Engineer.

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 to be deposited by the successful tenderer and the percentage if any, to be deducted from bills. Copies of the specification, 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 payments made on account of work, 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 receipt 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 Department and their issue rates shall be filled in and completed in the office of the Sub-divisional Officer/ Superintending Engineer before the tender form is issued if a form is issued to an intending tendered without having been so filled in a completed he shall request the office to have this done before he completes and delivers his tender.

5. Any person who submits a tender shall fill up the usual printed form stating at what rate he is willing to undertake each item of the work. Incomplete tender and tenders which propose any alternation in the work specified in the said form of invitation to tender, or which contain any other conditions of any sort, or omit to note the time within which the work can be furnished or which are not accompanied by a treasury challan 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 shall bear the name of the work to which they refer written outside the envelope. Cash deposits for earnest money herein before mentioned shall be made in Govt. treasuries and the challan thereof should be enclosed with the tender.

6. 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. In the event of a tender being rejected, the challan for the earnest money forwarded therewith shall there upon be returned to the tenderer with a pay order for the amount of the earnest money.

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

8. 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 document mentioned in rules 1 and 4 for the purpose of identification and for his acceptance with tender. The tenderer of the selected tender shall also deposit 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 recommend for acceptance. Such tenderer shall there upon sign forthwith copies of the specification and other documents mentioned in rules 1 to 4 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 competent to accept the same in case he rejects the tender the security money deposited shall be refunded to tenderer.

9. When a tender is selected for acceptance the tenderer shall deposit the required amount of the security money in cash in the treasury and shall forward the challan to the Superintending Engineer Govt. securities may be endorsed to the Superintending Engineer in lieu of a 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.

10. The amount of security money to be deposited by the tenderer whose tender is selected for acceptance shall be **2** percent of the estimated value of the work and towards this amount, the earnest money already deposited by him shall be credited. At least half this security inclusive of the earnest money shall be deposited by the tenderer within such time as may be notified to him in writing by the office 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 deductions of 5 percent of the amount of each payment to be made to him under clause 6 of the conditions of contract for the work done under the contract.

11. When tender has been selected for acceptance and the required amount of the security money has been deposited the Engineer shall scrutinize all pages of the form of item, rate, tender 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 tender or if he is not so competent, shall send the form for signature of the acceptance to the officer competent to accept it.

12. **(i)** A separate and specific bank account may be opened to keep the security deposits deducted from the running bills in any Nationalized Bank only in the name of the concerned Executive Engineer of the Division/ FA & CAO, but not in personal name.

(ii) The security amount so deposited should be withdrawn from the same account after completion of the defect liability period of the concerned work and after the work is found defect free in all respects.

MEMORANDUM OF TENDER FOR WORKS

I/We hereby tender for the execution for the Governor of Odisha of the work specified in the under written memorandum at the specified therein within a period of **5 (Five)months** from the date of written order to commence and complete in all respect with the specifications, designs, drawings and other documents referred to in rule-1 there of and subject to the annexed conditions of contract and with such material as are provided for by and in all other respects in accordance with such conditions so far as applicable.

MEMORANDUM

a)	Name of work **:**	i)	If several sub works are included, they should be detailed in a separate list	Construction of Kumbhari-II Check Dam over local Nalla in Narayanpatna Block of Koraput District Under MATY 3.0
b)	Name of the Contractor **:**			
c)	Estimated Cost of the work :	i ii.	Amount put to tender **:** Agreement Amount **:**	**Rs. 59,81.496/-**
d)	Earnest money deposit **:**	i.	1% of the tender value	**Rs. 59,900/-**
e)	The deposit will be 2% of the estimated cost of the work	i) ii)	Initial Security deposit (including earnest money) to be deposited at the time agreement: Additional PerformanceSecurity **:**	
f)	This percentage deduction from bills will be credited to the contractor's security deposit	i)	Percentage to be deducted from bills @ Rs. 5% (Rupees five percent) **:**	
g)	Period for completion of the work	i.	Time required for the work from date of written order to commence **:**	**05 calendar month**
		ii.	Date of written order to commence**:**	
		iii.	Stipulated date of completion **:**	
		iv.	Total number of items of work tendered For :	**09 (Nine)**

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 there of to forfeit and pay to the Governor of Odisha or his successors in office the sums of money mentioned in the said conditions.

CONTRACTOR SUPERINTENDING ENGINEER

Dated the ..... day of 2026

Signature of the Contractor

Signature of the Contractor before submission of tender

Witness:

Signature of one witness to Tenderer's signature

Address:

Occupation:

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

Dated the .....day of 2026

Superintending Engineer
Minor Irrigation Division,
Jeypore

Signature of the Officer by whom accepted

CONDITIONS OF CONTRACT

Compensation for delay	**Clause-1 :** All compensation or other sums 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 whatsoever 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 shape of NSC/ KVP/ Deposit receipt of schedule Bank Pledged in favour of the Superintending Engineer 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.
The work should not be considered finished until such date as the Superintending Engineer shall certify as the date as on which the work is finished after necessary rectification of defects as pointed out by the Superintending Engineer or his authorised agents are fully complied with by the contractor to the Superintending Engineer's satisfaction :	**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 essence of the contract on the part of the contractor) and the contractor shall pay, as compensation, an amount equal to 1/2 percent of the amount of the estimated cost, if the whole work as shown by the tender for every day that the work remains un-commenced, or un-finished 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 authorised agents, are fully complied with by the contractor to the Superintending Engineer's satisfaction). And further to ensure good progress during the 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 of the work before one fourth of the whole time allowed under the contract has elapsed, one half of the work, before the half of such time has elapsed, and three fourth of work before three fourths of such time has elapsed. In the event 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 percent of the estimated cost of the work as shown in the tender. **(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 rendered himself liable to pay compensation
Actions when whole	

security deposit is forfeited:	amounting to the whole of his security deposit in the hands of Government (whether paid in the 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 the Government. **i)** To rescind the contract (of which recession notice in writing to the contractor under the hand of the Superintending Engineer shall be conclusive evidence) 20% of the value of the left over work will be realised from the contractor as penalty . **ii)** To employ labour paid by Deptt. of Water Resources and to supply materials to carry out the work, or any part of the work, debiting the contractor with the cost of the labour and the price of the materials (of the amount of which the cost and price certificate of the Superintending Engineer shall be final and conclusive against the contractor) and crediting him with the value of the work done, in all respect in the same manner and at the same rates as if it had been carried out by the contractor under the terms of his contract; the certificate of the Superintending Engineer as to the value of the work done shall be final and conclusive against the contractor. **iii)** To measure up the work of the contractor and to take such part of the work of the contract, as shall be unexecuted out of his hands and to give it to another contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor if the whole work had been executed by him (of the amount of which excess the certificate in writing of the Superintending Engineer shall be final and conclusive) shall be borne and paid by the original contractor and may be deducted from any money due to him by Government under the contract or otherwise or from his security deposit or the proceeds of sale thereof or a sufficient part thereof. 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 advance on account of 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 there to 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. **iv)** Security deposit of the contractor shall be refunded only one year after the date of completion of the work provided the final bill has been paid and defects, if any rectified. In case, however where

	refund of security is delayed for non payment of final bill, two percent of the security deposit recovered as earnest money and initial security shall be refunded and the balance of the security deposit shall be refunded after payment of the final bill. However, the security deposit less any amount due, shall be returned to the contractor subject to the Engineer-in- Charge certifying that no liability attaches to the contractor.
Contractor remains liable to pay compensation if action not taken under clause – 5 Power to take possession of a require removal of or sell contractor's plants	**Clause-3 :** In any case in which any of the powers, conferred upon the Superintending Engineer by clause 3 here of, shall have become exercisable if the same shall not be exercised. The non-exercise thereof shall not constitute a waiver of any of the conditions in the event any further here of and such powers shall not with standing to be exercisable. In the event of any future case of default by the contractor of which by any clause or clauses hereof he is declared liable to pay compensation amounting to the whole of his security 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 clauses, he may if he so desires, take possession of all or any tools, plants, materials and 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 allowing 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 notice in writing to the contractor or his clerk of the works, foreman or other authorised agent require 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 such requisition, 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 any such removal and the amount of the proceeds and expense of any such sale shall be final and conclusive against the contractor.
Extension of time	**Clause - 4 :** If the contractor shall desire an extension of the time for completion of the work, on the ground of his having been unavoidably hindered 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 grounds be shown therefore, authorise 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. In case where the sanction of higher authority to grant extension of time is necessary, the Superintending Engineer will send his recommendation to higher authority. If the order of the competent authority is not received within 60 days from the date of receipt of recommendation of the Superintending Engineer, the Superintending Engineer shall grant extension of time under intimation to the concerned authorities so that the contract shall remain in force, but while communicating this extension of time he must inform the contractor that extension is granted without prejudice to Government's right to levy compensation under relevant clause of the Agreement.
Final Certificate	**Clause-5 :** On completion of the work, the contractor shall be furnished with a certificate by the Superintending Engineer (hereinafter called the Engineer-in-charge) of such completion, but no such certificate be given nor shall the work be considered to be completed until the contractor shall have removed from the area of the 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 cleared 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, 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 Department of Water Resources in accordance with the rules of the department whose measurements shall be binding and conclusive against the contractor, if the contractor shall fail to comply with the requirements of this clause as to removal of scaffolding surplus materials and rubbish and cleaning off dirt on or before the date fixed for the completion of the work, the Engineer-in-charge may at the expense of the contractor remove such scaffoldings surplus materials and rubbish and dispose of the same as he thinks fit and clean off such dirt as aforesaid and the contractor shall forthwith 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 realised by the sale thereof. **Sub-Clause - 5 :** If in the opinion of Engineer-in-Charge, which shall be final and binding on the contractor, occupation or utilisation of a portion of the work completed in no way interferes with progress of the work the same may be occupied or utilised by on behalf of the Govt. under the written order of the Engineer-in-Charge and to get the defects, if 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 concession either in the shape of extension of stipulated period or any other monetary compensation on account of such occupation or use.

Payment on intermediate certificate be regarded as advances and bill to be submitted monthly.	**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 having the same verified and the claim as far as admissible, adjusted, if possible, before the expiry of ten days 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 counter signature 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. Provided that, if any balance of the 7% security, outstanding from each such payment shall be deducted so as to, not exceeding 5% as may be necessary to make up the balance of the security. All such intermediate payments to the contractor shall be regarded as payments 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 reconstructed or erected, or any part thereof in any respect, or the accrual 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 to the final settlement or adjustment of the accounts or otherwise, or in any other way vary or affect the contract. **Clause-7 :** The final bill shall be prepared by the officers of the Department of Water Resources in accordance with the rules of the Department in the presence of the contractor within one month of the date fixed for completion of the work.
Stores supplied by Government.	**Clause-8 :** If the specification or estimate of the work provides for the use of any special description of materials to be supplied from the Engineer-in-Charge's store, or if it is required that the contractor shall use certain stores to be provided by the Engineer-in-Charge under the conditions of this contract (such materials and stores and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the contractor, but not so as in any way to control the meaning or effect of this contract or are specified in the schedule or memorandum hereto annexed) the contractor shall be supplied with such materials and stores noted in the annexed schedule as are required from time to time to be used by him for the purposes of the contract only, and the value of the full quantity of materials and stores so supplied at the rates specified in the said schedule may be set off or deducted from any sums then, due or thereafter to become due to the contractor under the contract or otherwise, or against or from the security deposit, or the proceeds of sale thereof if the same is held in Government securities, the same or a sufficient portion thereof being in this case sold for the purpose.

	All materials supplied to the contractor shall remain the absolute property of Government and shall not on any account be removed from the site of the work and shall at all times be open to inspection by the Engineer-in-Charge. Any such materials unused and in perfectly good condition at the time of the completion or determination of the contract shall be returned to the Engineer-in-Charge's store, at the prevailing market rate or at the issue rate whichever is less if by a notice in writing under his hand he shall so require, but the contractor shall not be entitled to return any such materials unless with such consent, and shall have no claim for compensation on account of any such materials so supplied to him as aforesaid being unused by him, or for any wastage in or damage to any such materials. 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 be then or at any time thereafter may become due to the contractor, or from his security deposit, or the proceeds of sale thereof". **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 hereto annexed. There may be delay in obtaining materials by the Department and the contractor is therefore required to keep himself in touch with the day to 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 completion of work can be granted on timely application by the contractor vide also Clause-4.
Works to be executed in accordance with specification, drawing and orders etc.	**Clause - 9 :** The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner, and both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also confirm exactly, fully and faithfully to the designs, drawings and 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 hour and the contractor shall, if he so requires, be entitled at his own expenses to make or cause to be made copies of the specification, and of all such designs, drawings and instructions as aforesaid. **Clause-10 :** The Engineer-in-Charge shall have power to make any alterations in or additions to the original specifications, drawings,

Do not invalidate Contract. Extension of time in consequence of alterations.	designs and instructions that may appear to him necessary and advisable during the progress of work and the contractor shall be bound to carry out the work in accordance with any instructions which may be given to him in writing signed by the Engineer-in-Charge and such alteration shall not invalidate the contract, and any additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work, and at the same 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 differs to the original contract work and the certificate of the Engineer-in-Charge shall be conclusive as to, such proportion. And if the additional work includes any class of work, for which no rate is specified in this contract, then such class of work shall be carried out at the rates entered in the sanctioned schedule of rates of the locality during the period when the work is being carried on and if such last mentioned class of work is not entered on the schedule of rates of 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 it is his intension 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 of work and arrange to carry it out in such manner as he may consider advisable.
Rates of work not in estimate or schedule of rates of the district	No deviations from the specification stipulated in the contract or additional items of work shall ordinarily be carried out by the contractor, nor shall any altered, additional or substituted work be carried out by him, unless the rates of the substituted, altered or additional items have been approved and fixed in writing by the Engineer-in-Charge. The contractor shall be bound to submit his claim for any additional work done during any month on or before the 15th day of the following month accompanied by a copy of the order in writing of the Engineer-in-Charge for the additional work and that the contractor shall not be entitled to any payment in respect of such additional work if he fails to submit his claim within he aforesaid period. Provided always that if the contractor shall commence work or incur any expenditure in regard thereof before the rates shall have been determined as lastly herein before mentioned, in such case he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rates as aforesaid according to such rates as shall be fixed by the Engineer-in-Charge. In the event of a dispute, the decision of the Superintending Engineer of the Circle will be final
No compensation for alteration in or restriction of wok to be	**Clause-11 :** If at any time after the commencement of the work the Governor of Odisha shall for any reason whatsoever not required the whole thereof as specified in the tender to be carried out, the

carried out.	Engineer-in-Charge shall give notice in writing of the fact to the 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 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 alterations having been made in the original specification drawings, designs and instruction which shall involve any curtailment of the work as originally contemplated.
Action and compensation payable in case of bad work.	**Clause -12 :** If it shall appear to the Engineer-in-charge or his sub-ordinate-in-charge of the work, that any 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 the 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 for, forthwith rectify or remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide 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 ten days, while his failure to do so 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 others, the materials or articles complained of as the case may be at the risk and expense in all respects of the contractor.
Work to be open for inspection. Contractor or responsible Agents to be present.	**Clause - 13:** All work under or in course of execution or executed in pursuance of the contract shall at all times be opened to the inspection 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 the intention of the Engineer -in-charge or his subordinate to visit the works shall have been given to the contractor either himself be present to receive orders and instruction, or have a responsible agent duly accredited in writing, present for that purposes. 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.
Notice to be given before work is covered up.	**Clause -14:** The contractor shall give not less than five days notice in writing to 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 or placed beyond the reach of measurement and shall not cover up or place beyond the reach of measurement, any work without the consent in writing of the Engineer in charge or his subordinate - in charge of the work and if any work shall be covered 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 payment or allowance shall be made for such work of the materials with which same was executed.
Contractor is liable for damages dine and for imperfection for 3 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, fence, enclosure, or grass land or cultivated ground continuous to the premises on which the work of any part of it is being executed or if any damages shall happen to the work while in progress, from any cause whatever or any imperfection became apparent in it within three 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 to be made good by other workmen and deduct the expenses (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 there of and the contractor shall be liable to pay any part of the expenses not so recovered by the Engineer-in-charge.
Contractor to supply plant, ladders, scaffolding etc.	**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 -charges 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 to 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 be 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 works, and counting, weighing and assisting in the measurement of examination at any time and from time to time of the work or the materials. Failing him so doing the same may be provided by the Engineer-in-Charge at the expense of 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 of every suit, action or other proceedings at law that may be brought any person for injury sustained owing to neglect of the above
And is liable for	

damages arising from provision of lights fencing etc.	precautions, and to pay damages and cost which may be awarded in any such suit, action or proceedings to any such person or which may with the consent or the contractor be paid to compromise any claim by any such person.
Work not to be sublet.	**Clause-17:** No female labourer shall be employed within the limits of a cantonment. The contractor shall not employ for the purpose of this contract any person who is below the age of twelve years, and shall pay to each labourer for the work done by such labourer, wages not less than the wages paid for similar work in the neighborhood. The Superintending Engineer shall have the right to enquire into and decide any complaint 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. **Explanation** - Fair wages means wages whether for time of piecework prescribed by the State DOWR provided that where higher rates have been prescribed under the minimum wages Act. 1948 wages at such higher rates would constitute Fair Wages. The Superintending Engineer shall have the right to enquire into and decide any complaint alleging that the wages paid by the contractor to any labour for the work done by such labour is less than the wages paid for similar work in the neighbourhood. The officer-in-charge of the work shall have the right to decide whether any labourer employed by the contractor is below the age of twelve years and to refuse to allow any labourer whom he decides to be below the age of twelve years to be employed by the contractor. **Clause-17(a)** – The contractor shall if so required by the Engineer-in-Charge employ one or more Engineering Graduates or Diploma holders as apprentices at his own cost of the work as shown in the tender exceed Rs.2,50 Cr. The Chief Engineer will select the apprentices. The period of employment will commence within one month after the date of work order and would last until the date when 90% of the work is completed. The stipend to be paid to the apprentices should not be less than Rs. 200/- per month in the case of graduate Engineers and less than Rs.150/- per month in case of Diploma holders. The number of apprentice to be employed shall be fixed by the Chief Engineer in a manner so that the expenditure does not exceed 1 % of the tendered cost of the work. **Clause-18:** The contractor shall not be assigned or sublet without the written approval of the Superintending Engineer. And if the contractor shall assign or sublet his contract or attempt to do so or become insolvent or commence any insolvency, proceedings or make any composition with his creditor or attempt to do so or if any bride, gratuity, gift, loan, perquisite reward, or advance, pecuniary or otherwise, shall either directly or indirectly be given, promised, or offered by the contractor, or any of his servants or agents to any public officer or persons in the employ of Government in any way

	relating to his office employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Superintending Engineer may there upon by notice in writing rescind the contract and the security deposit of the contractor shall there upon stand forfeited and be absolutely at the disposal of Government and the same consequences shall ensure if he contract had been rescinded under the clause 2 thereof, and in addition the contractor, shall not be entitled to recover or be paid for any work thereto for actually performed under the contract.
Contract may be rescinded and security deposit forfeited for subletting, bribing or if contractor becomes insolvent.	**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 change in the constitution of the firm shall be forth with notified by the contractor to the Engineer-in-charge for his information.
Changes in constitution of firm.	In case of failure to notify the change in the constitution within fifteen days the Engineer-in-charge may by notice in writing rescind the contracts and the security deposit of the contractor shall thereupon stand forfeited and be absolutely at the disposal of Government and the same consequences shall ensure as if the contract had been rescinded under clause-2 hereof, and in addition the contractor shall not be entitled to recover or be paid for any works therefore actually performed under the contract.
	Clause-21: All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the 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.
Lump sums in estimates.	**Clause-23:** When the estimate on which a tender is made includes lump sums in respect of parts of the work the contractor shall be entitled to payment 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 sum or sums payable to him under the provisions of this clause.
	Clause-24: In the case of any class of work for which there is no such specification as is mentioned in the rule I, such work shall be carried out in accordance with Circle specification and in the event of

Action where no specification. Definition of works.	there being no circle specification, then in such case the work shall be carried out in all respect in accordance with the instructions and requirements of the Engineer-in-charge. **Clause-25 :** The expression "work" or "work" where used in these conditions shall, unless there be something either in the subject or context repugnant to such construction, be construed, and taken to mean the works by or by virtue of the contract contracted to be executed, whether temporary or permanent, and whether original, altered, substituted or additional. **Clause-26:** Government shall be entitled to recover in full from the contractor any amount that the Government may be liable to pay under Workman's compensation Act-VII of 1923 to any workmen employed in course of execution of any part of the work covered by these contract. **Clause-27 :** That the purpose of jurisdiction in the event 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 of 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. **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 this own cost for his labour camp. **Clause-30 :** The contractor shall bear all taxes including sales tax, Income tax, royalty, fair-weather charges and tollage, where necessary.
	Clause-31(a) i: If during the progress of the work the price of any materials incorporated in the work (not being materials supplied from the Engineer-in-Charge's store in accordance of the clause thereof) increases or decreases as a result of increase or decrease in the Average Wholesale Price Index (all commodities)and the contractor thereupon necessarily and properly pays in respect of that materials (incorporated in the work) such increased or decreased price, then he shall entitled to reimbursement or liable to refund quarterly the case may be, such as an amount as shall be equivalent to the plus or minus difference of 75% in between the Average Wholesale Price Index (all commodities) which is operating for the quarter under consideration and that operated for the quarter in which the tender was opened as per the formula indicated below : **Formula to calculate the increase or decrease in the price of materials :**

$$VM = \frac{0.75 \times Pm}{100} \times R \times \frac{(i - i_O)}{i_O}$$

VM = Increase or decrease in the cost of work during the quarter under consideration due to changes in prices of base materials.

R = the value of work done in rupees during the quarter under consideration

i_o = Average Wholesale Price Index (all commodities) prevailed during the quarter in which the tender was opened.

i = Average Wholesale Price Index (all commodities) prevailed for the quarter under consideration.

Pm = Percentage of material component as per sub-clause of this clause.

(ii) Where original contract period is one year and above, increase/decrease of cost of steel, cement and bitumen are to be paid/ recovered. Payments in case of increase are to be made with prior approval of Govt. when the total claim is more than Rs.50, 000/- and with prior approval of Engineer-in-Chief/ Chief Engineer (as the case may be) when the claim is up to Rs.50, 000/-. The concerned Superintending Engineer shall make recovery in the case of decrease from the contractor immediately. The cost shall be determined as follows.

Steel: Rate as fixed by Steel Authority of India Ltd.,(SAIL)

Cement: Average factory price of three manufacturers of cement inside the state

Bitumen: Rate as fixed by Indian Oil Corporation (IOC)

(iii) Where original contract period is more than six months and below one year, increase/ decrease of cost of steel, cement and bitumen are to be paid/ recovered. Payments in case of increase are to be made with prior approval of Govt. when the total claim is more than Rs.50,000/- and with prior approval of Engineer-in-Chief/ Chief Engineer (as the case may be) when the claim is up to Rs.50,000/- subject to the fulfillment of the condition mentioned below.

(i) The cost shall be determined as follows.

Steel: Rate as fixed by Steel Authority of India Ltd., (SAIL)

Cement: Average factory price of three manufacturers of cement inside the state

Bitumen: Rate as fixed by Indian Oil Corporation (IOC)

(ii) Cost of the Project should be more than Rs.50.00 lakhs. However, the differential cost of such materials may be

paid to the contractor after deducting the hike percentage amount in the tender for those materials from the calculated amount of differential cost.

(iii) Contractors have to submit the vouchers showing procurement from an authorized dealer for the said work within 28 days before utilization of steel, cement and bitumen.

(iv) Differential cost will be allowed only for the original agreement period, but not for the extended period even though it might have been validly extended.

(v) Differential cost will be allowed only after successful completion of the work as per approved work programme.

(vi) Stipulations contained in the existing clause 31(a),(ii) recovery in case of decrease shall be made by the concerned Superintending Engineer from the contractor immediately.

Clause-31(b)

Similarly, if during the progress of work, the wages of labour increase or decrease as a result of increase or decrease in the Minimum Wages for Industrial Workers prescribed in the Government and the contractor thereupon necessarily and properly pays in respect of labour engaged on execution of the work with such increased or decreased wages, then he shall be entitled to reimbursement or liable to refund quarterly as the case may be such an amount as shall be equivalent to the plus or minus difference in between the Minimum Wages for Industrial Workers which is operating for the quarter under consideration and that operated for the quarter in which the tender was opened as per the formula indicated below :

Formula to calculate the increase or decrease in the cost of labour :

$$VL = \frac{0.75 \times Pl}{100} \times R \times \frac{(i - i_O)}{i_O}$$

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

R = the total value of work done in rupees during the quarter under consideration.

i_o = Average Minimum Wages for labour in the state as prevailed during the quarter in which the tender was opened.

i = Average Minimum Wages for labour in the state prevailed during the quarter under consideration.

Pl = Percentage of labour component as per sub-clause of this clause.

Clause-31(c) : Similarly, if during the progress of work, the prices of Petrol, Oil and lubricants (Diesel oil being the representative item for price adjustment) increases or decreases as a result of the price fixed therefore by the Government of India & the contractor thereupon necessarily and properly pays such increased or decreased price towards Petrol, Oil and Lubricants used on execution of the work then he shall be entitled to reimbursement or liable to refund, quarterly as the case may be such an amount as shall be equivalent to the plus or minus difference in between the price of P.O.L which is operating for the quarter under consideration and that operated for the quarter in which the tender was opened as per the formula indicated below :

Formula to calculate the increase or decrease in the price of P.O.L :

$$K1 = \frac{0.75 \times K2}{100} \times R \times \frac{(D_2 - D_1)}{D_1}$$

K1 = Increase or decrease in the cost of work during the quarter under consideration due to changes in the price of P.O.L.

R = the value of work done in Rupees during the quarter under consideration.

D1 = Average price per litre of diesel oil which is fixed by the Government of India for the nearest consumer P.O.L pump during the quarter in which the tender was opened.

D2 = Average price per litre of diesel oil which is fixed Government of India for the nearest consumer P.O.L pump during the quarter under consideration.

K2 = Percentage of P.O.L. component as per the sub-clause.

Clause 31 - (d) : The following shall be the percentage of material, labour and P.O.L. component for reimbursement/refund on variation in price of material, labour and P.O.L. as per sub-clause (a), (b) and (c) of this clause.

Category of work	**Contractors Supply**			Departmental Supply of materials
	%of materials	% of labour	% of POL	
Irrigation Work (a) Structural Works	20	30	5	45

(b) Earth Works (c) Canal Works Embankment Works Etc.	20	60	5	15

Clause-31(e)

The reimbursement / refund on variation in price of materials, labour and P.O.L (vide Works Department letter No. 21369, dated 25.09.1991) as per sub-clauses (a) (b) and (c) of this clause shall be applicable in the following manner.

"In terms of the aforesaid escalation clause where the period for completion of the work as stipulated in the agreement **is less than one year**, **no escalation is admissible at all.** In case of work where the stipulated period of completion **is one year and more**, the escalation on account of price variation is admissible only for the remaining period after excluding **the one year period** thereof, provided the work has been carried out by the contractor in terms of the relevant provision of the agreement. In the situations, where the period of completion initially stipulated in the agreement was **less than one year** and subsequently the completion period has been validity extended on the ground that the delay in completion of the work is not attributable to the contractor and in the result the total period including the extended period stands at one year or more, escalation is admissible only for the remaining period after **excluding the first one year** period there from."

Clause 31 - (f) The contractor shall for the purpose of sub-clause (a) (b) and (c) of this clause keep such books of account and other documents as necessary to show 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 verified in such manner as the Engineer-in-charge may required any document kept and such other information as the Engineer-in-charge may require.

Clause 31 - (g) The contractor shall within a reasonable time of his becoming aware of any alteration in the price of such materials/wages of labour and or price of POL give notice there of to the Engineer-in-charge stating that the same is given in pursuant to this condition together with an information relating there to which he may be in a position to supply.

Clause-32 : After the work is finished all surplus materials 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 the 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 the wages not less than fair wages to labourers engaged by him on the work.

Explanation :" Fair Wage" means wages, whether for time or piece 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".(WD No.22059 dt:16.8.77)

(b) The contractor shall, not withstanding the provisions of any contract to contrary, cause to be paid a fair wage to labourer indirectly engaged on the work including

any labour engaged by his subcontractors in connection with the said work, as if the labourers had been immediately employed by him.

(c) In respect of all labour directly or indirectly employed in the works for the performance of the contractors part of this agreement, the contractor shall comply with or cause to be complied with all regulations made by the Government in regard to payment of wages, wage period deductions from wages, recovery of wages not paid and unauthorised deductions made, maintenance of wage 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 the contractor, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of wages or of deductions made from 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-contractors.

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

(g) Under the provision of the Minimum Wages Act 1948 and the minimum wages (Central Rules, 1950) the contractor is bound to allow or cause to be allowed to the labourers directly or indirectly employed in the work 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 of Sub-Divisional Officer concerned shall have the right to deduct the sum not paid on account of wages for weekly holiday to any labourers and pay the same to the persons entitled thereto from any money due from the contractor.

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

(i) The contractor shall submit by the 4th and 19th 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 of the current month respectively:

i.) The number of labourer employed by him on the work.
ii.) Their working hours.
iii.) The wages paid to them
iv.) The accident if any occurred during the said fortnight showing the circumstances under which they happened and the content of damage and injury caused by them and;
v.) The number of female workers who have been maternity benefit according to clause (K) and the amount paid to them, failing which the contractor shall be liable to pay the Government a sum not exceeding Rs.50/- for each default of materially incorrect statement. The decision of the Superintending Engineer shall be final in deducting from any bill due to the contractor, amount levied as fine.

(j) In respect of all labour directly or indirectly employed in the works for the performance of the contractors part of this agreement, the contractor shall comply with or cause to be complied with all regulations made by the Government from time to time for the protection of health and sanitary arrangement for the workers employed by the Odisha Public Works Department and this will apply to work place having 50 or more workers.

(k) Maternity benefit rules for female workers employed by the contractor, leave and pay during leave shall be regulated as follows:
a)**Leave:**In respect of Delivery: Maternity leave not exceeding 8 weeks (4 weeks up to and including the day of delivery of 4th weeks following that day,.

in case of miscarriage: Up to 3 weeks from the date of miscarriage.

ii.)**Pay:**In case of Delivery: Leave pay during maternity leave will be at the rate of the woman's average daily earnings calculated on the total wages earned on the days when full time work was done during the period of three months immediately proceeding the date of which she gives notice that she expects to be confined or at the rate of Rs.52.50 a day whichever is greater.

In case of miscarriage: Leave pay at the rate of average daily earning 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 miscarriage.

Condition of the grant of maternity leave: No maternity leave benefit shall be admissible to a woman unless she has been employed for a total not less than 6 months immediately proceeding the date on which she proceeding on leave.

MODEL RULES
FOR HEALTH & SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY ODISHA P.W.D.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 is employed in connection with construction work.
   ii. "Large Work Place" means a place at which an average of 500 or more workers is employed in connection with a work.

3. FIRST AID:
   i. At every work place, there shall be maintained in a readily accessible place for first-aid appliances including an adequate supply of sterilizer dressings and sterilized cotton wool. The appliances shall be kept in good order and in large work places, which shall be readily available during working hours.
   ii. At Large Work Places, where hospital facilities are not available within easy distance of works, first aid posts shall be established and run by a trained Compounder.

iii. Where Large Work Places are remote from regular hospitals an indoor ward shall be provided with one bed for every 250 employees.

iv. Where Large Work Places are situated in cities, towns or in their suburbs and no beds are considered necessary owing to the proximity of the city, town hospitals, 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 person or persons suddenly taken ill to the nearest hospital.

4. DRINKING EATER:

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

ii. 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.

iii. Every water supply of storage shall be at distance of not less than 50 feet from any latrine, drain or other sources of pollution. Where water has to be drawn from an existing well, which is within such proximity of latrine, drain or any other source 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 a trap door, which shall be dust and waterproof.

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

v. The temperature of the drinking water supplied to worker shall not exceed 90°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 clean and well drained condition.

6. SCALE OF ACCOMODATION IN LATRINES NAD URINALS:

There shall be provided within the premises of every work place, latrines and urinals in an accessible places and accommodation, separately for each of them for men and women not less than the following:

i.	Where the number of person employed does not exceed 50	No.of seats 2.
ii.	Where the number of person employed does exceed 50 but not exceed 50	No.of seats 3.
iii.	For every additional 100 employees (in particular cases, the Superintending Engineer shall have the power to vary the scale where necessary)	No.of seats 3 per 100

7. LATRINE AND URINAL FOR WOMEN:

If women are employed, separate latrines and urinals separate from that for men 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. CLEANLINESS OF LATRINES AND URINALS:

Except in work places provide with water flushed latrines connected with a water borne sewerage system, all latrines shall be provided with receptacles 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 receptacle shall be tarred inside and outside at least once in 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 this 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 the Asst. Director of public Health of Municipal, Medical Officer of Health as the case may be in whose jurisdiction the work place is situated. Alternatively, excreta may be disposed off by putting a layer of light soil at the bottom of pucca tank prepared for the purpose and covering it with a layer of waste or refuse and then covering it up with a layer of earth for a fortnight (when it will turn into manure).

11. PROVISIONS OF SHELTERS DURING REST:

At every work place, there shall be provided free of cost, two suitable sheds one for meals and other for rest or use of the labourers. The height of the shelter shall not be less than 11 feet from the floor level to the lowest part of the roof.

12. CRECHE:

a. At every work place at which more than 50 women workers are employed, there shall be provide only hut for the use of children under the age of 6 years, 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 the lower standard than the following:
   i. Thatched roofs.
   ii. Mud floors and walls.
   iii. Plants spread over the mud floor and covered with mat.
   iv. The hut shall be provided with suitable and sufficient opening for light and ventilation. There shall be adequate provision for sweepers to keep the place clean. There shall be two Dhais in attendance. Sanitary utensils 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 is more than 50, the contractor shall provide one hut and one Dhai to look after the children of women workers.

c. The size of the 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.

13. CANTEEN:

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

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ODISHA P.W.D CONTRACTOR'S LABOUR REGULATIONS

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

2) **Definitions:** In these regulations, unless otherwise expressed or indicated the following words and expressions shall have the meaning hereby assigned to them respectively, that is to say:
   - **i. "Labour"** means a worker employed by the contractor of Odisha Public Works Department, directly or indirectly through sub-contractor or other person, or by an agent on his behalf.
   - **ii. "Fair Wages"** means wages whether for the time or piece 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 rates would constitute fair wages.(WD No.22059 dt: 16.8.77).
   - **iii. "Contractor"** shall have the same meaning as defined the Payment of Wages Act and include time and piece rate wages, if any.

3) **Display of notices regarding wages etc:** The contractor shall :
   - i. 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 conspicuous places on the work, notices on English and in the local Indian Language spoken by the majority of the workers, giving the rate of wage prescribed by the State P.W.D/ Electricity Department for the district which the work is done.
   - ii. Send a copy of the notices to the Engineer-in-charge of the work.

4) **Payment of wages:**
   - i. Wages due to every worker shall be paid to him direct.
   - ii. All wages shall have to be paid in cash where no food grain is supplied by the department or partly in cash and partly in grain, if food grain is supplied by the Department to the contractor for issue to labour engaged on the work.

5) **Fixation of Wages period:**
   - i. The contractor shall fix the wage period in respect of which the wages be payable.
   - ii. No wage period shall exceed one month.
   - iii. Wages of every workmen 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.
   - iv. 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.
   - v. All payments of wages shall be made on a working day.

6) **Wage book and Wages cards etc:**

6.1 The contractor shall maintain a wage book of each worker in such forms as 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 case of the ground for which the deduction is made.
   - f. Wage actually paid for each wage period.

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

6.3 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:

7.1 The wages of a worker shall be paid to him without any deduction of any kind except the following-

a. Fines.
b. Deductions for absence from duty, i.e., from the place or places where the 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 good expressly entrusted to the employed person for custody or for loss of money for which he is required to account where such damage or loss is directly attributable to his neglect or default.
d. Any other deductions which the Odisha Government may from time to time allow.

7.2 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 cause against such fines or deduction.

7.3 The total amount of fines which may be imposed in any one wage period on a work shall not exceed an amount equal to 10% in a rupee of the wages payable to him in respect of that wage period.

7.4 No fine imposed on any worker shall be recovered from him by instalments or after the expiry of 60 days from the date on which it was imposed.

8) Register of Fines, etc:

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

8.2 The contractor shall maintain a list in English and in the local Indian language, clearly defining the 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 places on the work.

9) Preservation of Register:

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

10) Powers of Labour Welfare Officer to make investigation or enquiry:

The labour Welfare Officers or any other persons authorised by the Government of Odisha on their behalf shall have the power to make enquiries with a view to ascertaining and enforcing due and proper observance of the fair wage clauses and the provisions of these regulations. He shall at liberty to

investigate into any complain 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 authorised as aforesaid shall submit a report of the result of his investigation or 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 labourer concerned.

12) Appeal against the decision of Labour Welfare Officer:

Any person aggrieved by the decision and recommendation of the Labour welfare Officer or other authorised person, may appeal against such decisions to the Labour Commissioner within 30 days from the date of the decision forwarding simultaneously a copy of his 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 the wage book and wage cards of any of his workers at a convenient time and place after due notice is received or to the Labour Commissioner or any other person authorised 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) Amendments:

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 these regulations, the decision of the Labour Commissioner or any other person authorised by the Government of Odisha on that behalf shall be final and binding on that effect.

Clause-34 Additional Performance Security

Additional Performance Security shall be deposited by the successful bidder when the bid amount is seriously unbalanced i.e less than the estimated cost by more than 10% but less than 15%.In such an event, the successful bidder will deposit the additional performance security to the extent of the 1.5 times differential cost of the bid amount and 90% of the estimated cost in shape of post office saving bank account/ NSC/ KVP/ Post office TDR/ Deposit receipt of scheduled bank before execution of the agreement.

The tender will be liable for rejection in absence of furnishing of the performance security even in case of **fixed deposit holders** and **Engineer Contractors** who were exempted from furnishing EMD while participating in tender or In case of bid amount being 15% or less than the estimated cost.

(As perAmendment to Para-3.5.5(V) Note-II of OPWD Code, Vol-I)

Clause-35 The terms and conditions of the agreements have been read/ explained to me and I Sri/Smt..... certify that I clearly understand them and agreed to abide by these rules.

Date: Witness Contractor

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ADDENDUM TO CONDITION OF CONTRACT

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 Within 15 days of issue of the letter of acceptance, the contractor shall submit to the Engineer-in-charge for approval and programme commensurate to clause no 2 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 the Engineer-in-charge a revised programme showing the modifications 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 hold 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 over dues programme has been submitted.

2.1.5 An update of the programme shall be a programme showing the act all 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 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 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 issue 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 and 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 indicates the forecast of the dates of commencement and completion of various trades of section of the work and may be amended as necessary by agreement between the Engineer-in-charge and the Contractor within the limitation 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 contract data.

2.2.3 In case of delay occurred due to any of the reasons mentioned below, the contractor shall immediately give notice therefore 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) Serous loss or damage by fire or
iii) Civil commotion, local commotion of workmen, strike or lockout, officers any of the heads employed on the work or
iv) Delay on the part of other contractors or tradesmen engaged by Engineer-in-charge, in executing work not forming part of the contract.
v) In case of variation is issued which makes it impossible for completion to be achieved by the intended completion date without the contractor taking steps to accelerate the remaining work and which would cause the contractor to incurred additional cost or
vi) Any other cause, which, in the absolute discretion of the authority mentioned, in contract date 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 within 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 complied 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 of completion has been specified.

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 item of work for which a 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 particulars milestone mentioned in contract date, or the rescheduled milestone(s) in terms of clause 2.5 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 to 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 fails to make up for the delay in subsequent milestone(s) amount mentioned against such milestone missed subsequently also shall be withheld. However no interest, whatsoever, shall be payable on such withheld amount.

2.4 Bonus for early completion.

2.4.1 In case the contractor completes the work ahead of scheduled completion time, a bonus 1% (one percent) of the tendered value per month computed on per day basis, shall be payable to the contractor subject to a maximum limit of 2% (two percent) of the tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work.

The Bonus/ Incentive should be paid in respect of individual project for new construction/ substantial additional improvement works, the minimum value for which the Bonus/ Incentive applicable is given below.

	Type of work	**Minimum Value**
1.	Building work / P.H. Work	Rs. 40.00 Lakhs
2.	Road Work	Rs. 300.00 Lakhs
3.	Irrigation works	Rs. 1,000.00 Lakhs

Incentive will be paid with approval of next higher authority of tender accepting authority on completion of original work before original time schedule.

2.5 Management of Meetings.

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

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

RELEVANT PROVISION IN THIS CONRACT STANDS MODIFIED ACCORDINGLY.

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CHAPTER – II

SPECIAL CONDITIONS OF CONTRACT

SPECIAL CONDITIONS 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 do 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 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 @ 1% of the amount put to tender.

ii) In case the contractor proposes to engage machineries and equipments as asked for in the tender document owned or hired but deployed outside the State, he /she is required to furnish additional 1% EMD as bid security. The entire bid security including the additional bid security shall stand forfeited in case the contractor fails to mobilize the machineries with stipulated time as per the tender document.

iii) The earnest money to be pledged in favour of the **Superintending Engineer M.I.Division, Jeypore**and may be in the following shape.

a) Deposit Receipt of any Schedule Bank.

b) National Savings Certificate.

c) Kisan Vikash Patra

iv) No Cash/ Cheque payments are accepted.

v) 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), VAT/GSTIN along with tender documents failing which the tender may not be considered. The original are to be shown at the time of opening. The bidders registered out side the State are required to submit an undertaking in the form of an affidavit that they are not registered under the GSTIN 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 GSTIN clearance certificate.

4. TIME OF COMPLETION

The work is to be completed within with in the period indicated in the detailed tender call notice which includes the period of 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 No.F-2 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, assessed all the facilities 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 On the outer cover the tenderers should write the name of the work and authority who had issued the tender. They should submit the tender document in correct identification box. The tender submitted in the wrong box shall not be taken into consideration.

6.2 The tenderer must furnish copy of Registration &GSTIN clearance certificate at the time of delivery of tender document other wise his/her bid shall be declared as non-responsible & shall be liable for rejection.

6.3 The rates quoted shall remain valid for a period of 90 (ninety) days from the last date prescribed for receipt of tenders.

6.4 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.

6.5 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.

6.6 Loose letters found in the tender box intimating modification to the tenders already submitted will not be considered.

6.7 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 exclude GSTIN butinclude all taxes including rent. Royalty, 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.

6.8 The units and rates in the tender should be written both in words and figures and in case of any discrepancy noted, the units and rates written in words will prevail. The rates should be quoted in Indian Currency.

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.
viii) The tender shall be written legibly and free from erasures, overwriting or correction of the figures. Corrections unavoidable should be made by scoring out the same and initialing dating and rewriting. The tender should show the total of each page and grand total of whole tender.

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

6.10 In order to qualify for 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.

6.11 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.

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

6.13 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.

6.14 An affidavit shall be furnished by the contractor at the time of submission of tender paper about the authentication of tender documents including E.M.D.

6.15 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 acceptance shall within a period of fifteen days upon written intimation being given to him by Registered post deposit, initial security deposit so that the EMD and initial security deposit will be 2% (two percentage) +additional security 1% in case of machineries to be hired from outside, of the accepted tender amount and sign the agreement in the PWD form F-2 (Schedule SLV. No.61) for fulfillment of the contract in the office of the Engineer-in - charge. This initial security deposit together with the EMD and the amount of 5% deduction from each running bill as per F-2 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 The work may be splitted up and distributed among several contractors if considered necessary in urgency of circumstances of the work and the contractor will not be entitled to any compensation on this account.

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

7.4 The earnest money deposited by the unsuccessful tenderers will be refunded as per relevant rules in force.

7.5 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.

7.6 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.

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

8. OBSERVATION 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 excavations, 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 & CESS:

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

b. SALES TAX / GSTIN:

2% GST to be deducted from work bills where agreement value exceeds Rs 2.50 Lakh. (to be applicable as per Government Notification).

c. INCOME TAX:

Income Tax will be deducted from the gross amount of each on going account & will be recovered from the contractor towards Income Tax as applicable from time to time (Provisional or as advised by Income Tax Department)

d. LabourCess :

Labourcess will be deducted from each contract bill as applicable 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 details 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 F2 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 construction programme should be such that, road work will commence after completion of 75% of lining work, or otherwise after completion of the canal work including structure in full shape. The Engineer-in charge shall have to approve the saidconstruction 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.

iii) 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 rate in 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 MAJUORE:

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 of the canal including Govt. Department unless other wise restricted by the Engineer-in-charge.

22. DEPARTMENTAL STOCK MATERIALS:

The contractor may be issued stock materials as per terms and conditions specified under Clause - 8 of F-2 contract for bonafied use in the work. It shall be his responsibility to make all arrangements for proper transport, safe storage, watch and ward of materials and all other charges incidental there on. No payment shall be made on this account to the contractor separately.

He shall be responsible for any loss or damage of departmental materials and machinery during transit and execution of work. The stock materials to be issued by the Department and details there of is annexed separately Annexure-IV.

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 kept 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 Superintending 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 the contractor.

31. EMERGENCY MEASURE:

The work may be split up and distributed among several contractors if considered necessary on the emergency of the circumstances of the work and the contractor will not be entitled to any compensation to this account.

32. 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.

33. CONTRACTOR DYING, BECOMING INSOLVENT, INSTANCE 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 F-2 contract.

34. MEASUREMENT OF EACH WORK SHALL BE TAKEN AS FOLLOWS:

Before commencement of work initial levels and to determine the final measurement of the work, final levels of the embankment or canal or ground 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.

34.1. 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.

35. 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-charg

36. 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.

37. 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.

38. 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.

39. PRICE PREFERENCE:

a) Schedule Caste and Schedule Tribe tenderers will be given concession where their tenders are within 10% of the rate quoted by the lowest tenderer for any work. The work may be considered for award to him / them at the lowest tendered rate in relation of rule 18 of O.G.F.R. Vol. 1 Para 2.5.14 of O.P.W.D. Code vide Govt. of Odisha Works Deptt. Circular No.27748 dated 11.10.97.

b) Preference in price will also be given to M/s Odisha Construction Corporation Ltd. as per relevant Govt. Circular.

40. 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.

41. TESTING OF THE STRUCTURES:

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

42. 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.

43. 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.

44. PAYMENT OF PRICE ESCALATION IN THE CONTRACT CONTAINING THE PRICE ADJUSTMENT CLAUSE:

With regard to payment of price escalation during the extended period when the reasons for delay are not attributable to the contractor, it is clarified that where the extension of time is allowed by the Govt. / Higher authorities with the benefit of price escalation in respect of the balance work left for execution, pragmatic revised milestones should be fixed for completion of the balance work. The escalation calculation should be based on the milestones which could have been achieved by the contractor during the agreement period and extended period and should be limited to the quantities stipulated therein. Payment of price escalation during extended period will be paid subject to approval of the same by the Government of Odisha, Department of Water Resources.

45. 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.

46. 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.

47. 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 part to the contractor nor the agreement will be competent to bring a suit in regard to matters covered by this contract any place outside the state of Odisha.

47.1. 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.

48. CLAUSE FOR ADDITIONAL SECURITY FOR UNBALANCED ITEMS:

Additional performance Security shall be obtained from the bidder when the bid amount is less than estimated cost put to tender. In such an event, only the successful bidder who has quoted less bid price/ rates than the estimated cost put to tender shall have to furnish the exact amount of differential cost i.e. estimated cost put to tender minus the quoted amount as Additional performance Security (APS) in shape of Demand Draft/Term Deposit Receipt duly pledged in favour of the Divisional officer WITHIN SEVEN DAYS, otherwise the bid shall be cancelled and the security deposit shall be forfeited. Further, proceeding for black listing shall be initiated against bidder as per amendment to para 3.5.5 (V) of OPWD code volume-I vide office memorandum No. 14299 dt. 03.10.2017 of Govt. of Odisha work Dept.

(As perAmendment to Para-3.5.5(V) Note-II of OPWD Code, Vol-I)

49. CEMENT:

The Cement manufactured inside the State of Odisha is to be used as mentioned in Technical Specification. (Refer clause 31 of condition of contract).

50. STEEL:

Reinforcement bar manufactured by Steel Authority of India Ltd. (SAIL) is to be used. (Refer clause 31 of condition of contract).

51. BITUMEN:

Bitumen manufactured by Indian Oil Corporation Ltd. (IOCL) is to be used. (Refer clause 31 of condition of contract).

CHAPTER – III

TECHNICAL SPECIFICATION

SECTION - 1

GENERAL SPECIFICATION

The terms the India Standard Specification herein after referred to as BIS as used therein means the relevant Bureau of Indian Standard codes with all amendments published up to the date of Submission of tenders. A statement of relevant BIS is applicable to this contest is enclosed.

LIST OF INDIAN STANDARDS

Sl. No.	Short Title	B.I.S Number
I.	**CEMENT**	
1.	Specification to ordinary Portland cement 33 grade (4th Rev)	269-1989
2.	Specification for Portland Pozzolana Cement	1489-1976
3.	Portland Slag Cement (Fourth revision)	455-1989
4.	Method for physical tests for hydraulic cement (Reaffirmed 1980)	4031-1968
5.	Method of Chemical analysis for hydraulic cement (First revision)	4032-1985
6.	Rapid hardening Portland cement	8041-1978
7.	Hydrophobic Portland cement	8043-1978
8.	High Strength ordinary Portland cement	8112-1976
II.	**AGGREGATES**	
1.	Specification for coarse and fine Aggregates from natural source for concrete (Second Revision)	383-1970
2.	Specification for sand for masonry mortars	2116-1965
3.	Method of Tests for aggregates for concrete	2385-1969 (Part-I to Part- VIV)
4.	Standard sand for testing of cement (First revision) with amendment 1 and 2 Reaffirmed 1980	650-1966
5.	Methods for sampling of aggregates for concrete	2430 -1969
6.	Method of test for determining aggregates impact value of soft coarse aggregates	5640-1970
III.	**STEEL**	
1.	Code of practice for bending and fixing of bars	2502-1963
2.	Specification for cold worked steel deformed bars for concrete reinforcement	1786-1979
3.	Code of practice for welding of MS Bars used for reinforced concrete construction.	2751-1966
4.	Code for practice for use of Metal are welding for general construction of mild steel	818-1989
5.	Deformed bars for concrete reinforcement hot rolled mild steel and medium tensile steel (Revised)	1139-1966
6.	Recommendations for detailing of reinforcement in reinforced concreted works	5525-1969
7.	Specification for Mild Steel and medium tensile steel Bars for Concrete reinforcement.	432-1966(Part I)
8.	Code for practice for safety and health requirement in Electric and Gas welding and cutting operations	818-1968

Sl. No.	Short Title	B.I.S Number
9.	Code for practice for fire precautions in welding and cutting operation.	3016-1965
10.	Measurement of building and Civil Engineering works, method part VIII steel work and iron work	1200-1974 (Part VIII)
11.	Code of procedure for manual or metal ARC and welding of Mild steel	823-1964
12.	Specification for filler rods and wires for gas welding	1278-1972
13.	Recommendations for welding cold worked steel bars for reinforced concrete construction	9417-1979
14.	Hard drawn steel wire fabrics for concrete reinforcement	1566-1982
IV.	**CONCRETE**	
1.	Method of Measurement of building and Civil Engineer work Part-II cement concrete works.	1200-1968 (Part-II)
2.	Code of practice for plain and reinforced concrete	456-2000
3.	Specification for pre cast concrete coping blocks.	5751-1969
4.	Methods of tests for strength of concrete	516-1959
5.	Code of practice for laying in situ cement concrete lining on canals	3873-1993
6.	Specification for Admixtures for concrete	9103-1979
7.	Method of Test for Autoclaved cellular concrete products.	6441-1972-73 (Part-I to IX)
8.	Method of Sampling and Analysis of concrete	1199-1959
9.	Specification of Batch type concrete mixtures (Second Revision)	1791-1968
10.	General requirements for Concrete Vibrators immersion type	2505-1980
11.	Specification for concrete vibrating tables	2514-1963
12.	Method of test for permeability of cement mortar & concrete	3085-1965
13.	Specification for fly ash for use as pozzolana as admixture for Concrete	3812-1981 (Part-II)
14.	Specification for Portable swing weigh batch for concrete (single and double bucket type)	2722-1964
15.	Code of practice for installation of joints in concrete pavements	6509-1972
16.	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures	457-1957
17.	General requirement for concrete vibrator screed board type (First revision)	2506-1985
18.	Code of practice for concrete structures for shortage of liquids	3370 (Part-1 to 4)
19.	Code of practice for use of immersion vibrator for consolidating concrete (First revision)	3558-1983
20.	Method for testing performance of batch type concrete mixer	4634-1968
21.	Form vibrators for concrete	4656-1968
22.	Concrete batching and mixing plant	4925-1968
23.	Ready mixed concrete (Scond revision)	4926-1976
24.	Code of practice for sealing joints in concrete lining on canals	5256-1992
25.	Vibrating plate compactor	5889-1970
26.	Concrete transit mixer and agitator	5892-1970
27.	Concrete pavers	7245-1974
28.	Concrete slump test apparatus	7320-1974

Sl. No.	Short Title	B.I.S Number
29.	Method of making curing and determining compressive strength of accelerated cured concrete test specimens.	9013-1978
30.	Specification for 43 Grade Ordinary Portland Cement (First Revision)	8112-1989
31.	Specification for 53 Grade Ordinary Portland Cement (First Revision)	12269-1987
32.	Specification for admixtures for concrete (First Revision)	9103-1999
V.	**EARTH WORK**	
1.	Method of Measurement of building and Civil Engineering Works Part I, Earthwork.	1200-1969 (Part-I)
2.	Safety code for piling and other deep foundations	5121-1969
3.	Code of practice for Design installation, observation and Maintenance of uplift pressure pipes for Hydraulic structures on permeable foundation.	6532-1972
4.	Safety code for excavation works	3764-1966
5.	Code of practice for protection of slope for Reservoir embankment	8237-1985
6.	Code of practice for earth work on canals	4701-1982
7.	Guidelines for lining of canals in expansive soils	9451-19
8.	Method of test for soils Part-II Determination of water concrete	2720-1973 (Part-II)
9.	Method of test for soils Determination of water content dry density relation using light compaction.	2720-1974 (Part-VII)
10.	Method of test for soils determination of dry density of soils in place by the sand replacement method	2720-1974 (Part-XXVIII)
11.	Method of test for soils determination of dry density of soils in place by the core cutter method	2720-1975 (Part-XXIX)
12.	Classification and identification of soils for general	1498-1970
13.	Safety code for blasting and related drilling operation with Amendment No. I (Reaffirmed 1978)	4081-1967
14.	Portable Pneumatic drilling machine (First revision)	5441-1986
15.	General requirement for black hold drilling rigs	7209-1974
16.	Safety code for working with construction machinery	7293-1974
17.	Code of practice for stability analysis of earth dams	7894-1975
18.	Guidelines for design of under seepage control measures for earth and rock fill dams	8414-1977
19.	Filtration media sand and gravel	8419-1977(Part-I)
20.	Guidelines for design of large earth and rock fill dams	8826-1978
21.	Under drainage arrangements of lined canals.	4558-1995
22.	Pre-cast cement concrete stables for canal lining	3868-1966
23.	Methods of tests of soils	2720(Part-1 to X)
24.	Ammonium nitrate for explosive	4668-1967
25.	Method of test for commercial blasting explosives and accessories.	6609 (Part-1 to V)
26.	Detonators	7632-1975
27.	Method of load test on soils (Second revision)	1888-1982
28.	Method for standard penetration test for soil (first revision)	2131-1981

Sl. No.	Short Title	B.I.S Number
29.	Glossing of terms and symbolic relating to soil engineering.	2809-1972
30.	Method of sampling and preparation of stabilized soils for testing	4332 (Part-I of 1967)
31.	Test in over burden	5529 (Part-1 of 1969)
VI.	**OTHER SUBJECTS**	
1.	Safety code for scaffolds and ladders part I scaffolds	3696-1966
2.	Safety code for scaffolds and ladders Part 2 ladders.	3696-1966 (Part-II)
3.	Recommendation s on stacking and storage of construction materials at site.	4082-1977
4.	Plywood for general purposes (Second revision amendment 1 to 3)	303-1975
5.	Test Sieves	460-1985
6.	Code practice for under drainage of lined canals (2nd revision)	4558-1995
7.	Code of for practice for in situ permeability test	5529 (Part-1 & 2)
8.	Structural steel (Standard quality) (with amendment No.1 to 3)	IS: 226-1975
9.	Hard drawn steel wires (Third revision)	IS: 432-1982 (Part-II)
10.	Concrete pipes (with and without reinforcement) (2nd revision)	IS: 458-1971
11.	Code of practice for laying of concrete pipes	IS: 783-1959
12.	Specification for mild steel tubes, tubular and other wrought Steel fittings Part-I mild steel tubes (fourth revision) (With Amendments No. 1 to 5)	IS:1239-1979
13.	Hard drawn steel wire fabric for concrete reinforcement (Second revision)	IS: 1566-1982
14.	Asbestos cement pressure pipe (Second revision)	IS: 1592-1980
15.	Preformed filler for expansion test in concrete payment and structures (non extruding and resilient type)	IS: 1838-1961
16.	Cast iron detachable joints for use with asbestos cement pressure pipes.	IS:8794-1978
17.	Structural steel (Fusion welding quality) (Second revision)	IS: 2062-1980
18.	Code of practice for laying of cast iron pipe (With amendment No. I)	IS: 3114-1965
19.	Methods of testing for concrete pipes	IS 3597-1966
20.	Rubber sealing rings for gas mains water mains and sewers	IS: 5382-1969
21.	Centrifugally cast (spun) iron low pressure pipes for water gas and sewage (First revision)	IS: 6163-1978
22.	Code of practice for laying of asbestos cement pressure pipes	IS: 6530-1972
23.	Cast iron detachable joints for use with asbestos cement pressure pipes	IS: 8794-1978
24.	Other Publications: Ministry of shipping and transport Specification for Road and Bridge works	No. 7900
VII.	**STONE PITCHING AND LAUNCHING APRON**	
1.	Methods of test for determination of strength properties of natural building stone	IS: 1121-1975(Part-1 to 4)

Sl. No.	Short Title	B.I.S Number
2.	Method of test determination of true specific gravity of natural building stone (First revision)	IS: 1122-1974
3.	Method of identification of natural building stone (Ist Revision)	IS: 1123-1975
4.	Method of test for determination of water absorption apparent specific gravity and porosity of natural building stone (1st revision)	IS: 1124-1974
5.	Method of test for determination of weathering of natural building stones (First revision)	IS: 1125-1974
6.	Method of test for determination of durability of natural building stone (First revision)	IS: 1126-1974
7.	Recommendations for dimensions and workmanship of natural building stones for masonry work (First revision)	IS: 1127-1970
8.	Recommendation of dressing of natural building stone (1st. revision)	IS: 1129-1972
9.	Sand for plaster (First revision)	IS: 1542-1977
10.	Code of practice for construction of stone masonry	IS: 1597-1967
11.	Rubble stone masonry	IS: 1597-1967(Part I to II)
12.	Method for determination of resistance to wear by abrasion of natural building stones (First revision)	IS: 1706-1972
13.	Sand for masonry mortars (First revision)	IS: 2116-1980
14.	Code of practice for preparation and use of masonry mortars (First revision)	IS: 2250-1981
15.	Stone facing	IS: 4101-1967(Part-I)
16.	Method of test for determination of water transmission rate by capillary action through natural building stones	IS: 4121-1967
17.	Method of test for surface softening of natural building stones by exposure to acidic atmospheres	IS: 4120-1967
18.	Methods of test for determination of permeability of natural building stones (First revision)	IS: 4348-1973
19.	Method of test for toughness of natural building stones	IS: 5218-1969
20.	Gujarat State, Section 2, Engineering properties of building stones	IS: 7779-1975 (Part1/Sec.2)
21.	Recommendation practice for quarrying stones for construction purpose.	IS: 8881-1977
VIII. ROAD WORK		
1.	Paving bitumen (revised) (with Amendment No.1)	IS: 73-1961
2.	Cut back bitumen (Revised)	IS: 217-1982
3.	Glossary of terms relating to bitumen and tar(2nd revision)	IS:454-1961
4.	Digboi type cut back bitumen (revised)	IS: 454-1961
5.	Distributors for hot tar and bitumen (first revision)	IS: 2093-1974
6.	Heaters for tar and bitumen (first revision)	IS: 2094-1974
7.	Hot asphalt mixing plants (with amendment No.1)	IS: 3066-1965
8.	Bitumen emulsion for roads (anionic type)	IS: 3117-1965
9.	Asphalt pavers' finisher (first revision with amendment No.1)	IS: 3251-1965
10.	Bitumen drums	IS: 3575-1977

Sl. No.	Short Title	B.I.S Number
11.	Recommendations on stacking and storage of construction materials at site (first revision)	IS: 4082-1977
12.	Bitumen mastic for bridge decking and roads	IS: 5317-1969
13.	Method of test for determining aggregates impact value of soft coarse aggregates.	IS: 5640-1970
14.	Safety code for construction involving use of hot bituminous materials.	IS: 5916-1970
15.	Method of test for determination of stripping value of road aggregates.	IS: 6241-1971
16.	Coarse aggregates for water bound macadam (first revision)	IS: 6579-1981
17.	Adhesive, bitumen emulsion	IS: 7393-1974
18.	Code of practice for road gullies	IS: 774-1975
19.	Bitumen emulsion for roads (Cationic type)	IS: 8887-1976
20.	Methods for testing tar and bituminous materials	IS: 9381-1976
21.	Method for testing tar and bituminous materials Determination of effect of heat and air by thin film over test.	IS: 9382-1979

In addition to the relevant BIS code, the specifications prescribed and guidelines issued by Central water Commission Standard Specifications shall also be followed where BIS specifications are not available.

All works of the contract shall be executed as per the specific and relevant clause/ clauses of relevant I.S. code unless otherwise specified. Materials used should confirm to the desired standards prescribed in the relevant codes. Wherever a Para of IS Code is cited in specification, it goes without saying that the latest revision of the specification subsequently, shall apply. For the purpose of relevancy or otherwise of any provision of the I.S. Code referred to, the decision of the Engineer-in-charge shall be final and binding.

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SECTION – 2
SITE OF WORK

2.1 DISCHARGE RECORDS

The Hydrological data, pertaining to the canal and the streams crossing the canal furnished in the relevant report and drawings, are for information of bidders and contractors. It should be noted that the data used in preparing these particulars were recorded at locations different from the work site. The Government (i.e Govt. of Odisha) does not guarantee the reliability or accuracy of any of the data, shall assume no responsibilities for any conclusions or interpretations that may be made from them. The contractor shall undertake at his expense such studies as are necessary to assess the reliabilities and accuracy of the information presented in the Data.

2.2. SETTING OUT OF WORK

2.2.1 Permanent bench marks shall be fixed at suitable location connecting permanent bench marks fixed by Survey of India. Temporary Bench Marks shall be set up by the Department at every 0.5 Km intervals at convenient locations along the canal to serve as reference levels. The contractor shall establish additional reference Bench Marks as may be needed at his own cost for facilitating the setting out and taking levels for measurement of work, with the approval of the Engineer-in-charge. The bench mark shall be marked on a concrete pillar 30 cm.(L) x 30 cm (B) x 75 cm (H) which shall be embedded 55 cm into firm ground and projecting 20 cm above the ground. The Bench Mark pillar shall be constructed in plain cement concrete of M-10. The pillar shall be protected from being disturbed. The RL of bench marks shall be conspicuously carved and painted on the pillar.

2.2.2 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 centreline of the canal and the reference line for all alignments for demarcation purpose shall be laid by dug-belling on the ground. The reference line shall comprise the base line properly dug-belled on the ground with the numbered concrete/ masonry RD pillar suitably spaced.

2.2.3 Centre line of the canal shall be marked by fixing pillar/ stone at 30 m intervals. Profiles of the canal in filling and in moderate cutting shall be marked at 50 m intervals in straight reaches and at 25 m intervals in curves. A reference line shall also be marked on ground away from the outer edges of cutting and filling with pillars at suitable intervals for future reference.

To ensure correctness of execution, the edges of cutting and the outer toe lines of canal in filling should be marked by fixing pillars or pegs at suitable intervals or by dug- belling.

2.2.4 The check profiles shall be located 15 m apart or longer as directed by the Engineer-in-charge to serve as a guide for execution of all slopes and steps to the elevations and profile(s) indicated in the approved drawings. All important levels and all reference points with respect to bench marks and reference shall be fixed and co-related by the contractor as per directions of the Engineer-in-charge.

2.2.5 The zones of full cutting section, full filling section, partial cutting and filling section shall be separated by conspicuous demarcation in the field.

The curves stipulated in construction drawings shall be carefully laid in the field by adopting approved method of curve layout. The curves shall be marked on the ground by fixing pegs at very closer intervals and joining the peg points by dug-belling to a suitable depth.

The locations of different structures indicated in construction drawing shall also be clearly marked on the ground along the alignment of the canal. The control

structure locations of off-taking canals shall also be clearly demarcated, so that unnecessary excavation or filling at these locations can be avoided.

The spoils dumping zones shall clearly be demarcated in the field. These zones should be at least 2 m beyond the location of catch water drains.

2.2.6 To ensure accuracy in execution of cutting, the canal embankment, spoil banks and the structures, their layout shall be given in an appropriate manner with pegs and pillars suitably placed in relation to outer dimensions of these elements.

2.2.7 All materials and labour for setting out works including construction of reference bench marks, reference lines, check profiles and surveys as may be required at the various stages of construction, shall be made by the contractor at his own cost. The cost of such works shall be deemed to have been included in the cost of items in schedule.

2.3 CLEARING AND GRUBBING

2.3.1 CLEARING AND LEVELING SITE.

The portion of the right-of-way where required for constructing the work under these specifications shall be cleared of all trees, bushes, rubbish and other objectionable materials. Trees designated by the Engineer-in-charge shall not be cut and shall be protected from injury. Such cleared materials shall be disposed-off as provided in the sub-paragraph 3.2.3 below or removed from the site of work before the date of completion of the contract as approved by the Engineer-in-charge. The clearing operation shall be in accordance with clauses 4.1., 4.1.1., 4.2 and 4.3 of IS: 4701-1982 Indian code of Practice for earth work in canals. Surface boulders, either loose or partly embedded in the ground will have to be removed and stacked as directed.

2.3.2 GRUBBING.

The area described or shown on the relevant site plan shall be cleared of all obstructions, loose stones, non required materials and rubbish of all kinds. All brushwood shall be cleared and the roots grubbed up. **Trees to be preserved will be designated by the Engineer-in-charge**. No trees shall be cut down and removed without the instructions of the Engineer-in-charge. Those which are cut down shall be grubbed up. The same remarks apply to jungle clearance.

The products of the clearing shall be stacked in such place and manner as may be ordered by the Engineer-in-charge and the ground shall be left in a perfectly clean condition. All products of the clearing shall be the property of Govt. and shall be disposed- off as per the direction of the Engineer-in-charge.

All holes or hollows, whether originally existing or produced by digging up roots shall be carefully filled up with earth, well rammed to the design density and levelled off as directed.

2.3.3 PREPARATION OF BED

Ant-hills shall be completely dug out before earth work is started. Loose stones and digging of ant-hills involved in the preparation of bed. The contract rate for the earth work shall be deemed to include all the work to be done in accordance with this clause. In cases where the work of preparation of bed is rather extensive, the Engineer-in-charge will usually provide a separate schedule item of such preparation, but in the absence of such schedule provision, the contractor shall understand that his tender rate is inclusive of all such work without extra charge.

The contractor shall therefore examine the site before tendering and provide for all items to be done under this earth work tender rate. Old bunds will be benched or sloped as directed by Engineer-in-charge before addition of earth. The benches shall be 450 mm x 450 mm unless other sizes are specified (Refer page-35/Chapter-2 of Technical Manual, OCTDMS). The benches or slope shall be inspected by the Engineer-in-charge or engineer designated for the purpose and approved before new earth work is keyed into them.

2.3.4 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

The disposal of cleared and grubbed materials shall be in accordance with clause 4.1.1 of IS 4701-1982 code of practice for earth work on canals. All waste materials to be burnt shall be piled neatly and when in suitable condition shall be burnt completely to ashes. Pilling of waste material for burning shall be done at such a location and in such a manner as would not cause any fire risk in cleared area. Suitable materials and equipments for prevention and suppression of the fire shall be kept available at all times.

The materials to be disposed off shall be buried.

2.3.5 PAYMENT

For the clearance of light jungles, heavy jungle with or without up-rooting etc., payment will be made as provided for in the bill of quantities. Separate payment will not be made for clearing of site and grubbing including disposal of the cleared and grubbed materials required under the above paragraphs as specified in the contract document. The contractor shall include the cost thereof in the price bid in the bill of quantities of the contract for the relevant finished item of work for which clearing and grubbing as mentioned in the above para are required. No payment towards removal of small stones and boulders of size less than 0.5 cubic meters will be made, and the rate quoted for excavation will be considered to include this item. However, payment will made for the removal of surface boulders of sizes greater than 0.5 cubic meter, either loose or partly embedded in the ground, at the rate quoted in bill of quantities for the actual quantity so removed based on stack measurement applicable for the relevant strata classification after deducting 40% towards voids.

Benching will be paid as separate item, per cubic meter of excavation of bench at the rate provided for in the tender documents.

2.4 USE OF WATER

2.4.1 WATER FOR DUST ABATEMENT

The contractor shall procure and apply water for dust abatement.

Water applied for dust abatement will not be eligible for payment. The cost of procuring and applying water including all expenses for all means of conveying water to the point of use, their collection, usage, and all other incidental expenses will not be paid separately including creation of source of water and the cost shall be deemed to have been included in the concerned unit price bid in the bill of quantities of the contract for the relevant finished item of work for which water for dust abatement is required.

So also the cost of procuring and applying water required for the works shall be included in the price bid in the bills of quantities for the items of work for which the water is used.

2.4.2 PREWETTING OF CANAL PRISM AND ADJACENT AREAS

The contractor shall furnish all labour, materials and equipment and shall procure and apply water required for pre-wetting the areas under canal and embankment.

Water applied for pre-wetting areas as detailed above will not be eligible for payment. The cost of procuring and applying water including all expenses for all means of conveying the water to the point of use, their collection, usage and all incidental charges shall be included by the contractor in the concerned unit price bid in the bill of quantities for that item of work where the water shall be used and no separate payment for the same will be made.

2.5 SITE DRAINAGE

2.5.1 CROSS DRAINAGE

The contractor shall handle all flows from natural drainage channel intercepted by the work under these specifications, perform any additional excavation and grading for drainage as directed and provide and maintain any temporary construction required to by- pass or otherwise cause the flows to be harmless to the work and property. When the temporary construction is no longer needed and prior to acceptance of the work the contractor shall remove the temporary construction and restore the site to its original condition as approved by the Engineer-in-charge.

In addition to cross drains, longitudinal drains may be considered necessary for proper drainage. The drainage system consisting of network of cross and longitudinal drainage system will be led into out-fall drains to prevent stagnation of water at the place of construction. The drains shall be constructed to the section designed and shall be either open or filled up with material to ensure free flow of water without clogging of the filled materials.

The cost of all works and materials required by this paragraph shall be included by the contractor in the unit prices quoted in the bill of quantities and no separate payment will be made for the same.

2.5.2 DRAINS

In connection with excavation for the canal and structures, the contractor shall perform excavation for the construction of drains, beam drains and chutes and any other drains as directed by the Engineer-in-charge.

The location, grades and sections of the drains shall be as shown on the drawings and or as directed. Measurement of excavation for the above drains will be made to the lines shown in the drawings or as directed. Payment for excavation for the above drains, channels and embankment will be made at the unit price bid in the bill of quantities for execution of canal, which unit price shall include the cost of placing the materials in embankment or otherwise disposing of the excavated materials and all work necessary to maintain the work in good order during construction.

2.5.3 BERM DRAINAGE AND DOWEL BANKS

Berm drainage, including drainage along the berm and banks of the canal and longitudinal berm drains shall be constructed where shown to dimensions and grades on the drawings or as directed.

The surface of the berm shall be sloped transversely and dowel banks shall be made along with sides of the banks and berm where shown on the drawings and elsewhere where directed. The dowel banks may be made by balding of material in place, following completion of a canal reach.

No direct payment will be made for construing Dowel banks and sloping berms and cost thereof shall be included in the unit price per cubic meter bid in the bill of quantities for construction for canal embankment including reconstructing and remodelling.

2.6 MONSOON DAMAGES

Damages due to rain or flood either in cutting or in banks shall have to be made good by the Contractor till the work is handed over to the department. The responsibility for de-silting and making good the damages due to rain or flood rests with the contractor. No extra cost is payable for such operations and the contractor shall therefore, had to take all necessary precautions to protect the work done during the construction period.

2.7 REMOVAL OF SILT AND WATER

Accumulated silt and water in the canal and structures for the works partly done by the contractor in current or previous seasons should be removed and no extra payment will be made, for such removal of silt and water. This unit rate of excavation is deemed to include cost of removal of such silt and water.

2.8 PROCEDURES FOR MEASUREMENT

Before commencement of work, initial levels to indicate existing ground levels, shall be taken at 30 m intervals longitudinally along the alignment of the canal. The level points transversely along the cross sections shall be at the maximum of 5 m intervals in flat ground and 3 m in undulating terrain. The cross sections shall be extended beyond the limit of work to a suitable distance and minimum 5 m beyond the toe lines of slopes on both the sides. The interval stipulated shall be made closer depending on the topography or any stipulation made by the Engineer-in-charge.

All initial levels shall be recorded in ink in authenticated level books issued by the Engineer-in-charge and shall be signed by the Junior Engineer/ Assistant Engineer when he records the levels. The Assistant Engineers and Superintending Engineers shall exercise checks strictly in accordance with the codal provisions.

Actual construction works shall not be allowed to start unless the above formalities are fulfilled.

If the work is awarded to any agency, the level shall be recorded in the presence of the contractor or his authorized agent. The contractor or his authorized agent shall sign each page of the level book/ field book in token of acceptance. These cross sections shall form the basis of all future measurements and payments. Each dimension shall be measured to the nearest 0.01m, areas shall be computed to nearest 0.01sqm. Volume shall be computed to nearest 0.01 cubic m.

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SECTION- 3
EARTH WORK

3.0 EARTH WORK - GENERAL

To the extent that they exist, plans and estimates for the Government's studies of Earth Work for construction of the canal will be available for inspection by the Bidders in the office of the concerned Engineer-in-charge. Such information is made available solely for the convenience of Bidders. The Government does not guarantee that the information is accurate or complete. Bidders are cautioned that this information is subject to revision and that the Govt. disclaims responsibility for any interpretation, deduction or conclusions, which may be made there from. It is not intended that this information will limit or prescribe the excavation and handling procedures of the contractor, and the Govt. reserves the right to utilize and distribute earth work materials during the progress of work as it serves the interest of the Govt.

Drawing showing the typical section of the canal annexed to these specifications provides such details as would enable the contractor to execute the work in general conformity there-with under these specifications which have been prepared as definitely and in as much detail as possible with regard to design data presently available. These drawings will be supplemented by such additional, general and details drawings or directions as may be considered necessary or desirable as the work progresses. For all changes in approved drawing/ design the recommendation of Superintending Engineer and approval of Chief Engineer will be essential. Where details shown on these drawings differ from the requirements of these specifications, the requirement of specifications shall govern. 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 errors and omissions are discovered where upon the Superintending Engineer will prepare and lodge such revised additional drawings and specifications as may be required to suit the stage of the work. All such additional general and detailed drawings whether original or revised lodged in the office of the Engineer-in-charge and signed by him for the purpose of identification shall be open for inspection by the contractor under the same terms and conditions as provided in agreement.

3.1 EXCAVATION OF CANAL AND FOR STRUCTURES

3.1.1. CLASSIFICATION OF EXCAVATION

Payment shall be made on actual classification of soil met with during excavation. Materials excavated shall be measured in excavation to the lines shown on the drawings or as provided in these specifications, and all materials required to be excavated will be paid for at the applicable rates in the schedule for excavation. No additional allowance above the rates in the schedule will be made on account of any of the material being wet. Bidders and the contractors must assume all responsibility for deducing and concluding as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations. The classification of excavation shall be decided by the Engineer-in-charge and binding on the contractor. In case of dispute, the decision of Superintending Engineer shall be final. Merely the use of explosive in excavation will not be considered in areas on the higher classification unless blasting is clearly necessary in the opinion of the Engineer-in-charge.

3.1.2. EXCAVATION FOR CANAL

a) The excavation may be carried out manually or mechanically and as per specification drawing and direction of Engineer-in-charge.
b) The excavation for canal in all kinds of soil and D.I. Rock shall be done according to the dimensions and grades shown on the drawing. Proud equivalent to thickness of the lining on sides and in bed on the underside of the lining shall be left unexcavated temporarily and the removal of this proud shall be done just before trimming and placing concrete for lining.
c) Blasting shall be done in such a manner as not to cause over break, which in the opinion of the Engineer-in-charge is excessive. Special care shall be taken to prevent over break or loosening of material on bottom and side slopes against which concrete lining is to be placed. The method of drilling and blasting to be resorted to for rock excavation, shall be got approved from the Engineer-in-charge.
d) Except for the area of rock, all areas to be excavated for canal sections shall be pre-wetted so that at the time of excavation moisture content shall be at about optimum. However in case the excavated material from canal is not to be used for embankment, such pre-wetting is not necessary.
e) The excavation shall be allowed to progress from the valley ends of the reach towards the ridge in conformity with the layout given. All useful earth from excavation shall be used in for filling the banking section, with varying leads and with all lifts either manually or mechanically. Excavated materials which is not useful for banking or which is in excess after meeting the banking requirement of the reach shall be disposed as specified at Para 8.1 and 8.2 of I.S. Code 4701-1982 either by head lead or by mechanical means or by both in spoil bank or at any specified place with all lifts and with varying leads.
f) The re-gradation for tail channel and approach channel for structures and diversion of drains, nallah shall be done according to the dimension and grade as shown on the drawings or as instructed by the Engineer-in-charge.
g) The contractor shall not be entitled to any additional rate above the rates quoted in the schedule on account of the requirement for allowing additional time for drying, stock piling and re-handling the excavated materials which have been deposited temporarily and stock piled.
h) When cutting on cross sloping ground, the contractor shall cut a catch water drain on the higher side to prevent water from flowing down the cutting slope.

3.1.2.1 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 boulders up to 300 mm maximum diameter in one direction. Excavation of D.I. rock. 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 and 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 and the materials shall not be classified in higher grade.

Excavation for canal shall confirm to provisions of relevant I.S.Codes. Side slopes are to be provided as per the approved drawings, specification and provision of I.S.Code.

3.1.2.2 EXCAVATION OF MEDIUM/ HARD ROCK

This shall include all solid rock in place, of such hardness and textures that it can not be removed by pick axe and crowbars or any other method until loosened by drilling, appropriate blasting and wedging. All boulders or detached pieces of solid rocks having volume greater than 3.0 cum can be classified as Medium/ Hard Rock. Blasting shall only be resorted to only after it has been certified by the Engineer-in-charge that blasting is necessary.

The excavated rock and debris so obtained shall be carried and dumped / stacked separately with varying lead at the places indicated by the Engineer-in-charge. The volume shall be calculated after deduction of suitable void percentage and compared & co-related with the pre-measured volume.

The excavated materials shall be the property of the Department. The same shall be issued to the contractor for the works such as pitching, filter, rock toe, masonry works etc under this work if required, at the issue rate fixed by the department from time to time which is applicable and binding on the contractor.

Payment for Medium/ Hard Rock by means of appropriate blasting shall be made as per level section (pre & finished) at such closer intervals considered necessary for levelling as per opinion of the Engineer-in-charge. Isolated boulders having volume more than 3.0 cum and can't be covered under section measurement, shall be pre-measured. However, the excavated rock as measured by the above method and as calculated by stack measurement (deducting voids) shall be co-related and variation worked out. The volume from stack measurement of rock shall not ordinarily be less than 70%, which shall be ascertained by the Engineer-in-charge and certified in the measurement book. If a higher variation is found after verification, a report in this effect shall be forwarded to the Superintending Engineer for approval.

3.1.2.3 OVER EXCAVATION

The canal shall be excavated to exact designed section in all kinds of soil and D.I. rock. No over excavation will be allowed in such reaches. However in canal sections, taken 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.

In canal sections where expansive type of soil such as CH type of soil is encountered and over which concrete lining can not be directly laid, the canal prism shall be over excavated to the extent as directed by the Engineer-in-charge and such over excavated section shall be filled with cohesive-non-swelling (CNS) type of soil to be placed in uniformly compacted layers as directed by the Engineer-in-charge. The over excavation made in such strata, filling by suitable soil, watering & compacting will be paid under respective items at the quoted rate.

3.1.2.4 DEWATERING TRENCHES AND WET EXCAVATION

Subsoil water met within canal excavation shall be diverted to nearby drain/ nalla by cutting an open channel within the canal section to be excavated. When the drain/ nalla bed is higher than the subsoil water level met with, pumping shall be resorted to for dewatering below the drain/ nalla bed level. In case where topography of the area is such that surface water is not possible to be drained off by excavating the channel, pumping shall be resorted to till completion of the work. No distinction shall be made as to whether the materials being excavated is dry, moist of wet, care should be taken to discharge the drained water not to cause damage to works, crops or any other property. No separate payment shall be made for dewatering by pumping of by any other method.

3.1.2.5 MEASUREMRENT AND PAYM ENT

The payment shall be made on volumetric basis for the quantities excavated to the required extent. The cross sections shall be taken initially before commencement of work as stipulated in earlier Para. On completion of excavation, final cross sections shall be taken at the same points longitudinally and transversely. These cross sections shall be marked on the initial cross sections and the quantities between initial and final cross section shall be worked out and paid.

3.2 EXCAVATION FOR STRUCTURES

Excavation for the foundation of structures shall be to the level shown on the drawings or as directed by the Engineer-in-charge. In so far as practicable the useful materials removed in excavation for structures shall be used for back fill and embankment.

3.2.1 FOUNDATIONS FOR STRUCTURES

All trenches in soil other than rock or hard compact soil more than 1.5 m depth and soft of fissured rock exceeding 2.0 m depth in which men enter shall be securely shored and shuttered and timbered. All loose stones, projecting clumps of earth, pockets of materials which might come down on the workers in the trenches or any condition which is hazardous, shall be either removed or the excavated, sides adequately braced and the trench suitably guarded. On stiff slopes, workmen shall not be permitted to work one above the other.

The contractor shall prepare the foundations of structure sites by method which will provide firm foundation for the structures. The bottom and the side slopes of common excavation upon or against which the structure is to be placed shall be finished to the prescribed dimensions and the surfaces so prepared shall be moistened and tamped with suitable tools to form a firm foundation upon or against which the structures is to be placed. The contractor shall prepare the foundation of the structures as shown on the respective drawings. The horizontal foundation materials beneath the required excavation shall be moistened if required and compacted in place.

If the Engineer-in-charge considers it necessary to consolidate the foundation strata by grouting cement slurry, then drilling and grouting or any other foundation treatment shall be done by the contractor as directed by the Engineer-in-charge and the payment will be as per the general contract document in respect of extra items. Densities of the compacted foundation materials and the testing there of shall be in accordance with relevant IS specification.

When unsuitable materials are encountered in the foundation for structure, the Engineer-in-charge will direct additional excavation to remove the unsuitable materials. The additional excavation shall be refilled as follows. The excavation in soils, the over-excavation shall be filled in by selected bedding materials and compacted. In excavation of rock it shall be filled by cement concrete M-7.5. No

Payment will be made for the over-excavation and the resulting backfill. Should remains of old building be met with, the materials shall be removed with wedges and levers. Blasting shall not be allowed, with out the permission in writing of the Engineer-in-charge. If bad ground of loose soil is met with, the contractor shall be responsible for reporting the fact to the Engineer-in-charge, who shall issue such orders as may be necessary. For extra excavation, concrete and masonry arising from bad ground, the contractors shall be paid for treating this as additional quantity as per the contract rate of contract documents. All excavated earth which is unfit or surplus to the requirements for filling in canal embankments etc. shall be spared, as instructed by the Engineer-in-charge at the contractor's expenses.

3.2.2 OVER EXCAVATION

If at any point in common excavation the foundation material is excavated beyond the lines required to receive the structure, or if at any point in common excavation the natural foundation material is disturbed or loosened during the excavation process, it shall be compacted in place or where directed, it shall be removed or replaced as follows. In excavation in soils and in rock, it shall be filled by cement concrete M-7.5. Any and all excess excavation or over excavation performed by the contractor for any purpose or reason except for additional excavation as may be prescribed by the Engineer-in-charge and whether or not due to the fault of the contractor shall be at the expense of the contractor. Filling for such excess excavation or over excavation shall be at the expense of the contractor.

3.2.3 DISPOSAL OF MATERIALS

All suitable material removed in excavation or as much thereof as may be needed as directed by the Engineer-in-charge shall be used in the construction of canal embankments, roadway embankments and for selected bedding materials or for backfill and around structures. If there is an excess of material in the excavation, it shall be used to strengthen the embankment on either side of the canal, deposited in low areas uphill of the canal to eliminate trapped drainage or otherwise wasted as directed by the Engineer-in-charge. The disposal of the excavated material shall be in accordance with clauses 8.1 and 8.2 of BIS 4701-1982.

3.2.3.1 MEASUREMRENT FOR PAYMENT

Foundation for structures will be measured for payment, as per drawing with due consideration for shuttering. The payment shall be made on volumetric basis for the quantities excavated to the required extent.

3.2.3.2 PAYMENT

Payment for excavation for structures shall be made at the unit price per cubic metre. The rate of excavation for structures shall include the cost of all labour and materials and other temporary constructions, cost of all pumping and dewatering, cost of all other work necessary to maintain the excavation in good order during construction, cost of removing such temporary construction where required and shall also include the cost of disposal of the excavated material.

3.2.4 BACK FILL

3.2.4.1 BACK FILL AROUND STRUCTURES

The item of the schedule for back fill around structures including pipe portions of structures includes all back fill required to place under these specifications.

3.2.4.2 MATERIALS

The type of material used for backfill, the amount thereof and the manner of depositing the material shall be subject to approval of Engineer-in-charge. In so far as practicable backfill material shall be obtained from material removed from excavation for structures. But when sufficient suitable material is not available from this source or from adjacent canal excavation, additional material shall be obtained from approved burrow areas. The burrow pit excavation shall be in accordance with clauses 9.1 to 9.3 of B.I.S. 4701 - 1982.

Where sand filling is specified, the sand shall be clean, free from admixture of foreign material and approved by the Engineer-in-charge before filling is commenced. Should there be a necessity to fill in a basement with sea sand, prior written approval of the Engineer-in-charge shall be obtained. Sand filling should be saturated with water before the construction is allowed to proceed.

Filling around structures shall have well consolidated in layers of 15 cm. by ramming with iron rammers and cut ends of crowbars. When filling reaches the finished level the surface shall be saturated with water for at least 24 hours, allowed to dry and then rammed and consolidated.

Except as otherwise provided below, backfill material to be compacted shall contain no stones larger than 80 millimetres in diameter and if not be compacted shall contain no stones larger than 130 millimetres in diameter. If the excavation for the foundations of the structure is in swelling soils, a layer of cohesive non-swelling (CNS) soil conforming to B.I.S. 9451-1985 should be interposed between the swelling soil and the structure.

3.2.4.3 PLACING BACKFILL

Backfill shall be placed to the lines and grades shown on the drawings as prescribed in this paragraph or as directed by the Engineer-in-charge.

The surface to receive the filling shall be first prepared free from all roots, vegetation or spoil and wetted. All backfill shall be placed carefully and spread in uniform layers so that all spaces around rocks and clods will be filled. Backfill shall be brought up as uniformly as practicable on both sides of walls and all sides of structure to prevent unequal loading. Backfill shall be placed to about the same elevation on both sides of the pipe positions of the structures to prevent unequal loading and displacement of the pipe. The contractor shall provide at least 60 (Sixty) cm thick earth cover over the top of pipe to prevent damage from construction equipment loads. If a haul road is built over a pipe, all backfill about and over the pipe shall be placed to get a uniform surface and no humps or depressions will be permitted at the pipe crossing.

3.2.4.4 STRUCTURES ON FILL

Where the original ground surface is below the base of a structure or below the bottom of pipe, all fill required for the structure foundation and all fill up to the bottom of the pipe shall be placed as compacted embankment. The embankment over the natural ground up to pipe bottom and over the pipe shall be laid in accordance with clauses 9.2.4, 9.2.5 and 9.2.6 of B.I.S. 783 code of practice for laying of concrete pipe.

3.2.4.5 MEASUREMRENT AND PAYM ENT

Payment for backfill about structure will be made as provided in the unit price bid in the bill of quantities which shall include cost of backfill about the structure up to ground level. The cost of backfill shall be included in the applicable price bid in the fill of quantities of contract for excavation of foundation of the structure for which backfill is required.

3.3 DRILLING AND BLASTING

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. 4081 – 1967 (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 Specifications for safety Code for excavation work) and in accordance with the Indian Explosives Act-1982 shall be taken.

All contractors who execute blasting operations in connection with works for purpose of quarrying stones, road construction, excavating foundations, well sinking or for any other purpose shall observe the rules and precautions as per standard norms and any further additional instructions which may be given by the Engineer-in-charge.

Blasting operation, when considered necessary shall be resorted to only with the written permission of the Engineer-in-charge. Prior inspection shall be carried out for the safety and stability of the public and property. Blasting operations in the proximity of overhead power lines, communication lines, utility lines or other structures shall not be carried on until the operator or the owner or both of such lines have been notified and precautionary measures deemed necessary have been taken.

Any damage to the neighbouring buildings, properties, standing crops, and life due to blasting shall be made good by the contractor at his cost.

3.4 EMBANKMENTS

3.4.1 PREPARATION OF SURFACES UNDER EMBANKMENTS

The preparation of surfaces under embankment shall be in accordance with clause 6.1 & 6.5 of IS 4701-1982.

Before commencing the work, the toe of the slope on each side of the Banks shall be lock spitted (dog belled) and marked by pegs firmly driven into the ground at intervals of about 15 meter. Profiles made by bamboos, earth, or other convenient materials and strings shall be set up for the guidance of the workmen about 15 meters apart over straight reaches and about 7.5 meters apart at curves & payment therefore will be made at the unit prices.

Except in areas of rock, the areas under canal embankments shall be pre-wetted by sprinkling water before cleaning, grubbing or excavation operations or construction of embankment begin. The moisture content shall be optimum to a depth of one meter below the original ground surface or to impervious material whichever less as directed by the Engineer-in-charge. Whenever possible, all water shall be added uniformly in one application. Areas, on the sides of the canal banks upon which the Engineer-in-charge may direct spoil banks to be constructed will not require application of water.

The contractor is cautioned to control carefully the application of water and to check on the depth and amount of water penetration during application so as to avoid over watering, accumulation of water in depressions or excessive run-off.

If at any location on embankment foundations, before and during embankment construction, there is excessive moisture as determined by the Engineer-in-charge; steps shall be taken to reduce the moisture by excavating drains, by allowing adequate drain time or by any other approved means.

The contractor shall not be entitled for any additional allowance above the unit prices bid in the schedule, on account of the requirement for allowing additional time for drying, delays or increased costs due to poor traffic ability on the embankment, foundations or on the haul roads, reduced efficiency of the equipment the contractor elects to use or on account of any other operational difficulties caused by over wetting of embankment, foundation or haul roads.

Where the ground surface under any embankment is not suitable as determined by the Engineer-in-charge for a foundation for the embankment, the contractor shall strip the area under the embankment of such unsuitable material to such depth as may be directed. The material so removed shall be disposed off as provided in paragraph 3.2.3. Measurement for payment of stripping unsuitable materials under embankments shall be made only to the lines and to such depth as may be directed and payment there off will be made at the unit prices per cubic meter bid in the bill of quantities for excavation for canal/construction of embankment.

Before beginning the construction of embankments the surface area of ground to be occupied shall be cleared of all roots and vegetable matter of any kind stripped to a suitable depth. The stumps shall be pulled or otherwise removed, and the roots grubbed. The stumps and roots removed shall be suitably disposed-off.

The depth to which top soil is removed shall be adequate to remove all perishable material and any soil which may become unstable on saturation or may

interfere with development of proper bond between foundation and embankment. It is not necessary to remove all the soil containing fine hair like roots but only heavy mat. The underline table may offer as a guideline for finding depth of stripping.

Type of vegetable cover in the soil	**Depth of stripping.**
1. Soil containing light grass cover	5.0 to 7.5 cm.
2. Agricultural Lands	To bottom of ploughed zone 15.0 to 20.0 cm.

The ground surface under all canal embankments excepting rock surface, where it is below the full supply level in the canal shall be scarified making open furrows not less than 20 (twenty) centimetres deep below natural ground surface at intervals of not more than 1.0 (One) meter. However, where the ground surface is below the bed level of the canal, the entire surface of the foundation of embankments shall be stripped to a depth of not less than 20 (twenty) centimetres.

Immediately after preparation of the embankment foundation, the contractor shall excavate cut-off trenches. Following this operation, as soon as feasible and as approved by the Engineer-in-charge the contractor shall place and compact embankment in the cut-off trenches and place one metre of embankment over the entire embankment foundation and compact where required. This procedure will seal the foundation against loss of moisture and provide some consolidation of the foundation. Foundation surfaces under the canal embankments and other embankments shall be scarified before laying earth.

Water applied for pre-wetting areas under the canal embankments and under other embankments will not be measured for payment and shall be included in the unit price bid per cubic metre in the bill of quantities for excavation for canal and other embankments.

In case of existing canals and dams, where the slopes in canals and embankment portions are to be modified, benching of slopes shall be done or old bunds shall be sloped as directed by the Engineer-in-charge duly clearing the surface area under slopes from all roots and vegetable matter and stumps shall be pulled or otherwise removed and roots grubbed. The stumps and roots removed shall be suitably disposed off.

The measurement of benching operation if done shall be done separately and the payment shall be made at unit price per cubic metre bid in the bill of quantities for that item.

3.4.2 CONSTRUCTION OF EMBANKMENTS

3.4.2.1 GENERAL

Canal and dam embankments shall be constructed to top widths and side slopes as shown on the drawings duly providing for compacted allowance of two centimetres per meter height of bank for settlement. The embankment shall be built to heights as directed above those shown on the drawings. The top of all the embankments shall be graded to be suitable for a road way in accordance with subparagraph 3.4.2.2 and the top of other embankments shall be graded or scarified as directed.

Before commencing over haul of material from the burrow area, levels of the banks to be formed in the sections where the over hauled material is proposed for construction of embankments shall be taken. After completing the construction of embankment final cross section levels shall be taken and the volume shall be arrived at and payment shall be made to that quantity only.

All materials shall be deposited in embankments so that cobbles, gravel and boulders are well distributed through other materials and not nested in any position

within or under the embankment as enunciated in clause 6.4 of IS 4701 – 1982.

In area where required excavation does not furnish suitable or adequate material for constructing embankment, material shall be obtained from area where material in excess of that required to construct the adjacent embankment is available.

Where the original ground surface is below the grade of the canal and where construction of a fill below the bottom of the canal is prescribed, such fill shall be placed as a compacted embankment. Where the original ground surface is below the base of a structure, the fill required to form a suitable foundation for the structure shall be placed as compacted embankment.

3.4.2.2 ROADS AND RAMPS

In conjunction with construction of canal embankments, the contractor shall construct operate and maintain earth ramps adjacent to the canal and structures where shown on the drawings and where directed at his own expense. Suitable materials obtained from excavation shall be placed on embankment for the roads and ramps. If sufficient material is not available from required excavation the Engineer-in-charge may direct Excavation from burrow areas.

3.4.2.3 EMBANKMENTS NOT TO BE COMPACTED

Embankment not be compacted shall be formed conforming to clause 6.6.1 of I.S. 4701-1982. The material for these embankments shall have optimum moisture content before earth moving equipment is routed over the embankment. The embankments shall be built in layers not exceeding 30 (thirty) cm in thickness. Embankments shall be built in approximately horizontal layers carried across the entire width of the embankments to the required slopes. Embankments shall not be widened with loose materials dumped from the top. Embankments may be built by excavation and hauling equipment or by excavating and hauling equipment shall be made in horizontal layers and shall be kept as close to level as practicable. The travel over the embankments during construction shall be routed so as to distribute the compacting effect of the equipment to the best practicable advantage.

3.4.2.4 DEPOSITING

Spoil from the pits shall be deposited on bank to each section as are shown on the relevant plans specified or ordered by the Engineer-in-charge. Ramming, breaking clods and smooth surface sectioning shall not be necessary, but a spoil bank with a neat straight toe, even slopes and even top surface shall be formed as the depositing proceeds.

Embankment built by excavating machinery depositing the materials directly from the excavation shall be made in horizontal layers having a thickness of 30 (thirty) cm. Finer portions of the materials excavated shall be placed in that part of the embankment nearest to the water and coarser materials shall be placed in the outer part of the embankment.

3.4.2.5 EMBANKMENT TO BE COMPACTED

The requirements for compacted embankments shall be as specified in section 3.5. All materials shall be placed, moistured and compacted as provided in Section 3.5. The materials used for compacted embankments shall be suitable materials as determined by the Engineer-in-charge and shall be obtained from required excavation. The materials shall conform to clause 6.4 of IS 4701-1982.

Before the materials for the 1st layer of embankment is placed, the foundation of the embankment shall be prepared as provided in paragraph 3.4.1 and shall be moistured and compacted in the manner herein after specified for each layer of compacted embankment to be placed thereon. The embankments shall be compacted to the elevation and to the top widths and side slopes shown on the drawings or prescribed by the Engineer-in-charge.

The layers shall be placed in rows approximately parallel to the axis of the

bank. The base of embankment at every height is to be made to its full width of each zone as shown in the drawing plus offsets of not less than 0.45 meters beyond the finished profile on either side for compaction. No payment will be made for the off sets or for the subsequent removal, and unit price quoted for the banking is deemed to include this. No additions will be allowed to slope for the full design section of the bank after the bank is raised. The embankment shall be compacted to at least 95% proctors density using pneumatic tampers, frog rammers or vibratory plate compactor or power roller.

Where the original ground surface is below the bottom of the canal (designed bed level) and where a compacted fill below the bottom of the canal is prescribed, such fill shall be placed as compacted embankment. Where the original ground surface is below the base of structures or where sloping concrete walls or slabs extend above the original ground surface and it is practicable as determined by the Engineer-in-charge to construct the walls or slabs directly on earth foundation, without intervening forms, compacted embankments shall be constructed to lines and grades as directed to form suitable foundation for the structure of for the sloping or slabs.

3.4.3 BURROW AREA

3.4.3.1 GENERAL.

All materials required for the construction of embankment and backfill for cut-off trench and around the structures which are not available from excavation, excavation for structure or from excavation of other ancillary works shall be obtained from the designated burrow area after stripping as shown on drawing or as designated by the Engineer-in-charge in consultation with field laboratory. The depth of cut in all burrow areas shall be designated by the Engineer-in-charge and the cuts shall be made up to such designated depths only. Haphazard exploitation of burrow pits shall not be permitted. The type of equipment used and the operations in the excavation of materials in burrow area shall be such as to produce the required uniformity of the mixture of materials for the embankment. The contractor has to arrange burrow earth at his own cost and responsibility. No compensation whatsoever for change in limits and locations of the burrow areas and depth of cut for getting suitable earth shall be paid to the contractor within a distance of 5 Km of dumping place of embankments in most practical route. The burrow area shall not be designated within a distance of **five times** the height of embankment from the toe.

Burrow 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 reasonably level and even condition.

3.4.3.2 PREPARATION OF BURROW AREAS

All areas required for burrowing earth for embankment shall be cleared of all tree stumps, roots, bushes, rubbish and other objectionable materials. Adequate lighting arrangement should be provided by the contractor.

Particular care shall be taken to exclude all organic matter 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 burrow areas indicated above as this is deemed to have been included in unit bid price of earth work in the bill of quantities.

3.4.3.3 STRIPPING OF BURROW AREAS

Burrow area shall be stripped of top soil, sod and any other objectionable materials to the required depths as directed by Engineer-in-charge. The work may be done manually or with suitable machine. Stripping operations shall be limited only to the designated burrow areas. Materials from stripping shall be disposed off in exhausted burrow areas or in the approved adjacent areas as directed. No extra

payment shall be admissible for stripping the burrow areas as this is deemed to have been included in the unit bid price for earth work in the bill of quantities.

3.4.3.4 BURROW AREA WATERING/ DEWATERING

Burrow area watering shall be done by the contractor at his own cost wherever necessary preferably 48 hours in advance, so that materials may be carried with adequate moisture and in the manner specified by the Engineer-in-charge.

The initial moisture content of the materials in the burrow areas shall be estimated with the help of field laboratory tests. The optimum moisture content required for the materials in any particular burrow areas shall be obtained from the field laboratory. The additional moisture requirements as determined by the laboratory test shall be introduced into the burrow areas by watering well in advance of the excavation to ensure uniformity of moisture content. All care shall be taken to reduce excessive moisture in any of the locations of a burrow area before or during excavation to secure the materials with moisture content close to the optimum. To avoid formation of pools in the burrow areas during excavation operation, drainage ditches from burrow areas to suitable outlets shall be excavated, wherever necessary. Upon exhausting of all materials or abandoning the burrow areas, the pits shall be fully drained to ensure to ponding of water.

3.4.3.5 HAUL ROADS AND APPROACH ROADS

Construction and maintenance of approach roads, and haulage roads to quarry area and burrow area will be the responsibility of the contractor. The department will have full right of way to those roads for inspection purposes. Proper roads sign as directed have to be provided for safety. For haulage of earth, the contractor shall construct ramps and haul roads of sufficient width along the shortest but most practicable 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. When ever service roads meant for public thorough fare run through or close to the burrow area, the contractor shall direct the 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 cheek gates and road signs.

No extra payment is admissible as this is deemed to have been included in the unit bid price for earth work in the bill of quantities being contingent to the main work.

3.4.4 EARTH FILL MATREIALS

3.4.4.1 HOMOGENEOUS EARTHFILL

Dams and canal embankments shall be constructed to the top width and side slopes as shown on the drawings. Suitable excavated materials available from the canal cutting, proud cutting, removal of ramps and excavation for structures shall be used for construction of banks. If suitable and adequate materials for constructing embankment are not available from excavations, the desired materials shall be obtained from burrow area designated for the purpose as per the instruction 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 burrow earth from outside. The embankment earth shall be burrowed only after getting written instruction of the Engineer-in-charge. Only suitable materials as per specification shall be excavated, loaded and conveyed to the point of placement in the embankment. Unsuitable materials if conveyed shall be removed and disposed clear of the work site as directed by the Engineer-in-charge at the cost of the contractor.

3.4.5 PLACING EARTHFILL

3.4.5.1 LAYER THICKNESS

Construction of embankment shall begin at the toe of the fill and in no case shall embankment be widened by materials dumped from the top. The materials shall be placed in the earth fill in the continuous horizontal layers not more than 15 cm 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 shall give the required density 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, not more than 15 cm, if by sheep foot roller and not more than 30 cm, if compaction is performed by vibratory or pneumatic rollers or similar equipment. Initially the earth in the embankment fill shall be laid in a greater width than the designed section. Adequate extra width of about 0.45 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 trimmed & removed and utilized in the upper layers of embankment along with slope dressing, for which no additional payment shall be made as it is deemed to have been included in bid price of earth work in embankment in the bill of quantities.

The inside proud section shall not be removed, if the lining work is not included under the same contract. Such proud section made out of burrow earth from outside only shall be paid as per bid price of the item in the bill of quantities. No payment shall be made for compaction for such proud section left.

3.4.5.2 LAYING OF FILL

No fresh layer shall be laid until the previous layer is properly watered and compacted as per the requirement. If in the opinion for 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 bond 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 bonding surface before the next succeeding layer of earth fill materials is placed. If the rolled surface of any earth fill is found to be too wet for proper compaction of the layer of earth fill materials to be placed thereon, it shall be raked 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.

3.4.5.3 COMPACTION OF LAYERS

The materials shall be deposited in rows parallel to the axis and spread in the uniform layers and clods shall be broken to a maximum up to 5 cm. in thickness or such thickness as directed by Engineer. The work of spreading and compaction shall be so adjusted as to 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 operation shall be such that, the materials when compacted shall be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability. If the work is held up due to failure of machinery, no claim whatsoever shall be entertained even in case the machinery is supplied by Department. The surface of banking shall at all time of construction be maintained true to the required cross section.

During construction, a small transverse slope from centre towards edges should be given to avoid pools of water forming due to rains.

3.4.5.4 COMPACTION NEAR STRUCTURES

When compacting, the soil against the rock abutment or walls of masonry or concrete structures, the construction surface of the embankment shall be sloped

away from the rock or masonry or concrete structure leaving a minimum distance of 0.6 m and at an inclination of 3:1. If the foundation surface is too irregular to allow the use of large roller directly against the structure or rock out crop, the roller shall be used to compact the soil, as close to the structure or the out crop as possible and the portion of the embankment directly against the rock or the structure shall be compacted with pneumatic hand tampers in thin layers. The moisture content of the earth fill placed against the rock or the structure shall be slightly above the optimum to allow it to be compacted into all irregularities of the rock and this shall be determined by the field laboratory. In placing the earth fill under rock foundation, the foundation shall first be prepared as detailed earlier.

3.4.5.5 CARE IN LAYING FILATERS

Care shall be taken in placing the first layer of the fill above the filter layer so that no damage is caused to the filter layer by the hauling machinery. Sheep foot rollers shall not be employed for compaction over the filter, till the thickness of the layer compacted by other means is greater by 30 cm. than the teeth of the roller drum. The soil for the first layer shall be at moisture content sufficient to enable satisfactory bonding of the fill with the filter surface.

3.4.6 WEATHER CONDITIONS

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 corrosion due to rain water. No payment whatsoever shall be made for providing such protection work and rectifying the monsoon damages.

3.4.7 MOISTURE CONTROL

The water content of the earth fill materials 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 needle moisture determination of soil shall be carried out as per I.S. 2720-1983.

Laboratory investigations may impose some restriction on the lower limits of the practicable moisture contents on the basis of studies on consolidation characteristics of soil in embankment. Here in after the term, range of optimum practicable moisture content shall refer to the value as described above. As far as practicable, the materials shall be brought to proper moisture content in the burrow area before excavation. If additional moisture is required it shall be added preferably at the burrow area and only in limited cases/ extent if required, on the embankment by sprinkling water before rolling of a layer. If more moisture is present than required, the material shall be spread and allowed to dry before starting compaction. Moisture control shall be strictly adhered to. The moisture content shall be relatively uniform throughout the layer of material. If necessary, ploughing, disc harrowing or blending with other materials may have to be resorted to obtain uniform moisture distribution. If the moisture content is more or less than the range of optimum practicable moisture content or if it is not uniformly distributed throughout the layer, rolling and adding of further layer shall be stopped. Further work shall be started again only when the above conditions are satisfied.

In order to have proper control of moisture content in the earth fill, no earth work shall be done during rainy days. No compensation shall be made to the contractor due to held up of work for rain or fog.

3.4.8 MEASUREMENT AND PAYMENT

3.4.8.1 MEASUREMENT

All works shall be measured by levels. For payments, the level books, field books, the cross section sheets and calculation sheets shall be treated as adjuncts to the measurement books. All linear measurement shall be in metres, correct to 0.01m, and volume worked out in cubic meter correct up to 0.01 M^3.

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 excavation soils within the pay lines shall be worked out excluding rip-rap, rock toe and filters. It shall be clearly understood that construction of embankments to extra widths as specified in paragraph 3.4.5.1 and extra height formed for shrinkage allowance as specified in paragraph 3.5.8 will not include for payment.

The measurement for construction of consolidated embankment with the materials obtained from the burrow areas shall be the difference between the net quantities of the final compacted embankment section under OMC and net quantities of the compacted embankment constructed with the suitable materials from all excavations as specified above and in earlier paragraphs.

The final measurements and levels shall be taken at the cross sections specified in paragraph 2.8 of the completed, compacted design section after the slopes dressed to ensure that the work is completed as shown on the drawings plus the settlement allowances. The measurement for computation of quantities shall not include the extra section provided as per paragraph 3.4.5.1 and 3.5.8. The quantity of compacted earth work utilising the materials from all excavations and compacted materials utilising from the burrow area shall be worked out on the basis of cross sectional areas of the pay lines and the difference between the cross sections.

3.4.8.2 RATE FOR PAYMENT:

The rate for embankment fill under item specified in schedule of quantities shall include the entire cost for labour, materials, tools and plants, machinery, taxes, excavation, transportation and incidental operation required for carrying out and completing the item of work in accordance with the specification, drawing and as directed by Engineer-in-charge including

(i) site clearance

(ii) setting out works

(iii) cost component of construction and maintenance of cofferdam with diversion arrangements for allowing to flow the excess water in coffer dam and removal of the same after completion of the work

(iv) clearing trees, stumps and bushes, grubbing and stripping of the burrow area up to required depth and scarifying etc.

(v) marking out, providing and forming model section, look spitting, string and stacks as may be considered necessary by the Engineer-in-charge to guide the contractor in embankment construction

(vi) maintaining burrowing area free from vegetation growth, drainage arrangement and moisture control including watering

(vii) loading, conveyance from designated burrow area, unloading and spreading of suitable fill materials including re-handling

(viii) construction and maintenance of approach roads and haul roads

(ix) cutting and trimming the extra fill as specified in **paragraph 3.4.5 and dressing of the slope in paragraph 3.5.9**

(x) restricted working near site of structures

(xi) settlement allowance as per paragraph

(xii) spreading in thinner layers at required places

(xiii) removal of unsuitable materials like bushes, roots, sods, other perishable materials and pebbles etc. from the fill materials

(xiv) providing labour for testing of samples (cost of testing shall be borne by the department)

(xv) the department might review the design, if necessary, on examination of density test results and the contractor shall have no claim arising out of such a review and consequent change, if any, in the design

(xvi) all safety measures.

3.5 COMPACTING EARTH MATEIALS

3.5.1 GENERAL

Where compaction of earth materials is required, the materials shall be deposited in horizontal layers and compacted as specified in this paragraph. The excavation, placing moistening and compacting operations shall be such that, the materials will be uniformly compacted to the required density throughout the required section, and will be homogeneous, free from lenses, pockets, streaks, voids, laminations or other imperfections.

Having decided on the filling materials to be used, standard compaction test will be conducted on the materials proposed for embankment to indicate best type of equipment to be used and the moisture content at which compaction should be done, thickness of layer and number of passes etc.

The following guide lines are prescribed for compaction of different height of earth fill in canals.

3.5.1.1 EARTH FILL UP TO 5 M. HEIGHT:

When a finished reach of canal having an earth fill height up to 5 m is subjected to natural compaction by rain and own weight for two seasons or more before it carries irrigation water, no compaction is required to be done.

When it is expected to carry water just after one season, compaction by dozer track chain is to be done. However this is not necessary, if the earth fill could be subjected to profuse watering during laying of each layer.

If the canal will be used immediately for carrying irrigation water, compaction by sheep foot roller or by any approved method shall be done.

Having decided on the filling materials to be used, standard compaction test will be conducted on the materials proposed for the embankment to indicate the best type of equipment to be used and the moisture content at which the compaction would be done, thickness of the layers and number of passes etc.

3.5.1.2 EARTH FILL HEIGHT MORE THAN 5 M.

Canal reaches having earth fill height more than 5 m shall always be compacted by any approved method of compaction.

3.5.1.3 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% of the optimum moisture content. As far as possible and practicable, the moisture content of the materials should be brought to required level by watering of burrow area before excavation. If additional moisture is required, the same should be sprinkled while laying the earth fill in layers. If the moisture content is greater than required, the material shall be allowed to dry and if necessary, ploughing, blending with other materials may have to be resorted to obtain uniform moisture

distribution. In order to have proper control of moisture in earth fill, no embankment shall be constructed during rainy days.

3.5.2 COMPACTING CLAY AND SILTY MATERIALS.

Where compaction of earth materials containing appreciable amount of clay or silt is required, the compaction shall be carried out in accordance with the clause 6.6.2 of IS 4701-1982. The materials shall be deposited in horizontal layers. The thickness of each horizontal layer before compaction shall not be more than 25 cm. (Loose layer) and the layer shall be to full width of the embankment. The excavating and placing operation shall be such that the materials when compacted will be blended sufficiently to secure the highest practicable density and best impermeability and stability. If the surface of any compacted layer of earth fill is too dry or too smooth to bond properly with the layer of materials to be placed thereon, it shall be moistened and or scarified in an approved manner to provide a satisfactory bonding surface before the next succeeding layer is placed. The entire roller used on any one layer of fill shall be of the same type and same weight.

Prior to and during compaction operations, the embankment materials shall possess optimum moisture contents as required in clause 6.6.4 of IS 4701-1982. The embankment materials shall have optimum moisture content required for the purpose of compaction and this moisture content shall be fairly uniform throughout the layer. In so far as practicable the moistening of the material shall be performed at the site of excavation but such moistening shall be supplemented as required by sprinkling water at the site of compaction if necessary. If the moisture content is greater than the optimum for compaction, the compaction operations shall be delayed until such time as the materials has dried to the optimum moisture content or to the level directed by Engineer-in-charge. The moisture content of soils shall be determined in accordance with I.S 2720(Part-III) 1982.

If the moisture content is not within the limit described above, the compaction operation shall not be proceeded except with the specific approval of the Engineer-in-charge., until the materials has been wetted or allowed to dry out, as may be required to obtain optimum moisture content, and no adjustment in price will be made on account of any operations of any such operation of the contractor in wetting or drying the materials or on account of any delays occasioned thereby.

When the materials has been conditioned as herein before specified, it shall be compacted by rollers or by hand or power tampers. Where hand or power tampers are used to compact soils in confined areas such as under pipes and at the joints of bank connections with the structures, they shall be equipped with suitably shaped heads to obtain the required density.

The dry bulk density of the soil portion in compacted embankment materials shall be not less than 95% of the maximum dry bulk density at optimum moisture content obtained in accordance with I.S. 2720 (Part-VI) 1980 Indian Code of Practice for determination of moisture content, dry density relation using light compaction.

The dry density of soil in field shall be determined in accordance with I.S. 2720 (Part – XXVIII) 1974, Indian Code of Practice for determination of soil in place by sand replacement or by I.S. 2720 (Part – XXIX) 1975 Indian Code of Practice for determination of dry density of soils in place by the core cutter method.

Moisture content of soil shall be determined in accordance with I.S. 2720(Part-II) 1973Indian Code of Practice for determination of moisture content.

The optimum moisture content is the moisture content that corresponds to the laboratory maximum dry density determined in accordance with I.S: 2720 (Part – VII) 1974.

The above compaction tests will be conducted by contractor in the presence of departmental officers at his cost and the contractor shall ensure compaction, till the Engineer-in-charge or his authorized representative is satisfied that the maximum dry density at optimum moisture content is obtained and permits the laying of next

layer.

3.5.3 COMPACTING COHESIONLESS MATERIALS

Where compaction of cohesion less, free draining materials, such as sands and gravels is required, the materials shall be deposited in horizontal layers and compacted to the relative density specified below. The excavating and placing operation shall be such that the materials when compacted will be blended sufficiently to secure the best practicable degree of compaction and stability. Water shall be added to the materials as may be required to obtain the specified density by method of compaction being used.

As envisaged in clause 6.6.2.1 of IS 4701-1982 the thickness of the embankment layer shall not exceed 25 cm. (loose layer) before compaction and it should be spread over the full width of the embankment and compaction shall be done by tampers or crawler tractors or vibrating rollers. If the compaction is performed by Treads of crawler type tractor, surface vibrators or similar equipment, the thickness of the layer before compaction shall not be more than 40 cm. If compaction is performed by internal vibrators, the thickness of the layer shall not be more than the penetrating depth of the vibrator.

As envisaged in clause 6.6.3.1of I.S. 4701-1982, the relative density of the compacted materials shall not be less than 70%, when tested in accordance with I.S.2720(Part-XIV) 1983 Indian code of practice for determination of density Index (relative density)of cohesion less soils.

3.5.4 COMPACTION OF COHESIONLESS MATERIALS CONTAINING SOME CLAY AND SILT

This sub-paragraph applies only to cohesion less materials and not to cohesive materials. Cohesion-less materials containing clay and silt may not be free draining. When compaction of cohesion-less materials containing clay and silt is required, the materials shall be compacted to a dry density in accordance with either sub-paragraph below, using whichever test that result in higher dry density of the compacted materials in the placement.

Prior to and during compaction operation the materials shall posses optimum moisture content as determined in accordance with clause 6.6.4.1 of I.S. 4701-1982 and the moisture content shall be uniform throughout each layer. Provided that the moisture content is ensured as required in clause 6.6.4 of I.S. 4701-1982, the dry density of soil portion in the compacted materials shall not be less than 95% of the laboratory maximum soil dry density compacted. The field dry density shall be determined in accordance with I.S. 2720(Part-XXVIII) 1974 or IS 2720 (Part XXIX) 1975.

The relative density of the compacted materials obtained shall be not less than 70% determined in accordance with clause 6.6.3.1 of I.S. 4701-1982. The moisture content shall be maintained as per clause 6.6.4 of I.S. 4701-1982.

3.5.5 ROLLERS AND OTHER COMPACTING EQUIPMENT

As shown in Appendix C or IS 4701 – 1982 the following compacting equipment may be used for compacting the soils shown against them as detailed below.

Major Division	**Sub-group**		**Suitable type of compacting equipments.**
1. Coarse Grained Soils	1.	Well Grained Gravel, gravel and mixtures of little or no fines.	Smooth wheel roller, Diesel road rollers of 8 to 10 tones capacity, pneumatic tyred roller and vibrating smooth wheel roller.
	2.	Well graded gravel sand mixtures with excellent clay binder	Smooth wheel roller, Diesel road rollers of 8 to 10 tones capacity, pneumatic tyred roller and

			vibrating smooth wheel roller.
	3.	Uniform gravel with little or no fines.	-do-
	4.	Poorly graded gravel and gravel sand mixtures little or no fines.	-do-
	5.	Gravel with fines, silty gravel, clayey gravel poorly graded gravel sand clay mixtures.	-do-
2. Coarse Grained soils, Sand & sandy clays.	1.	Well graded sand and Gravely sands, little or no fines.	Heavy vibrating plate Frog rammer, power rammer and power roller.
	2.	Well graded sand with excellent clay binder.	-do-
	3.	Uniform sand with little or no fines.	-do-
	4.	Sands with fines silty sands, clayey sands, poorly graded sand clay mixtures.	-do-
3. Fine Grained Soils, Soil having low compressibility	1.	Silts (in organic) and very fine sands rock flour, silty or clayey fine sands with slight plasticity.	Smooth wheel roller, diesel Road Rollers of 8 to 10 tones capacity, power rollers, and pneumatic tyred roller.
	2.	Clayey silts (inorganic)	-do-
4. Soils having medium compressibility	1.	Organic silts of low plasticity	Sheep Foot Roller
	2.	Silty and sandy clays (Inorganic of medium plasticity.)	Frog rammer, power rammer
	3.	Clays (inorganic of medium plasticity)	-do-
	4.	Organic clays of medium plasticity.	-do-
5. Soils having higher compressibility	1.	Micaceous or diatomaceous fine sandy and silty soils, elastic silts.	Smooth wheel roller, diesel Road Rollers of 8 to 10 tones capacity and pneumatic tyred roller.
	2.	Clay (Inorganic)	-do-
	3.	Organic clays of high plasticity.	-do-

The compacting equipment shall confirm to relevant India specification below.

1. Smooth wheeled roller should conform to IS 5502-1969
2. Sheep Foot roller should conform to IS 4661-1968
3. Pneumatic tyred roller should conform to IS 5501-1969
4. Vibratory plate compactor should conform to IS 5889-1970

5. Vibratory roller should conform to IS 500-1970

The methods of compaction shall conform to clause 7.2.1, 7.2.2.7, 2.3 of IS 4701-1982

Unless otherwise specified compaction shall be done by mechanical compactors like standard sheep foot roller hauled by dozer or tractor. While specifications below provide that equipment of particular type and size is to be used, the use of improved compaction shall be encouraged. Tamping rollers used for compaction of earth fill shall conform to the following requirement.

A. ROLLER DRUMS:

Double drum sheep rollers shall be used for compaction. Each drum of a roller shall have an outside diameter not less than 142.25 cm. And shall not be less than 122 cm. in length. The space between two adjacent drums when on level surface shall not be less than 30 cm and not more than 38 cm. Each drum shall be free to pivot about an axis parallel to the direction of travel.

B. ROLLER WEIGHT.

The weight of the roller when fully loaded shall not be less than 7091 Kg. and the ground pressure when fully loaded shall not be less than 40 Kg/sq cm. Appropriate equipment for hauling the rollers should be used which can pull the rollers satisfactorily at a speed of 4 Km. Per hour when drums are fully loaded. The space between the tamping feet shall be kept clear of material striking the drum as the same can reduce the effectiveness of the tamping roller.

C. ROLLING.

When each layer of material has been prepared to have the proper moisture content uniformly distributed throughout the materials, it shall be compacted by passing the tampering roller. The exact number of passes for each layer to obtain specific density shall be designated by Field Laboratory tests and tests conducted on the burrowed material. The layers shall be compacted in strips overlapping not less than 0.6 m. Rolling shall commence at edges and progress towards centre longitudinally. The rollers of loaded vehicles shall travel in a direction parallel to the axis of the canal. Turns should be made carefully to ensure uniform compaction. Rollers shall always be pulled.

3.5.6 TAMPING

Roller will not be permitted to operate within one meter of concrete and masonry structures in the following locations where compaction of the earth fill materials by means of roller is impracticable or undesirable. The earth fill shall be specially compacted as specified further below:

i. Portions of the earth fill in embankment adjacent to masonry structures and embankment foundation designated on the drawing as specially compacted earth fill.
ii. Earth fills in embankment adjacent to steep abutments.
iii. Earth fills at specially designated location.

Earth fill shall be spread in layers of not more than 10 (ten) cm in thickness when loose and shall be moistened to have the required moisture content as specified. When each layer of materials has been conditioned to have the required moisture content, it shall be compacted to the specified density by special rollers, pneumatic/ hand tampers or by other approved methods. The moisture control and compaction shall be equivalent to that obtained in the earth fill actually placed in the embankment in accordance with specifications.

3.5.7 TESTING

Density tests shall be carried out after rolling to ascertain the state of compaction which should be measured in terms of dry density. Standard proctor density tests shall be carried out at regular intervals to account for variations in the

burrow area material. Not less than three tests shall be conducted to indicate variation in the standard Procter density attained in the laboratory.

In case of determination of maximum Dry/ Bulk Density viz: proctor density and optimum moisture content (OMC) are sometimes not easily feasible, particularly on the jobs of strengthening of canal sections, then these values may be assumed as have been outlined in table 2 of ***IS: 12169-1987*** *for calculating the compaction efficiency of the compacted earth fill layers in terms of the percentage of Proctor Density.*

Density tests shall be conducted from time to time at site to ascertain whether compaction is attained as specified. For every **1500 cum** of compacted earth fill, at least one field density test shall be conducted. However, minimum **four density tests** shall be made per day irrespective of quantity of earth work. In case, the tests show that the specified densities are not attained, suitable action shall be taken either by moisture correction or by additional rolling, so as to obtain the specified density which shall be checked again by taking fresh tests at the same locations. The test locations should be so chosen as to represent the whole layer under test. Each layer should be tested for proper compaction before a fresh layer is allowed over it.

The density to be attained after compaction should be at least 95% of proctor density predetermined by Laboratory tests. For strengthening of channels, compaction should be done to 95% of the proctor density. In case of non-cohesive soils the layers should be compacted to at least 65% relative density.

3.5.8 SETTLEMENT ALLOWANCE

In the mechanically compacted earth fill, settlement allowance of 2% should be provided. **In case of earth fill of canal which has not been mechanically compacted, settlement allowance at 10% should be provided & settlement allowance shall be calculated after embankments are subjected to natural compaction of one full monsoon rains. For short duration works, settlement allowance at 16% should be provided & necessary adjustments are to be made to take care of natural settlement due to rains.** Extra height should be provided taking the settlement into account. Settlement allowance at 2% should be provided after embankments are subjected to natural compaction for two or more full monsoon rains. The base width of the embankment shall not be increased to maintain the design slopes indicated in the drawings for additional heightas settlement allowance, but the following procedure shall be adopted.

Settlement allowance shall be calculated at various levels and the elevation including settlement allowance shall be derived keeping the embankment width at the designated levels unchanged. The edges of the 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.

3.5.9 SLOPE DRESSING

The slopes of a particular reach of the canal which has been completed in the manner described earlier shall be dressed neatly to the designated line and grade. Extra earth works done at sides are to be dressed and reused in the embankment.

3.5.10 MEASUREMENT AND PAYMENT

The costs of the compacting earth materials as described in this paragraph shall be paid separately in the price bid in the bill of quantities for watering and compacting earth work in dam/ canal embankment under these specifications. The unit rate of this item shall be for unit volume of earth fill watered and compacted. No extra payment shall be allowed for labourers engaged for collecting of samples for testing and rectification during compaction as may be required.

3.6 **SLOPE PROTECTION (Rip-Rap)**

3.6.1 MATER1ALS

The stone required for rip-rap shall be in accordance with clause 4.1. of I.S: 8237-1967 Indian Code of practice for protection of slopes for Reservoir embankments The stones for rip-rap 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 5.1, 5.1.1, 5.1.2, 5.1.3. and 5.2 of I.S: 8237-1976. The thickness of the stone to be used in the rip-rap shall be in accordance with clauses 6.3, 6.4 and 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, tolls, octroi duties, seignorages, quarry fees etc. on all materials and articles that he may use.

3.6.2 PLACING

The placing and laying of rip-rap with coarse gravel protection shall be, in accordance with clause 6.1, 6.2, 6.2.1 and 6.2.2 of I.S: 8237-1985 in case the rip-rap is hand placed rip-rap, and in accordance with clause 7.1, 7.2 of I.S: 8237-1976 in case the rip-rap is dumped rip-rap.

MINIMUM THICKNESS OF HAND PLACED RIP-RAP

Expected Wave Height in m	Minimum Thickness cm.
0 to 1.5	30
1.5 to 3.0	45
Larger than 3.0	60

RECOMMENDED RIP-RAP THICKNESS AND GRADATION

Range of Wave height in m	Minimum/ Average Rock size in cm	Minimum Rip-Rap thickness in cm
0 to 1.5	30	60
1.5 to 3.0	40	75
Above 3.0	70	100

3.6.3 MEASUREMENT AND PAYMENT

Measurement for payment of rip-rap or of coarse gravel protection shall be made to the outlines of nominal thickness prescribed. Payment for rip-rap and coarse gravel protection shall be made at the applicable unit price per cubic meter bid there for in the bill of quantities for rip-rap and coarse gravel protection which unit price shall include the cost of procuring or furnishing, hauling and placing the rock for rip-rap or gravel for coarse gravel protection including the rock-spalls and gravel to fill the voids in the revetment.

3.7 **FORMING DRY RUBBLE ROCK-TOE**

The dry rubble rock-toe along with filter shall be formed to the lines and grades as shown in the drawing. The forming of dry rubble rock-toe filters consists of:

a. Excavation of foundation trench 45 cm deep for laying filters and forming rock toe.
b. Laying of filters
c. Laying of graded metal filters and
d. Forming of dry rubble rock-toe.

3.7.1 MATERIALS

The filter materials should be composed of layers of fine sand, coarse sand and hard rock aggregate of thickness specified in the plan and in schedule.

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 and cleaned with water so as to get rid of all soluble impurities. The sand shall be screened and the fine and coarse sand is stacked separately which materials shall conform to the gradation specified as under.

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.

Almost all the quantities of rock chips and spalls required breaking for 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 utilise this materials to the full and the recovery cost for the material used from such spoil from canal excavation shall be fixed by the Engineer-in-charge, **which is binding on the contractor**.

The gradation of 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 particle size of 15% of base materials (15% smaller than and 85% larger than the diameter) is more than 5 times that of 15% size of the layer above.

The requirement for grading of the filters shall be established by the field laboratory on the basis of mechanical analysis of the adjacent fill material. Mechanical analysis shall be performed on samples which have been compacted. The test has to be conducted by the contractor at his cost in the presence of Departmental Engineers to be nominated by the Engineer-in-charge.

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.

Coarse Sand: At least 15% particles should be less than 2.5mm to 3mm in diameter.

Aggregate: 10mm to 75mm with at least 15% particles are less than 20mm in diameter.

3.7.2 ROCK-TOE

The rock fill at the down stream toe of the bank shall be constructed to the finished lines and grades shown in the drawing. The stones used shall consist of sound, dense and durable rocks and shall be reasonably well graded.

The rock fill shall be placed in layers not exceeding 0.30 meter thickness at a time. The large rock fragments shall be placed in 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 of the outer faces, should be 300 mm 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 that wedged with small stones so as to allow free drainage of the embankment. Profile of strings and pegs should be used to ensure that rock-toe is done true straight and conform neatly to the designed slopes throughout.

3.7.3 SLOPE AND BED FILTER TO ROCK-TOE

Slope and bed filter should be laid for the rock toe consisting of filter materials of specified thickness and types shown in the drawings. The specification of the materials mentioned shall be the same as given in paragraph 3.7.1 above. The

thickness of the various types of filter materials shall be specified in the plans.

3.7.4 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 all materials and labour involved in all the operations specified for formation of filters.

3.7.5 ROUGH STONE DRY PACKING FOR APRONS AND REVETMENTS

3.7.5.1 The bed or slopes to receive the packing shall first be prepared 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 of the agreement. But if the work involved in such subsidiary item is very little, no separate provision need to be 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 shall be specified in a separate schedule item.

3.7.5.2 The size of the stone to be used for dry stone revetment should be of 225 mm. to 300 mm. thick or as specified.

3.7.5.3 The stone shall be perfectly sound, as regular in shape as possible, free from cracks and decay and with their length equal to the thickness of the required apron or revetments and each stone shall not be less in size than **0.03** cubic meters unless other wise specified or order by the Engineer-in-charge. Having regard to the nature of the stone along quarried, the smaller size stones required for filling in interstices and wedging shall only be supplied to the actual requirements for the work as defined in hereunder and shall not be used in two or three layers as a substitute for the full thickness stone specified in following clauses. The stone shall be obtained from the approved quarry.

3.7.5.4 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 stone 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 ie perpendicular to the slope for revetments.

3.7.5.5 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 filing shall be carried 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 sized 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.

3.7.5.6 Profiles of strings and pegs are to be put up to ensure that the pitching is done true straight and to proper slope throughout and revetment are in all cases to be built up from the foot of the bund. Care is necessary that, a strong toe wall or other protection is always given to the revetment, of which protective measures shall be shown on the plans.

3.7.5.7 On the completion, the surfaces presented by the aprons or revetments shall be even throughout, free from irregularities to the required length, breadth and slope as specified in the plans.

3.7.5.8 MEASUREMENT AND PAYMENT

Measurement and payment for rough stone dry packing for aprons and revetments will 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 all materials and labour involved in all the operations specified for rough stone dry packing.

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SECTION - 4
CONCRETE WORKS

4.0 CONCRETE STRUCUTRES

Concrete in structures shall conform to the requirements of paragraphs 4.1.1.

4.1 CONSTRUCTION OF STRUCTURES

The item of the schedule for concrete in the structures includes all cast-in-place concrete in the structure. Concrete to be Cast-in-place for all the structures shall conform to the requirement of section 4.2 below. Pipe and fitting of miscellaneous metalwork, mechanical and electrical equipment and other items forming a part of the structures are provided for elsewhere in these specifications.

The structures shall be built to the lines, grades, and dimensions shown on the drawings. The dimensions of each structure as shown on the drawings will be subject to such modifications as may be found necessary by the Engineer-in-charge to adapt the structure to the conditions disclosed by the excavation or to meet other condition. Where the thickness of any portion of a concrete structure is variable, it shall vary uniformly between the dimensions shown.

Where necessary, the contractor shall be furnished with additional detail drawings of the structures to be constructed as determined by the Engineer-in-charge. The contractor will not be entitled to any additional allowances above the price bid in the bill of quantities by reason of the dimensions fixed by the Engineer-in-charge or by reasons of any modifications or extension of a minor character to adopt a structure at site.

The cost of furnishing of all materials and performing all work for installing timber, metal and other accessories for which specific price are not provided in the schedule, shall be included in the applicable prices bid in the schedule for the work to which such items are appurtenant.

4.2 GENERAL CONCRETE REQUIREMENTS

4.2.1 COMPOSITION

Concrete shall be composed of cement, sand, coarse aggregate, water, admixtures (if any) as specified and all will be mixed in batching plant by weight or by concrete mixers by volume and brought to the proper consistency. Batching plant shall conform to IS: Code 4925-1968.

For works in which water tightness is required the specification in IS: 3370-1965 Para 1 to 10 shall be adopted.

4.2.1.1 MIXING:

Concrete shall be mixed in a mechanical mixer and shall be as dense as possible, plastic enough to consolidate, well and stiff enough to stay in place on the slopes.

Mixing shall be continued until there is a uniform mixing of the materials and the concrete is uniform in colour and consistency. The time of mixing shall be as shown in table-1 of IS 457-1957 reproduced below.

Capacity of Mixer	**Minimum time for Mixing**	
	Natural Aggregates	**Manufactured Aggregates.**
All mixers	2 minutes	2-1/2 minutes.

4.2.1.2 NOMINAL MAXIMUM SIZE OF AGGREGATES:

Sizes of aggregates shall conform to IS: 383-1970. The coarse aggregates to be used in concrete shall be as large as practicable, consistent with required strength, spacing of reinforcement and embedded items and placement thickness. The size of the coarse aggregates to be used will be determined by the Engineer-in-charge and may vary incrementally according to the conditions encountered in each concrete placement. Nominal maximum size of aggregates for concrete in structures and canal lining shall be as indicated in the relevant drawings appended to the contract documents. When proper placement of concrete is impracticable with the size of the aggregate specified in the drawings, smaller coarse aggregates than specified shall be used as per the opinion of the Engineer-in-charge.

4.2.1.3 MIX PROPROTIONS:

The proportions of various ingredients to be used in the concrete for different items of the work are given in the bill of quantities. In proportioning concrete, the quantity of both cement and aggregate should be determined by volume. Water shall be either measured by volume in calibrated tanks or weighed. Batching plant shall conform to IS: 4925-1968 (Indian Standard Specification for batching and mixing plant). All measuring equipments shall be maintained in a clean serviceable condition and their accuracy periodically checked. Adjustment shall be made as directed to obtain concrete having suitable workability, impermeability, density, strength and durability without the use of excessive cement. The acceptance or rejection of concrete shall be as per the acceptance criteria laid down in clause-16 of IS: 456-2000.

The water cement ratio exclusive of water absorbed by the aggregate shall be sufficiently low to provide adequate durability in concrete. The water cement ratio of various grades of concrete shall be as determined and ordered by the Engineer-in-charge. Admixture of Pozzolana, if ordered, shall conform to the requirements specified in IS: 9103-1979 (Indian Standard Specification for Admixtures for concrete).

4.2.1.4 CONSISTENCIES:

The slump of concrete at the placement shall be as follows:

Sl. No.	**Place condition**	**Degree of workability**	**Value of workability.**
1.	Concreting of light reinforced sections without vibration or heavily reinforced section with vibrations.	Medium	25mm to 75mm slump for 20 mm aggregate.
2.	Plain concrete work	-do-	-do-
3.	Lining with slip form machine for concrete paver finish	-do-	60 to 70 mm slump

If the specified slump is exceeded at the placement, the concrete is unacceptable. The Engineer-in-charge reserves the right to require lesser slump whenever concrete of such lesser slump can be consolidated readily into place by means of vibration specified by the Engineer-in-charge. The use of equipment, which will not readily handle and place concrete of the specified slump will not be permitted.

To maintain concrete at proper consistency, the amount of water and sand batched for concrete shall be adjusted to compensate for any variation in the moisture content or grading of the aggregates as they enter the mixer. Addition of water to compensate for stiffening of the concrete after mixing and before placing will not be permitted. Uniformity in concrete consistency from batch to batch will be required.

4.2.2 CONCRETE QUALITY CONTROL MEASURES AND QUALITY ASSURANCE TESTS

4.2.2.1 CONCRETE QUALITY CONTROL MEASURES

a. The contractor shall be responsible for providing quality concrete to ensure compliance of the contract requirements.
b. Making and cutting concrete test specimens in the field will conform to IS 516-1959
c. Capping cylindrical concrete specimens will conform to IS 516-1959
d. Compressive strength of concrete specimens will conform to IS 516-1959.

4.2.2.2 SAMPLING PROCEDURE AND FREQUENCY

a. A random sampling procedure shall be adopted to ensure that each concrete batch has a reasonable chance 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 frequency of sampling of concrete of each grade shall be in accordance with the following-

Quantity of concrete in cum	**Number of samples.**
1 to 5	1
6 to 15	2
16 to 30	3
31 to 50	4
51 and above.	4 plus one additional sample for every 50 cum or part thereof.

Note: At least one sample shall be taken during each shift.

4.2.2.3 TEST FACILITIES

The contractor should supply in free of cost, the samples of all the ingredients of concrete used in the work for the test to be conducted by the Engineer-in-charge or any officer nominated by him.

4.2.2.4 CONTRACTOR TO FURNISH DRAWINGS AND DATA

Not less than 30 days prior to start of installation of the contractor's plant and equipment for processing, handling, transporting, storing and proportioning concrete, the contractor shall submit its drawings and data to the Engineer-in-charge for approval, showing the arrangement of plant etc. The drawing and data shall provide a description in sufficient details for an adequate review of the facilities and equipment the contractor proposes to provide at site of work.

4.2.3 CEMENT

4.2.3.1 GENERAL

Cement shall conform to clause 5.1 to 5.1.3 of IS 456-2000 for the purpose of specifications. Cement used shall be any of the following with the prior approval of the Engineer-in-charge.

a. 33 grade Ordinary or low heat Portland cement conforming to IS: 269-1989
b. Rapid hardening Portland cement conforming to IS: 8041-1990
c. Portland slag cement conforming to IS: 455-1989
d. Portland Pozzolana cement conforming to IS: 1489-1991
e. 43 grade ordinary Portland cement conforming to IS: 8112-1989
f. Hydrophobic cement conforming to IS: 8043-1991
g. 53 grade Ordinary Portland cement conforming to IS: 12269-1987

The provisions of this paragraph apply to cement for use in cast in place concrete required under these specifications. Portland cement required for items such as concrete pipes, pre-cast concrete structural members and other pre-cast concrete products for grout and mortar and for other items provided for, under appropriate paragraph of these specifications covering items for which such Portland cement is required.

The contractor shall make his own arrangements for the procurement of cement to required specifications required for the work. Transportation from the place of supply to the batching plant shall be in weather-tight rail cars, trucks, conveyors and other means, which will protect the cement completely from exposure to moisture. Immediately upon receipt at the jobsite, bulk cement shall be stored in dry, weather tight, properly ventilated bins until the cement is batched. The bins shall be emptied and cleaned by the contractor when so directed by the Engineer-in-charge. However, the intervals between required cleaning will normally be not less than 6 months. Each shipment of bagged cement shall be stored separately so that it may readily be distinguished from other shipment and shall be stored in a dry enclosed area protected from moisture. Storage of materials shall be as described in IS: 4082-1996 (IS recommendation on staking and storage of construction materials at site). To prevent under-aging of bagged cement after delivery, the contractor shall use bags of cement in the chronological order in which they were delivered to the job site. All storage facilities shall be subject to approval of the Engineer-in-charge.

4.2.3.2 ACCEPTANCE OF CEMENT.

Cement shall be supplied by the contractor according to clause 10.1 of IS: 269-1989.

4.2.3.3 ACCEPTANCE OF POZZOLANA:

Pozzolana added to the concrete as an admixture shall be sampled and tested as per IS: 9103-1999.

4.2.3.4 RECOVERY OF COST OF CEMENT IN WASTED CONCRETE ETC:

The cost of cement used in wasted concrete in replacement of damaged or defective concrete and extra concrete required because of over excavation and in concrete placed by the contractor in excavations intentionally performed to facilitate the contractor's operation shall be borne by the contractor himself. No extra payment shall be made to the contractor for such additional quantity.

4.2.4 ADMIXTURES

The contractor shall use air-entraining admixtures as directed by the Engineer-in-charge. Admixtures shall be of uniform consistency and quality and shall be maintained at the job site at uniform strength of solution. Admixtures shall be batched separately in liquid form in containers capable of measuring at one time the full quantity of each admixture required for each batch. Chemical admixtures, which harm the quality and strength of concrete, shall not be used in the concrete.

4.2.5 WATER

The water used in making and curing of concrete mortar and grout shall be free from objectionable quantities of silt, organic matter, injurious amounts of oils, acids, salts and other impurities etc. as per IS specification 456-2000.

The Engineer-in-charge will determine whether such quantities of impurities are objectionable. Such determination will unusually be made by comparison of compressive strength, water requirement, time of set and other properties of concrete made with distilled or very clean water and concrete made with the water proposed for use. Permissible limits for solids when tested in accordance with IS: 3025-1964 shall be as tabulated below:

4.2.5.1 PERMISSIBLE LIMITS FOR SOLIDS IN WATER

1. Organic solids :Maximum permissible limit 200 mg/l.
2. Inorganic solids :300 mg/l.
3. Sulphate (as SO_4) :500 mg/l.
4. Chlorides (as Cl) :2000 mg/l for plain concrete work and 1000 mg/l for RCC work.
5. Suspended matter :2000 mg/l.

The pH value of water shall generally be not less than 6 (six).

If any water to be used in concrete mortar or grout is suspected by the Engineer-in-charge of exceeding the permissible limits for solids, samples of water shall be obtained and tested by the Engineer-in-charge in accordance with IS: 3025-1964.

4.2.6 SAND (FINE AGGREGATE)

4.2.6.1 GENERAL

The term sand is used to designate aggregate most of which passes 4.75 mm IS Sieve and contains only so much coarser material as permitted in clause 4.3 of IS: 383-1970. Sand shall be predominantly natural which may be supplemented with crushed sand to make up deficiencies in the natural sand grading.

All sand shall be procured by the contractor from approved sources. Sand as delivered to the batching plant shall have uniform and stable moisture content. Determination of moisture content shall be made as frequently as possible; the frequency for a given job being determined by the Engineer-in-charge according to weather conditions following IS: 456-2000.

4.2.6.2 QUALITY:

The sand shall be clean, dense, durable, uncoated rock fragments as per IS: 383-1979. Sand may be rejected if it fails to meet any of the following quality requirements:

FINENESS: The fineness modulus of sand shall be between 2.20 to 3.20.

ORGANIC IMPURITIES IN SAND:

Colour, no darker than the specified standard in clause 6.2.2.of IS: 2386 Part II 1963 (Indian Standard method of test for aggregates of concrete Part II estimation of deleterious materials and organic impurities)

Sand shall be screened before use. If sand brought to site is not clean, it must be washed clean in water. Fine draft sand or sea sand or sand containing saline impurities shall on no account to be used.

SODIUM SULPHATE TESTS FOR SOUNDNESS:

The sand to be used shall pass Sodium or Magnesium Sulphate accelerated test as specified in IS: 2386(Part-V) 1963 for limiting loss on weight.

SPECIFIC GRAVITY:

The sand to be used shall have minimum specific gravity of 2.4

DELETERIOUS SUBSTANCE:

The amount of deleterious substances in sand shall not exceed maximum permissible limits prescribed in table-1, clause 3.2.1 of IS: 383-1970 (Indian Standard Specification for coarse and fine aggregates form natural source for concrete) when tested in accordance with IS: 2386-1963.

4.2.6.3 GRADING

The sand as batched shall be well graded and when tested by means of standard sieves, shall conform to the limits given in table-4 of IS: 383-1970 and shall be described as fine aggregates, Grading zones, I, II, III and IV. Sand complying with

the requirements of any of the four grading zones is suitable for concrete. However, sand conforming to the requirements of grading zone IV shall not be used for **reinforced cement concrete** work.

Sieve analysis of natural sand shall conform to the following limits of gradation.

I.S. Sieve size	Percentage of passing on Sieve		
	Grading Zone-I	Grading Zone-II	Grading Zone-III
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 micron	15-34	35-59	60-79
300 micron	5-20	8-30	12-40
150 micron	0-10	0-10	0-10

It is recommended that the sand conforming to grading zone-I to III is suitable for use.

4.2.7 COARSE AGGREGATES:

4.2.7.1 GENERAL

For the purposes of these specifications, the term “Coarse Aggregate” designate clean well graded aggregates, most of which is retained on 4.75 mm. I.S: Sieve and containing only so much finer materials as permitted for various types described under clause 2.2. of IS: 383-1970. Coarse Aggregate for concrete shall consist of uncrushed stone, or crushed stone and partially uncrushed and crushed stone.

Coarse Aggregates for concrete shall be procured by the Contractor from the approved quarries. The contractor shall, unless otherwise specified in the tender notice and subsequently on this basis in the contract, be responsible for payment of seignorages, quarry fees etc. on all materials.

Coarse aggregates as delivered to the batching plant shall generally have uniform and stable moisture content. In case of variations, clause 9.2.3 of IS 456-2000 shall govern during batching.

4.2.7.2 QUALITY

The coarse aggregate shall consist of naturally occurring (crushed or uncrushed) stones, and shall be hard, strong, durable, clear and free from veins and adherent coating, and free from injurious amounts of disintegrated pieces, alkali, vegetable matter and other deleterious materials. Coarse aggregate not conforming to any of the following requirements, shall be rejected.

LOS ANGLES ABRASION TEST

The abrasion value of aggregates when tested in accordance with the method specified in IS: 2386 (Part IV)-1963 using Los Angles machine, shall not exceed 30% for aggregates to be used in concrete for wearing surface and 50% for aggregates to be used in other concrete.

AGGREGATE CRUSHING STRENGTH TEST

Aggregates crushing value, when determined in accordance with IS: 2386 (Part IV)-1963 shall not exceed 45% for aggregates used for concrete other than wearing surface and 30% for wearing surfaces. As an alternative to the crushing strength test of aggregates, impact value shall be found out with the method specified in IS: 2386 (Part IV)-1963. The aggregates impact value shall not exceed 45% by weight for aggregates used for concrete for other than wearing surfaces and 30% by weight for concrete for wearing surface such as runways roads and pavements.

SOUNDNESS TEST

The coarse aggregates to be used for all concrete works shall pass a Sodium or Magnesium Sulphate accelerated soundness test specified in IS: 2386 (Part V)-1963 and the average loss of weight after 5-cycles shall not exceed the limits specified in clause 3.6 of IS: 383-1970.

SPECIFIC GRAVITY

The coarse aggregates shall have specific gravity of 2.60 minimum.

DELETORIOUS MATERIALS

The maximum quantity of deleterious materials in coarse aggregates shall not exceed the limits specified in Table of I.S: 383-1970 when tested in accordance with IS: 2386-1963.

4.2.7.3 SEPARATION

The coarse aggregates shall be separated into nominal sizes during production of the aggregates. Just prior to batching, the coarse aggregates shall be re-washed by pressure spray and finish screened on multi-desk vibrating screen capable of simultaneously removing undersized and over sized aggregate from each of the nominal aggregate. Aggregates entering the batches occur during intermittent batching then a dewatering screen will be required after the finish screens to remove the excess free moisture. Finish screens shall be mounted over the batching plant or on the ground adjacent to the batching plant. Finish screens shall be so mounted that, the vibration of the screen will not be transmitted to the batching bins or scales and will not affect the accuracy of the weighing equipment in any other manner.

The method and rate of feed for finish screening shall be such that, the screens are not over-loaded and result in a finished product, which meets the grading requirements of these specifications. Coarse aggregate shall be fed to the finish screens in a combination of alternations of nominal sizes, which will not cause noticeable accumulation of poorly graded coarse aggregates in any bin. The finish-screened aggregates shall pass directly to the individual batching bin in such a manner as to minimize breakage. Below 2.36 mm. materials passing through the finish screens shall be wasted unless it is routed back through a sand classifier in a manner, which causes uniform blending with the natural sand being processed. Water from finish screening shall be drained in such a manner as to prevent aggregate wash water from entering the batching bins and weighing hoppers washing and finish screening requirements shall be subject to approval by the Engineer-in-charge.

Coarse aggregates for concrete shall be separated into various nominal maximum sizes specified in the relevant paragraph. Separation of the coarse aggregate into the specified sizes after finish screening shall conform to the grading requirements specified in Table-2 of IS 383-1970 when tested in accordance with IS: 2386 (Part II)-1963 (Method of test for aggregates for concrete part I) particles size and shape.

Coarse aggregate for mass concrete may be separated as previously herein specified. Separation of the coarse aggregates into the various sizes shall be such that when tested in accordance with IS 2386 (Part I) 1963 shall conform to the requirements specified in Table 3 of IS 383 – 1970.

Sieves used in grading tests shall be standard mesh sieves conforming to IS 460 (Part I) 1978 (specification for test sieves part I wire cloth test sieves)

4.2.8 PRODUCTION OF SAND AND COARSE AGGREGATE

4.2.8.1 GENERAL

Sand and coarse aggregate for concrete and sand for mortar and grout shall be obtained by the contractor from the approved sources. The approval of deposits by

the Engineer-in-charge shall not be construed as consisting of the approval of all or any specified materials taken from the deposits and the contractor will be responsible for the specified quality for all such materials used in the work.

Tests performed on samples of sand and coarse aggregate obtained from the approved sources mentioned in the contract documents indicates that they are generally suitable. Well in advance of their usage on the works, the contractor shall have his own testing of materials and satisfy himself that they conform to the specification mentioned here in for use in the works.

No separate payment will be made for such tests. If sand and coarse aggregate are to be obtained from a deposit not previously tested and approved by the Engineer-in-charge, the contractor shall submit representative samples for pre-construction test and approval not less than 60 days before the sand and coarse aggregates are required for use. Each sample shall approximately consist of 100 Kg. of material. In addition to pre-construction tests for the approval of deposits, the Engineer-in-charge may test the aggregates for their suitability during their processing. The contractor shall provide such facilities as may be necessary for procuring representative samples free of cost at the aggregate processing plant and at the batch plant or mixing platform.

However, use and development of any such deposit shall be subject to the approval by the Engineer-in-charge. Any royalties (seignorages or other charges) required for the materials taken from deposits either owned by the State Government or controlled by the Department of Mines and Geology, Govt. of India or owned by any other person shall be paid by the contractor.

4.2.8.2 DEVELOPING AGGREGATE DEPOSITS

If the deposit is owned by the State Govt. and controlled by the department of Mines and Geology, the portion of the deposit used shall be located and operated so as not to detract the usefulness of the deposit or any other property of the Government and so as to preserve, in so far as practicable, the future usefulness or value of the deposit. The contractor shall carefully clear the area of deposit from which the aggregates are to be produced, free from trees, roots, bushes, sods, solid unsuitable sand, gravel and other objectionable matter. Materials including stripping, removed from deposits owned by the Government, controlled by the Director of Mines and Geology, Government of India, and not used in the work covered by these specifications shall be disposed-off as directed.

Due to the overall construction programme, it is quite likely that more than one contractor may elect to use of the sources named in the contract document. The contractor shall be responsible for coordinating his work such that it does not interfere with the operations of other contractors who are also using any given source.

4.2.8.3 PROCESSING RAW MATERIALS

Processing of the raw materials shall include screening and washing as necessary to produce sand and coarse aggregate conforming to the requirements of paragraph 4.2.6 and 4.2.7. Processing of aggregate produced from any source owned by the State Government and controlled by the Department of Mines and Geology shall be done at an approved site. Water used for washing aggregate shall be free from objectionable quantities of salts, organic matter and other impurities. Oversize metal may be crushed to correct aggregate particle size and excess material in individual coarse aggregate size fractions may be crushed to give the largest practical yield of usable concrete aggregate.

Suitable types of crushers shall be used with the prior approval of the Engineer-in-charge for producing coarse aggregates. Crusher fines produced in the manufacture of coarse aggregates may be used in sand. Crushed stone, sand, crushed gravels and crusher fines if used shall be predominantly cubical in shape and shall be blended uniformly with natural sand by routing them together through

sand classifier. Crusher coarse aggregate shall be blended uniformly with natural coarse aggregate by routing both together through the classifying screens.

In the process of developing and producing aggregates from approved sources for work under these specifications, **the provisions of environmental quality protection shall apply**.

4.2.8.4 COST

This shall be included in the applicable price bid in the schedule for concrete, filter and other works in which the aggregates are used of which prices shall include the cost for stripping, producing and transporting & storing the materials. The contractor shall not be entitled to any additional compensation for materials wasted from a deposit including crushed fines and materials, which have been discarded by the reasons of being above the maximum size specified for use or for any other reasons.

4.2.9 BATCHING

The contractor shall notify the Engineer-in-charge 24 hours before batching of concrete. Unless inspection is waived in each case, batching shall be performed only in the presence of an Engineer authorized by Engineer-in-charge.

The contractor shall provide, maintain, and operate the equipment as required to accurately determine and control the prescribed amounts of the various materials entering the concrete mixtures. The quantities of cement, sand and each size of coarse aggregate entering each batch of concrete shall be determined by individual volume measurement or by weight as the case may be. Cement has to be weighed/ measured in volume separately from the aggregates. Sand and coarse aggregates may be weighed with separate scale and hoppers.

The grading of aggregates shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions, the different sizes being stacked in separate stock piles, the materials shall be stock piled a day before use. The grading of coarse and fine aggregates will be checked as frequently as directed by the Engineer-in-charge. Water shall be added by weight or measured by volume in calibrated tanks. The amount of added water shall be adjusted to compensate for any observed variations in the moisture contents. Determinations of moisture content in the aggregate shall be in accordance with IS: 2386 (Part III) 1963 (Indian Standard Method of test for aggregate of concrete Part III). The amount of surface water carried by aggregates will be determined in accordance with Table-5 of IS: 456-2000.

Cement and aggregates are hauled from a central batching plant to the mixer. Each batch shall be protected during transit to prevent loss and to limit the pre-hydration of cement. Separate compartments with suitable covers shall be provided to protect the cements or they shall be completely enfolded in and covered by the aggregates to prevent wind loss. If cement are enfolded in moist aggregates or otherwise exposed to moisture and delay occurs between batching and the mixing, then extra cement shall be added to each batch. The extent of such extra cement will be to attain the required quality. **No separate payment** for this addition of extra cement shall be made.

4.2.10 MIXING

4.2.10.1 GENERAL

The concrete ingredients shall be thoroughly mixed in mechanical mixers designed to positively ensure uniform distribution of all the component materials throughout the concrete at the end of the mixing period. Mixing shall be done as per clause-9 of IS: 456-2000. The mixer should comply with IS: 1971-1985 (IS Specifications for batch type concrete mixers)

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: 1199-1959. Mixer shall be examined regularly by the Engineer-in-

charge or his authorized Engineer for changes in conditions due to accumulation of hardened concrete or mortar or to wear of blades. The mixing shall be continued until there is a uniform in colour and consistency and to the satisfaction of the Engineer-in-charge. If there is, aggregation after unloading, the concrete should then be remixed.

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 capacity shall be at least 10% of but not in excess of the rate capacity of the mixer unless otherwise authorized by the Engineer-in-charge.

4.2.10.2CENTRAL MIXERS

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 the time specified by the Engineer-in-charge. The minimum mixing time shall be 2 minutes. The minimum mixing time specified is based on average mixer performance. The Engineer-in-charge will adjust the minimum mixing time as required by the observations of the mix delivered from mixer. Excessive over mixing which require addition of water to maintain the required concrete consistency shall not be permitted.

In addition to IS: 1791-1985, the mixing equipment shall conform to the following further requirements.

1. Plant configuration shall be such that the mixing of each mixer can be observed from the safe location, which can be easily reached from the control station. Provisions shall be made so that the operator can observe the concrete in the receiving hopper or bucket as it is being dumped from the mixers.
2. Each mixer shall be controlled with timing device, which will indicate the mixing period and assure compliance of required period of mixing.
3. The batch plant shall be equipped with an interlocking mechanism, which will prevent concrete batches from entering mixers, which are not empty.

4.2.10.3TRUCK MIXERS

Each truck mixer shall be equipped with accurate water meter located between the supply tank and mixers with a dial or digital indicator and a reliable revolution counter, located near the water meter, which can be readily reset to Zero for indicating the total number of revolutions of the drum for each batch. Each mixer shall have affixed there to a metal plate on which the drum operations in terms of volume for both mining and agitating and the maximum and minimum speeds of rotation of the drum are mainly marked.

Mixing shall be continued for the minimum period specified and may be increased and number of revolutions, speed of the drum may be such that the mixture as delivered from the mixer has uniform colour and consistency to the satisfaction of Engineer-in-charge. In no case shall the design water content be exceeded.

Concrete shall be discharged within half an hour after the introduction of the water and cement into the mixer. Each batch of concrete when delivered at the job site from commercial ready mix plants shall be accompanied by a written certificate of batch weights and time of batching.

4.2.11 TEMPERATURE OF CONCRETE

Fresh structural concrete and fresh canal lining concrete shall be placed at temperature of 15^0 C to 30^0 C. During hot or cold weather the concreting should be done as per the procedure set in IS: 7861 (Part I) 1975 or IS: 7861 (Part II).

The temperature will be determined by placing a thermometer in the concrete immediately after sampling at the site of placement. The temperature of concrete at the batch plant shall be adjusted to assure that the specified concrete temperature is

attained at the placement.

In case of concrete in hot weather condition, the contractor shall employ effective means such as pre-cooling of aggregates and mixing water and placing at nights as necessary to maintain the temperature of the concrete as it is placed at the specified limit. The methods of pre-cooling shall be subject to approval by the Engineer-in-charge.

Then contractor shall not be entitled for any additional compensation due to the foregoing requirements.

4.2.12 FORMS

4.2.12.1 GENERAL

Form shall be used wherever necessary to confine the concrete and shaping it to the required lines. If a type of form does not consistently perform in an acceptable manner as determined by the Engineer-in-charge, the type of form shall be changed and method of erection shall be modified by the contractor subject to approval of the Engineer-in-charge.

Plumb and string lines shall be installed before and maintained during concrete placement. Such lines shall be used by the contractor's personnel and by the Engineer-in-charge and shall be in sufficient number and properly installed as determined by the Engineer-in-charge. During concrete placement, the contractor shall continuously monitor plumb and string lines, form positions and immediately correct the deficiencies.

Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall be maintained rigidly in position. Where form vibrators are to be used, forms shall be sufficiently rigid to effectively transmit energy from the form vibrators to the concrete while not damaging or altering the positions of forms. Forms shall be sufficiently tight to prevent of loss of mortar from the concrete. Chamfer strips shall be placed to produce bevelled edges on permanently exposed concrete surfaces. Interior angle intersecting concrete surfaces and edges of construction joints shall not be bevelled except where indicated on the drawings.

Suitable struts, stiffeners, or ties shall be used for the formwork wherever necessary. All supports shall be braced and cross-braced into two directions. All splices and braces shall be secured by bolting unless specially intended otherwise. All struts shall be firmly supported against settlement and slipping, by suitable means as directed. All supports shall be cut square at both ends and firmly supported against settlement and slipping. When the formwork is supported on soil, sleepers etc. shall be used to properly disperse the loads. In case the supports rest on already completed beam or slab suitable props shall be provided under the latter.

The formwork shall be of well-seasoned timber or steel. When timber forms are used, they shall be lined with MS sheet or other suitable smooth faced non-absorbent materials as specified. Supports may be of timber of steel. Suitable wedges in pairs to facilitate adjustment and subsequent releasing of forms shall be provided preferably at the upper end of the supports. The details of the proposed formwork and supports shall be submitted to the Engineer-in-charge and shall be approved before erection.

In case of columns, retaining walls or deep vertical component, the height of the column shall facilitate the placement and compaction of concrete and suitable arrangement may be made for securing the forms to the already poured concrete for placing the subsequent lifts. No steel tie or wires used for securing this formwork shall be left exposed-off the face of the finished work.

Suitable inserts for block-outs for electrical and other service fixtures where necessary shall be provided in the required locations as specified. At the time the concrete is placed in forms, the surfaces of the forms shall be free from encrustations of mortar grout or other foreign material. Before concrete is placed, the surface of the forms shall be oiled with commercial forms of oil.

4.2.12.2 REMOVAL OF FORMS

The stripping of form*work* shall conform to clause-11.3 of IS: 456-2000. The contractor shall be liable for damage and injury caused by removing forms before the concrete has gained sufficient strength. Forms on sloping faces of concrete, such as forms on the watersides of wrapped transitions shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or treatment required on such slopping surfaces shall be performed at once and be followed immediately by permitted curing.

To avoid incessant appearance in concrete that might result from swelling of forms, wood forms for wall openings, shall be loosened as soon as the loosening can be accomplished without damages to the concrete. Forms for the opening shall be constructed as to facilitate such loosening. Forms shall be removed with care so as to avoid injury to concrete and any concrete so damaged shall be repaired in accordance with paragraph 6.2.21.

4.2.12.3 COST

The cost of furnishing all materials and performing all works for constructing forms including any necessary treatment or coating of forms is included in the price bid of item of form work provided in the bill of quantities.

4.2.13 TOLERANCES FOR CONCRETE CONSTRUCTION

4.2.13.1 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 4.2.13.2 below.

The intent of this paragraph is to establish tolerances that are consistent with modern construction practice that is governed by the effect that, permissible variations may have upon a structure. The Govt. reserves the right to diminish the tolerances set forth therein if such tolerances impair the structural 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 the 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 is not specified for particular structure, tolerances shall be those specified for a similar work. As an exception to clause-2 of the general provisions, specific tolerance shown here in connection with any dimension shall govern. The contractor shall be responsible for finishing the concrete forms within the limit necessary to ensure that the completed work will be within the tolerance limit specified. The defective work where the tolerance limit is exceeded shall be remedied in accordance with the sub-paragraph 4.2.13.2 and 4.2.13.3 as below.

4.2.13.2 VARIATION FROM SPECIFIED LINES, GRADES AND DIMENSIONS

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 as specified 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 or minus variations shown as indicated or permitted from actual position up or down and in or out from the specified position in plan. Variations not designated as plus or minus indicate the minimum deviation permitted between designated successive points on the completed element of construction.

Specified position in plan is defined as the lines, grade and dimensions

described in those specifications or shown on the drawings or as otherwise prescribed by the Engineer-in-charge.

4.2.13.3 TOLERANCE FOR CANAL EXCAVATIONS

1. Departure from Established alignment **:** ± 20 mm to on straight sections.
   ± 50 mm on tangent sections.
   ± 100 mm on curves.
2. Departure from Established Grade **:** ± 20 mm

4.2.13.4 TOLERANCE FOR CANAL LINING

1. Departure from Established alignment **:** ± 20 mm to on straight sections.
   ± 50 mm on partial curves and tangents

4.2.13.5 TOLERANCE FOR CANAL STRUCTURES

1. Deviations from specified dimensions of cross section of columns, beams, piers and slabs **:** (-) 6 mm to (+) 12mm
2. Deviations from dimensions of footing :

   a. Dimensions in plan **:** (-) 12mm to (+) 50 mm

   b. Eccentricity **:** ± 0.02 times width of footing in the direction of deviation but not more than 50mm

   c. Thickness **:** ± 0.05 times the specified thickness

Note: Tolerance applies to concrete dimensions only but not for positioning of vertical reinforcing bars or dowels.

4.2.13.6CONCRETE SURFACE IRREGULARITIES

GENERAL

Bulges, depressions and offsets are defined as concrete surface irregularities. Concrete surface irregularities are classified as “abrupt” or “gradual” and are measured relative to the actual concrete surface.

ABRUPT SURFACE IRREGULARITIES

Abrupt surface irregularities are defined herein as offsets such as those caused by misplaced or loose forms, loose knots in form of Lumber, or other similar forming faults. Abrupt surface irregularities are measured using a straight edge held firmly against the concrete surface over the irregularity and the magnitude of the offset is determined by direct measurement.

GRADUAL SURACE IRREGULARITIES

Gradual surface irregularities are defined herein as bulges and depressions 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 of change in slopes of the concrete surface.

The surface irregularities shall not exceed 6 mm 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 tolerance. The

Engineer-in-charge will also make such checks of hardened concrete surfaces as determined and ensure necessary compliance with such specifications.

4.2.13.7 HARDENED CONCRETE NOT WITHIN SPECIFIED TOLERANCES

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 4.2.20 and shall be accomplished in a manner approved by the Engineer-in-charge. Such repair shall be done only after consultation with a representative of Engineer-in-charge regarding the method of repair. The Engineer-in-charge shall notify 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 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 of cement by two parts of coarse sand as an abrasive. The mortar at the same time filling the voids, a neat cement works 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 carborandum 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 surface exposed after removal of the forms cannot be satisfactorily dealt with in this manner due to bad work or for other reasons, a coat of cement plaster of 1:2 mix of the thickness as ordered by Engineer-in-charge shall be applied. No extra payment will be given for finishing concrete surface as instructed above in this clause.

4.2.13.8 PREVENTION OF REPEATED FAILURE TO MEET TOLERANCES

When concrete placements result in hardened concrete that does not meet the specified tolerance, the contractor shall submit to the Engineer-in-charge an outline of all preventive actions such as modification to the form system, 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.

4.2.14 REINFORCING BARS

Reinforcing bars shall be placed in the concrete as shown in the drawings or as directed. For anchoring the concrete to the hard rock, provision of anchor bar is made in the drawing and contractor shall place these anchor bars to the spacing and depth shown in the drawings.

The contractor shall make his own arrangement for procurement of steel of required specification of reputed factory for the work. Transportation from the place of supply to work site and all incidental charges will be borne by the contractor.

4.2.14.1 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 IS: 1786-1985 specification for high yield strength deformed steel bars and wire for reinforced cement concrete.

4.2.14.2 PLACING THE GRILLS

Reinforcement shall be bent and fixed in accordance with the procedure specified in IS: 2502-1963 (code of practice for bending and fixing of bars for concrete reinforcement). All reinforcement shall be placed and maintained in the position shown in the drawings. Splices shall be located where shown in the drawing, provided that the location of the splice may be altered subject to written approval of the Engineer-in-charge.

Subject to the written approval the Engineer-in-charge, the contractor may for

his convenience, alter 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 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 centre line of the bars. Reinforcement will be inspected for compliance with requirement as to size, shape, length, spacing and splicing etc.

Before reinforcement is embedded in concrete, the surface of the bars shall be cleaned of heavy flaky rust, loose scale, dirt, grease or other foreign substances, 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 is considered objectionable.

As specified in clause 12.3.1 of IS: 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 specified cover or 5 mm whichever is less. Reinforcement shall be 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 disturbances 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 of clause 12.4 of IS: 456-2000. Concrete cover shall be maintained as shown on the drawings.

4.2.14.2.1 REINFORCEMENT DRAWINGS

The Engineer-in-charge will supply drawings of reinforcement details and bar bending schedules for adoption.

4.2.14.2.2 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, cutting, bending, cleaning, tying the grills, securing and maintaining in position of the reinforcing bars as shown in the drawings.

The total weight of bars placed as reinforcement in concrete shall be arrived at by adding the products of lengths each size and mass per meter (vide Table-1 and Para 6.2.1 of IS: 1786-1985) of that size of rod.

4.2.15 PREPARATION FOR PLACING

4.2.15.1 GENERAL

No concrete shall be placed until formwork 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 watertight container for such cards at the convenient location near each individual concrete placement site. The cards shall list all the various work items for example "cleanup" 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 contractor or his representative signifying completion of the required work. Engineers authorized by the Engineer-in-Charge will inspect the work during and after completion of each phase of the preparation and if the work is satisfactory will sign the checkout card (placement register). Approval of preparation of placement will

not be complete until the contractor or his representative and above authorized Engineer have approved by signature to all applicable items for the placement.

All surfaces of forms and embedded materials shall be free from curing compound, dried mortar of previous placements and 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 delay the start of the concrete placement until the number of working vibrators available is acceptable.

4.2.15.2 FOUNDATION SURFACES

All surfaces upon or against which concrete is to be placed shall be free from frost, ice, water, mud and debris. Rock surface shall be free from oil, objectionable coatings, and loose semi-detached and unsound fragments. Immediately prior to placement of concrete, surfaces of rock shall be washed with an air water jet and shall be brought to uniform surface dry condition.

Earth foundation surfaces shall be wet to a depth of 15 cm or to impermeable material whichever less before placement.

4.2.15.3 CONSTRUCTION JOINTS

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 rigged that the new concrete can not be incorporated integral with that previously placed. The provision of construction joints shall conform to clauses 12.4.1 and of IS: 456-978.

When the work has to be resumed on a surface, which has hardened, such surface shall be roughed. It shall than be swept clean thoroughly and wetted. For vertical joints, 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, applied immediately before placing of the concrete.

Where the concrete has not fully hardened, all litanies shall be removed by scrubbing the wet surface with wire or bristle, brushes, care being taken to avoid dislodgment of particles or aggregate. The surfaces 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 15 mm. in thickness shall first be placed and shall be well recommend against old work, particular attention being paid to corners and close spots, and work thereafter shall proceed in the normal way.

4.2.15.4 CONTRACTION JOINTS

Contraction joints serve to provide for volumetric shrinkage of monolithic concrete and or movement between monolithic units at established joints, thus preventing formation of objectionable shrinkage cracks elsewhere in concrete. Prior to application for wax based curing compound to contraction joints, the surfaces 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 other embedded items shall be free of curing compound when adjoining concrete is placed.

4.2.16 PLACING OF CONCRETE

4.2.16.1 GENERAL

The contractor shall notify the Engineer-in-Charge before batching 'begins for placement of concrete. Placing shall be performed only on the presence of an authorised 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 4.2.15.

Re-tampering of concrete will not be permitted for any concrete, which has become so stiff that proper placing cannot be assured.

Concrete shall not be placed in standing water except with written permission of the Engineer-in-Charge and the method of placing shall be subject to approval. Concrete shall not be placed, in running water and shall not be subjected to 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 flow in such a manner that the lateral movement will cause of the coarse aggregate separated from the concrete mass. Methods and equipment employed in depositing concrete in forms 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 4.2.12 and 4.2.13.

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 depth of layers where concrete cannot otherwise be placed and consolidated in accordance with the requirements of these specifications. All construction joints which intersect exposed concrete surface shall be made straight and level to plumb except as shown otherwise on the drawings. The placing of concrete shall be in accordance with clause 12.2 of IS: 456-1978.

If concrete is placed monolithically around openings having vertical dimensions grater than 60 cm or if concrete in decks, floor slabs or other similar part of structures is placed monolithically with supporting concrete, the following requirements shall be strictly observed:

(1) Concrete shall be placed up to the top of the formed opening at which point further placement will accommodate settlement of fresh concrete. If concrete levels are specified beneath nearly horizontal structural members such as decks floor slabs, beams and girders or the levels 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.

(2) The last 60 cm or more of concrete placed below horizontal members or bevels shall be placed with a slump of 50 mm or less and shall be thoroughly consolidated.

In placing concrete on uniform slopes so steep as to make internal vibration of the concrete impractical without footing, the concrete shall be placed in non-vibrating slip forms with screed extending approximately 0.75 meters back from its leading edge. Concrete ahead of the slip form screed shall be consolidated by internal vibrations so as to ensure complete filling under the slip form.

A cold joint is an unplanned joint 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 break down or other unavoidable prolonged interruption of continuous placing. If such unavoidable delay in placing occurs, which make it 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 the 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 placed before the delay. If concrete cannot be penetrated with vibrator, the cold joint shall be then treated as a construction joint. Care shall be taken to prevent cold joints when placing concrete in

any part of the work. The concrete placing rate shall ensure concrete is placed while previously placed adjacent concrete is plastic, so that the concrete can be made monolithic by normal use of vibrators/ tamping.

Concrete shall not be placed in rain sufficiently heavy or prolonged to wash mortar from concrete. A cold joint may necessarily result from prolonged heavy rainfall.

There shall not be any additional payment, over the unit price bid in the schedule for concrete by reason for any limitation in the placing of concrete, required under the provisions of this paragraph.

4.2.16.2 TRANSPORTATION

The transportation of concrete shall conform to clause 12.1 of I.S: 456-1978.

The methods and equipment used for transporting concrete from the batch plant to its final position in the placement and the time that elapses during transportation shall not cause measurable segregation of coarse aggregate or slump loss during transportation exceeding 5 centimetres.

Concrete shall be deposited as practical 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 bucket.

If used to transport concrete, the truck mixers shall meet the applicable requirements of paragraph 4.2.10. 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.

4.2.16.3 COMPACTION

The compaction of concrete shall conform to clause 12.3 of I. S 456-1978.

Concrete shall be consolidated by vibrators/ tampers. The vibrations shall be sufficient to remove all undesirable air voids from the concrete, including the air voids trapped 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 re-vibrate the concrete in the upper portion of the underlying layer. Care shall be exercised 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 upon either plastic concrete until the previously placed concrete has been thoroughly consolidated.

Form 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 for the concrete. The Engineer-in-Charge or his representative may remove samples of the hardened concrete for testing and examination, and the Contractor shall repair, at no cost to the Government, the concrete from which such samples are removed.

Immersion type vibrators shall be operated at speeds of at least 7000 revolutions per minute when immersed in concrete. Form vibrators shall operate at speeds of at least 8000 revolutions per minute when being used to consolidate concrete. The Contractor shall immediately replace improperly operating vibrators with acceptable vibrators.

4.2.17 FINISHES AND FINISHING

The requirements for finishing of concrete surface shall be as specified in this paragraph, paragraph 4.2.12 and 4.2.13 or as otherwise indicated on the

drawings. The Contractor shall notify the 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 will be tested by the Engineer-in-Charge in accordance with paragraph 4.2.13 where necessary to determine whether the concrete surface is within the specified tolerances.

Finished concrete which is not within the specified tolerances shall be repaired in accordance, with paragraph 4.2.20. Interior surfaces 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 the screed surface has stiffened sufficiently and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Joints and edges shall be tooled where shown on the drawing or as directed.

After the surface of roadway slabs of concrete bridges have been wood 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 a 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 millimetres in depth. Broom shall be of a quality, size and construction and be operated as to produce a surface finish of satisfaction to the Engineer-in-Charge.

The finishing in lining be in accordance with Clause 5.7 of IS: 3873-1993. The finished surface shall be equivalent in evenness, smoothness and free from rock pockets and surface voids to that obtainable by effective use of a long handled steel trowel. Where the surface produced by lining machine meets the specified requirements, no further finishing operations will be required.

4.2.18 PROTECTION

The contractor shall protect all concrete against damage until its 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 concrete has hardened. Hardened concrete surfaces, which have to receive finish, shall be protected against damage from foot traffic and the 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.

4.2.19 CURING

4.2.19.1 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 by water curing.

The pre-cast slab for canal lining shall be cured by keeping them immersed in water for seven days and by sprinkling water for another 21 days with straw canvass, Hessian or similar materials cover over slab.

The uniformed top surfaces of bridges decks shall be cured for 28 days with a damp sand cover or curing mat cover. The sand or curing mats shall not be kept so

wet as to allow water to drain from them, which may stain other concrete. The sand or curing mats shall be removed after expiry 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 back fill against those surfaces. Only sufficient time to prepare construction joint surfaces and to bring them to a surface dry condition shall be allowed between discontinuance of curing and placement of adjacent concrete.

Forms shall be removed within 24 hours after the concrete has hardened sufficiently conforming to IS: 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. Prior to curing, minor surface repair shall be completed within 2 hours after form 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.

4.2.19.2 MATERIALS

Concrete cured with water shall be kept wet at least for 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 wet. All curing methods are subject to approval of the Engineer-in-charge.

4.2.19.3 COST

The cost of furnishing of 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 the particular curing methods are required.

4.2.20 REPAIR OF CONCRETE

Concrete shall be repaired in accordance with the clauses 5.7 of IS 3873-1978. Imperfections and irregularities on concrete surface shall be corrected in accordance with the paragraph 4.3.13 and clause 5.7 of IS: 3873-1978.

Repair 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 trowel to the surface of the openings. The mortar shall be placed in layers not more than 20mm in thickness. After being completed, each layer shall be compacted thoroughly. All exposed concrete surface shall be cleaned of impurities, lumps of mortar or grout and unsightly stains.

The cost of furnishing all materials and performing all work required in the repair of concrete shall be borne by the contractor.

4.2.21 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.

The unit of measurement will be in cubic metre. In measuring concrete for payment, the volume of all opening, fixtures embedded pipes and metalwork each of which is larger than 0.1 square meters in cross section will be deducted.

4.2.22 PAYMENT FOR CONCRETE

Payment for concrete shall be made at the applicable unit price in therefor in the bill of quantities, which unit price shall include the cost of furnishing all

materials and performing all works required for the concrete construction except that payment for furnishing and placing reinforcement bars and form work which shall be made at the respective unit price's bid thereof in the schedule.

4.2.23 DETAIL SPECIFICATION OF EXPANSION JOINTS/ CONSTRUCTION JOINTER (EJ/CJ) FOR CANAL STRUCTURE

Description of Items

The joint should be left in concrete/masonry in required places as per drawing and design. Embedded parts if any will have to be provided prior to casting of concrete/construction of masonry. Old surface of the concrete/masonry joints should be made clean free of dirt, grease, protrusions or any objectionable materials as per the direction of the Engineer-in-charge. The face of the joints should be made straight. The surface of joints should be painted with bitumen/ coal tar and fitted with the approved sealing materials like bituminous filler boards, etc. The adjacent concreting masonry then only can be constructed.

In the case of P.V.C. water stop, the pieces should be jointed together at the site by vulcanising thoroughly to make it water tight having sufficient strength to withstand the designed water pressure exerted on it.

In case of copper seal, the thickness of the copper sheet should be of 16 gauge (1.63 mm) and minimum of 0.6m wide with 'V', 'U' or 'Z' groove of size 2.5 cm. at its longitudinal axis. The groove should be perfectly straight and uniform. Adjacent copper sheet should be perfectly braced together on both sides for the whole width by butting the two sheets against each other. If lapping between adjacent sheet are given, the maximum lapping should be 5 cm. and should be held together tight. Brazing should be done on both sides for the whole width. The joints should be braced, watertight and should be capable of withstanding the hydraulic pressure exerted on it. M.S. anchor rods of 6 mm to 8mm dia and 30cm long with hook on outer side and should be braced with the copper sheet @ 50 cm centre to centre approximately on both sides of copper sheet preferably staggered. The minimum length of the rod to be brazed is minimum 5 cm. and brazing should be done on both side of the rod.

The edges of the copper sheet should also be given a link at about 0.5 M. interval to have a better grip with concrete. The brazing should be done as per relevant IS specification.

The P.V.C water stop shall be dense, homogeneous and free from holes and other imperfections. The cross section of the water stop shall be uniform along its lengths and thickness shall be symmetrical.

Location and embedment of the P.V.C./Copper water stops shall be as shown on the drawings, with approximately one-half of the width. Water stops shall be embedded in the concrete on each side of the joints. In order to eliminate faulty installation that may result leakage, care shall be taken that the water stops shall be installed to form continuous watertight diaphragm in the joints. Unless otherwise shown, adequate provision shall be made to protect the water stops during the progress of the work.

Additional vibrations over and above that used for adjacent concrete placement shall be carried out to assure complete embedment of the water stops in the concrete. Larger pieces of aggregate near the water stops shall be removed by hand during embedment to assure complete contact between the water stop and surrounding concrete.

SECTION -5

CEMENT CONCRETE LINING

5.1 SCOPE OF WORK

5.1.1 GENERAL

Canal lining shall be done with concrete paving and finishing machines, which will place, compact and finish the concrete lining in bed and slopes. Plain cement concrete of M-15 grade, with the maximum size of aggregate of 20mm shall be laid on the bed and slopes of the canal sections as shown on relevant drawings. The thickness of lining shall be as indicated in paragraph 5.3.4.5. for both in bed and slopes of the canal. If during construction it is found necessary to alter the canal section and side slopes without altering the thickness of lining, the contractor shall be informed in writing of such changes.

Each concrete paving machine and associated support equipment utilized under this contract shall place canal lining at an average sustained rate of advancement of not less than 3.5 meters per hour. This minimum rate shall be obtained for paving operation on the side slopes and on the bottom of the canal while also meeting the requirements for lapsed time following trimming, consolidation of concrete, finishes, joints and other requirements specified therein.

The equipment and operation for concrete lining includes foundation trimming, sub-grade preparation, concrete production and delivery from point of production, placement of concrete, curing and other associated activities. Supporting the placement of the canal lining shall be matched with the lining equipments capability, so as not to impede the specified placement rate of lining operation. The overall equipment deployment shall be such as to ensure the completion of canal lining within the scheduled period specified in the contract.

The contractor can alternatively deploy longitudinally operating self aligning slip form Paver with built-in vibrator attached to the mould/ forms, so as to effectively compact and finish the concrete (alternative to concrete Paver finisher outlined above).

During the preparation of sub-grade for canal lining, the proud earth work shall be excavated and trimmed by machine for better progress and to achieve the designed profile of the sub-grade. This excavation for trimming for base preparation of lining shall be carried out immediately prior to laying of the lining, but in no case the time interval should exceed 3 days in normal whether and 2 days in adverse weather conditions.

The scope of work also includes the following:

i. Dewatering the canal section for preparing the base for lining and laying concrete lining.
ii. Providing steel safety ladders at required intervals or as directed.
iii. Providing necessary under drainage arrangements consisting of filter blanket of graded sand and pressure relief valves as per drawings.
iv. Providing filter materials of approved quality as per design.
v. Providing and fixing P.V.C. contraction joints forming water stops.

5.2. CLEARANCE OF SITE

Area proposed for lining of the canal as a whole shall have to be cleared of all objectionable materials, stumps, roots, bushes, and rubbish. Such materials, from clearing operation shall be disposed-off from the working area clear of work site as per direction of the Engineer-in-charge.

5.3. **PREPARATION OF SUB-GRADE FOR CONCRETE LINING.**

5.3.1 GENERAL

a. Provision of this paragraph shall apply to the preparation of sub-grade on which concrete lining is to be placed.

b. The work of trimming the canal section up to the bottom of concrete lining/ bottom of filter materials to be provided as the case may be and preparing sub-grade for concrete lining includes removal of proud from the slope and bed of the canal. The trimming operations is to be carried out manually or by machines (Trimmer) of adequate capacity immediately prior to laying of the lining but in no case the time interval between trimming and laying should exceed 3 days in normal weather and 2 days in adverse weather conditions. Wherever rock is over excavated the item of trimming and preparation of sub-grade includes filling the over excavated portion with suitable semi pervious materials, watering and compaction and trimming up to bottom level of the concrete lining. All along the canal alignment the rain cuts on inner slope of the banks shall be filed up with approved excavated materials and shall be compacted adequately to required line and grade and level. The material required for filling the over excavation in rock and rain cuts, if not available during excavation in soils to be done under this item, shall be hauled from stock piles or burrow area to be arranged by the contractor and placed in position.

c. If at any point, materials have been excavated beyond the pay line required to receive the concrete lining the excess excavation shall be refilled on horizontal layer with selected materials moistened if required and compacted using rollers and slope compactors. Where, placing and compacting bedding material is on a sloping foundation, the layers may be placed parallel to the surface of the foundation. If at any point the foundation materials disturbed or loosened during the excavation process or otherwise, it shall be moistened if required and thoroughly compacted by tamping, rolling or by other approved methods to form firm foundations for placing the concrete lining.

d. If at any place, placement of bedding material below the concrete lining is required due care shall be taken by the contractor to wet the surfaces of excavation and embankment to a depth of 15 cm. or to a depth up to impermeable layer below whichever is less as per direction of the Engineer-in-charge.

e. In the canal section requiring bedding material below the concrete lining due care shall be taken by the contractor to place the bedding materials on scientifically approved surface adequately wet as described above in layers not exceeding 15 cm. in depth in a single operation and compacted till the bedding material attains a height where it can be trimmed to form a true and even surface upon which the concrete for lining is to be placed. Each layer of bedding material shall be moistened and thoroughly compacted.

f. All loose materials likely to be present at the end panel of existing lining adjacent of which lining is to be placed under these specifications shall be removed and all voids beneath the existing lining shall be refilled and compacted thoroughly. No **extra payment shall be made** to the contractor on this account.

g. Suitable materials trimmed from the canal shall be judiciously utilized in canal embankment, road embankments or in back filling of the structures or used as a bed material as per direction of the Engineer-in-charge. The trimmed materials

which can not be utilized in proper place during one continuous operation shall be piled along the out of way where designated by the Engineer-in-charge.

h. In all, the preparation of sub grade for concrete lining shall confirm to clauses 4.1. 4.2., 4.3., 4.4 and 4.5. of IS 3873-1993 (Indian code of Practice for laying in situ cement concrete lining on canal)

5.3.2 TOLEARANCE IN PREPARATION OF SUB-GRADE

Excavated profile provides the final base for lining and tolerance departure from lines shown on the drawings shall be as indicated here below:

± 20 mm on straight section.
± 50 mm on tangents.
± 100 mm on curves.

Departure from levels shown on the drawings. ± 20 mm

The above tolerance shall be negotiated gradually through smooth transition in a length of 50 m. No over-run in concrete quantity shall be paid to the contractor.

5.3.3 MEASUREMENT AND PAYMENT

Measurement and payment for trimming and preparation of sub-grade shall be made on area basis of number of square meters of the canal prism trimmed over which the concrete lining is to be placed. Payment shall be made at the unit bid price in the bill of quantities. The rate shall include cost of labour, equipments, watering, compaction of bed and sides and all incidental works as necessary to complete the work as per the specifications and also dewatering of the canal sections where required.

5.3.4 SELECTED BEDDING MATERIALS

The selected bedding material in the case of bed and sides of canal profile in normal soils shall be graded filter material compatible with sub grade materials and thoroughly compacted. In case of expansive soils, cohesive non swelling (CNS) soil will be used for bedding. The thickness of CNS layer shall be designed according to swelling pressure of soil or as directed by the Engineer-in-charge. The bedding materials shall generally be provided conforming to following gradation and index properties.

5.3.4.1 LINING IN NON-BLACK COTTON SOILS

- Selective protective lining *to be provide immediately up stream and downstream of every structure for 2.5m upstream & 3.75m downstream of the structure where fluming of channel is involved, and for 2.5m reach both u/s & d/s of structure where fluming of channel is not made. Toe walls must be provided at upstream and downstream ends of lining.*

- *Lining be provided in high banking reaches and in all such reaches as are considered* "vulnerable" *viz; associated with seepage, slippage of slopes and breaches etc.*

- Model Sections/ Profile Walls of Concrete *of size 30cm x 30cm should be provided in the balance portion of the unlined canal at intervals of 50m and at a closer spacing in curves.*

5.3.4.2 LINING IN SWELLING-BLACK COTTON SOILS:

- *Lining to be provided th`roughout the canal reaches passing through swelling B.C. soils. In such case provision for CNS (Cohesive non-swelling) treatment of the sub-grade should be made prior to placement of lining as per* ***IS : 9451-1994****. The CNS layers shall be in accordance as under:*

Table 5A :Thickness of CNS layer in canal carrying Discharge less than 2.0 Cumecs

Discharge in Canal up to 2.0 Cumecs.		Minm Thickness of CNS layer in cm for Swelling pressure of BC Soil	
Cumecs	Cusecs	0.50 – 1.50 kg/cm^2	More than 1.50 kg/cm^2
1.4 – 2.0	50 -70	60 cm	75 cm
0.7 – 1.4	25 – 50	50 cm	60 cm
0.3 – 0.7	10 – 25	40 cm	50 cm
0.03 – 0.3	1 – 10	30 cm	40 cm

Table 5B :Thickness of CNS layer in canal carrying Discharge 2.0 Cumecs and above.

Swelling pressure of BC Soil in kg/cm^2	Minm Thickness of CNS layer in cm
0.50 – 1.50	75 cm
1.50 – 3.00	85 cm
3.00 – 5.00	100 cm

5.3.4.3 GRADATION & INDEX PROPERTIES

The CNS soils to be used should be non-swelling with a maximum allowable swelling pressure of 0.1 kg/cm^2 (10 KN/ m^2) when tested in accordance with Indian standard, IS: 2720 (Part- 41) – 1977. CNS soils are to be broadly conforming to the following range:

GRADATION:

Clay 15 – 20 %
Silt 30 – 40 %
Sand 30 – 40 %
Gravel 0 – 10 %

INDEX PROPERTIES

Liquid Limit : More than 30% but less than 50%
Plasticity Limit : More than 15% but less than 30%

Note: *Provision for mechanized compaction of CNS soil layers to at least 95% proctor density should be made.*

5.3.4.4 METHOD OF COMPACTION:

In small sectioned channels, provision for "fill & cut method" should be made in order to achieve effective compaction. The channel section should be over excavated (to the extent governed by the CNS thickness) say, in 300m long reach; CNS soil be placed in layers in the full section, watered (as required), and each layer is to be compacted to at-least 95% proctor density through deployment of, preferably, small width powered drum rollers or standard power rollers or fuel operated plate

compactors. This process of compaction should be continued right up to the top of designed section. There-after, the compacted section should be scooped out to the proposed design section and the CNS so scooped shall be re-used in the next 300m reach. Provision in the cost estimate should accordingly be made for re-handling of the scooped out CNS and also some percentage of wastage during re-handling is provided.

Note: *This procedure should also be followed for the re-sectioning and strengthening of channels (involving compaction of earth fill other than CNS fill) not passing through B.C. soils.*

5.3.4.5 PARAMETERS OF CAST-IN-SITU CEMENT CONCRETE LINING:

THICKNESS OF C.C.LINING: Thickness of un-reinforced viz: plain C. C. lining may conform to either the Indian Standard IS: 3873 – 1993 or US Bureau of Reclamation Practice as tabulated below:

Table 5C: THICKNESS OF C.C.LINING as per IS : 3873 – 1993

Discharge Capacity in Cumecs (Cusecs)	Depth of Flow in m	Thickness of C.C.lining in mm
0 – 5 (0 – 175)	0 – 1.0 m	50 – 60 mm
5 – 50 (175 -1750)	1.0 – 2.5 m	60 – 75 mm
50 – 200 (1750 – 7000)	2.5 – 4.5 m	75 – 100 mm

Table 5D: THICKNESS OF C.C.LINING as per USBR Practice

Discharge Capacity in Cusecs	Thickness of C.C.lining in inches
0 – 500	2.50
500 – 1500	3.00
1500 - 3500	3.50
3500 – 7500	4.00

Note: *Taking in to consideration the various factors including economy and ease/ practicability of placement, it may be appropriate to adopt a lining thickness of 65 mm for channels of discharging capacity up to 175 cusecs; 70 mm for the channels of discharging capacity up to 500 cusecs and 75 mm for channels of discharge beyond 500 cusecs up to 1750 cusecs.*

5.3.4.6 CEMENT:

For area other than coastal, 43 Grade or 53 Grade Ordinary Portland cement is to be used. In the coastal zones, Portland slag cement may be used.

5.3.4.7 CEMENT CONTENT AND WATER-CEMENT RATIO:

The concrete lining being exposed to alternate wetting and drying during its functioning or working life, comes in the category of " severe exposure condition" as per Indian standard IS: 456 – 2000. Accordingly, provision of cement content of minimum 250kg/m^3 of concrete mix is made in the cost estimate of C. C. lining from "durability consideration". Water Cement ratio is to be restricted to the range from 0.50 – 0.60.

5.3.4.8 MAXIMUM SIZE OF COARSE AGGREGATE:

Graded coarse aggregate with the maximum nominal size (MSA) of 20 mm down to IS grading should be used in the concrete mix of lining.

5.3.4.9 AIR ENTRAINING AGENT (AEA):

Provision for using AEA in the concrete mix for C. C. lining is made in the cost estimate. Concrete mix with AEA affords more" durability" as well as "better workability (viz: fluidity)" and better "finish" to the surface.

Graded fine and coarse aggregates are to be used in the concrete mix and any slight deviation in the requisite grading is compensated by air-entrainment in the mix by the addition of AEA.

5.3.4.10 CONTRACTION JOINTS:

As an acceptable thumb rule, the spacing of contraction joints should not exceed 36 times the thickness of lining in order to avoid cracking of the lining surface in between the joints.

Table 5E: SPACING OF CONTRACTION JOINTS

Lining thickness in mm (t)	Spacing of Joints (36 x t)
65 mm	2340 mm, say 2.30 m
70 mm	2520 mm, say 2.50 m
75 mm	2700 mm, say 2.70 m

Note: *If the perimeter of canal section is equal to or less than 6.0 m, no longitudinal contraction joints need to be provided. However, the transverse contraction joints across the canal section are to be provided irrespective of the extent of the perimeter.*

5.3.4.11 CONSOLIDATION OF CONCRETE LININGS:

Proper consolidation of concrete mix for the C. C. linings, as being placed on bed and sides is of paramount importance.

Use of conventional needle vibrators may puncture the sub grade surface. One of the most effective methods of consolidation comprises of deployment of "vibratory plate device" operated by a fuel operated tiny motor.

5.3.4.12 CUTTING GROOVES FOR CONTRACTION JOINTS:

Grooves should be cut when the concrete is still green/ plastic, to be later filled with the sealing compound. The groove is normally 27mm deep, for the C. C. lining thickness of 65 mm – 75 mm range, 11 mm wide at bottom and 14 mm wide at the top. It should be filled with hot/ poured sealing compound conforming to IS: 5256 – 1992. After the C. C. lining is fully set (viz: after a period of 28 days), only then the grooves have to be filled with the sealing compound after cleaning of dirt and mortar from the grooves.

5.3.4.13CURING OF C. C. LINING:

Adequate and fool-proof curing is the most vital requirement for C. C. Lining.

The bed lining should be effectively cured by constructing small earth bunds of say, 30 cm high at convenient intervals and ponding water on the bed between the successive bunds. The sloped lining surfaces should be cured either by fully covering the concrete surface with Hessian cloth rolls/ gunny bags and keeping these wet with water throughout 28 days period.

5.3.4.14 UNDER-DRAINAGE:

A convenient method of the under-drainage is the provision of "porous concrete plugs" of 75 mm dia and 250 mm to 300 mm length in bed and side slopes underlain by graded filter of size 300 mm x 300 mm or 350 mm x 350 mm. One plug can be provided in the bed and one plug in each side slope at a distance of d/3 (one third of FSD) from the bed in alternate panels (viz: at a spacing of 4.5 m to 5.0 m). The porous plugs should be composed of one part of cement and four parts of coarse

aggregate of size not more than 20 mm. No sand is to be used. Only so much water is used as is required to produce a paste to coat the aggregate without filling the voids. The porous plugs, after requisite curing, are becoming porous and free draining.

The porous concrete after curing shall be pervious and free draining type. As soon as the concrete hardens (i.e. it attains final setting) it should be sprinkled with water and kept moist for at least 14 days. The compressive strength of the porous concrete at 7 days as determined by tests on 15cm dia x 30 cm height cylinders should not be less than 70 kg/ cm2 and the porosity shall be such that, water shall pass through a slab of concrete 30 cm thick at a minimum rate of 500 lt/min/ sq.m of the plug with a constant 10 cm depth of water on the slab.

5.3.4.15 TOLERANCE IN C. C. LINING THICKNESS:

The permissible tolerance for the thickness of lining is ± 10%, provided the average thickness is not less than the designed thickness.

5.3.5 PARAMETERS OF PRE-CAST CONCRETE SLABS FOR LINING:

In case pre-cast slabs are to be used for the lining, the concrete mix for casting the slabs should be of M15 grade. The slabs, 30 cm x 30 cm (or any other convenient size) should be of 50 mm thickness. The sub grade is to be given a plaster layer (1:6) of 12 mm thickness, duly cured with water for at least 24 hours and, there after, placed on this base layer with 6 mm thick mortar of 1:3 mix. The joints between the slabs are to be filled/ pointed with mortar mix of 1:3 and cured.

Note: *Whether cast-in-situ or pre-cast concrete lining is to be placed, the sub grade MUST be hard, well compacted enough and smoothened prior to placement of lining. The "vibratory plate device" mentioned in Paragraph 5.3.4.11 above can be very effectively deployed for compaction of the sub grade.*

The surface irregularities (to be checked with a wooden template/ straight edge) should not exceed the following limits:

i) 6.25 mm for sub grade bed; and

ii) 12.00 mm for sub grade side slopes.

The loading, handling, transportation and placing of the selected bedding material shall be subjected to approval and shall be such as will result in a uniform mixture of the material being placed without separation or segregation. Selected bedding shall be obtained from required excavation in area where materials in excess of that required to construct the adjacent embankments is available or available from burrow pits approved by the Engineer-in-charge.

5.4. MATERIALS

All materials including cement, fine aggregate and coarse aggregate, water admixture and steel shall be as specified in Section 4.2 for concrete.

5.5. CAST IN SITU CONCRETE LINING

5.5.1. GENERAL

The work shall generally conform to IS 3873-1993. All concrete for lining shall be governed by IS 456-2000. The concrete shall be of controlled grade with suitable admixtures of approved air entraining agents using well graded aggregates with maximum size of aggregates of 20 mm. Ordinary Portland cement or Portland Pozzolana Cement to be used shall be 321 Kg. per cubic meter of concrete. However due to change in design mix, if it becomes obligatory to use lean/ richer mix, the contractor shall comply with the same. In case of leaner mix the department shall deduct the cost of cement from the bill of the contractor at the issue price of cement for short consumption of cement and no other compensation on this account shall be allowed. In case of richer mix the contractor shall be paid for the extra cement used at the issue price of cement.

5.5.1.1 PRODUCTION OF CONCRETE MIXES:

The concrete should be produced in a mechanical concrete mixer of any standard size or in a stationary weigh batching & mixing plant. Mobile concrete

mixers of various drum capacities (0.5 cum or more) are also available in the market for production of concrete.

Hand mixing of concrete shall not be allowed except in rare exceptional circumstances and isolated cases when the quantity of concrete to be placed is very small.

For price adjustments, the amount so recoverable/ payable shall be deducted/ added to the value of the work done. Design mix and actual cement required shall be communicated from time to time to the contractor in writing by the Engineer-in-charge.

5.5.2. **TRANSPORTATION OF CONCRETE**

a. Transportation shall be handled from the place of mixing to the place of final deposition as rapidly as practicable by use of equipments such as transit mixers which shall prevent initial setting, segregation and loss of any of the ingredients. It shall be transported and compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed agitators operating continuously where this time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator.

b. If segregation occurs during transport, the concrete shall be remixed before being placed after observing the time requirements as above.

5.5.3. **PLACING AND COMPACTION**

a. Concrete shall be placed only in the presence of a duly authorized representative of the Engineer-in-charge. Concrete shall be placed and compacted before initial setting time and shall not be subsequently disturbed.

b. Placing of concrete shall not be started until all form work installation of parts to be embedded if any and preparation of surface upon which concrete is to be laid have been completely inspected by the Engineer-in-charge. All absorptive surfaces against which concrete is to be laid shall be moistened adequately so that moisture shall not be withdrawn from freshly placed concrete. The surfaces, however, shall be free from standing water and mud.

c. Concrete shall be deposited in all cases as neatly as practicable directly from mechanized pavers in its final position and shall not be caused to flow in a manner to permit segregation. Excessive separation of the coarse aggregate caused by allowing the concrete to fall freely from too great a height or at too great an angle from the vertical shall not be permitted and where such separation would otherwise occur. The contractor shall provide suitable means to convey the concrete without allowing such separation.

5.5.4. **MECHANICAL PLACING**

a. For efficient placing and finishing of the concrete lining on slopes and in bed concrete laying machines such as slip form pavers or concrete paver finisher of approved quality and design shall be used. Each lining machine and associated support equipment utilized under this contract shall place canal lining at an average sustained rate of advancement of not less than 10 meters per hour. This minimum rate shall be obtained for paving operation on the side slopes and on the bottom of the canal, while also meeting the requirements for lapse time following trimming consolidation concrete thickness tolerances, finishes, joints and other requirements specified herein.

b. The equipment of operations for foundation trimming, sub-grade preparation, concrete production, concrete delivery, joints production, curing compound placement and other associated activities supporting the placement of the canal lining shall be matched with the lining equipment capability so as not to impede the specified placement rate of each lining operation. The overall equipment

development shall be such as to ensure in the completion of canal lining within scheduled period specified in the contract.

c. Concrete lining shall be done in the canal prism as shown in the drawing. Mixing of concrete is to be done in a stationery or mobile weigh-batching plant of capacity of one cubic meter to 3.5 cubic meter installed at suitable places and concrete is to be conveyed to work spot in transit mixers to be moved on canal banks and unloaded at site in the hopper of the Paver. The concrete in bed and side is to be placed with mechanized Paver finisher ISI 456 CP 650 or any other Paver of similar capacity. The concrete from transit mixer is to be unloaded into hopper and conveyed to other bank, through side discharge conveyor. Then placed with Paver in bed and side and vibrated, with plate joints which will be done with Groove cutter attached to the Paver. Panels shall be as per drawing or as directed by the Engineer-in-charge. The above mechanized procedure is to be followed for side lining where slant length is 2.70 M. and above. In case where canal bed width is less than 2.00 M and where bed lining is not possible to be tackled with the above mechanized Paver, concrete shall be laid by conventional method i.e. mixing by concrete mixtures and laying the concrete manually in alternative panels of 3 m. width and 3 m length as per drawing or as directed by Engineer-in-charge duly using steel form work to the required thickness of concrete and vibrated with mechanical pan vibrators. The concrete for side lining where the slant length is less than 2.70m shall be laid by using appropriate equipment with steel guided form work and vibrated by mechanical vibrator fitted to gantry. If the concrete is laid manually on slopes, compaction by suitable method as approved by Engineer-in-charge shall be adopted. Concrete shall be mixed in stationery or mobile batching plant and conveyed through transit mixers included for manual placement. Whenever necessary for the purpose of obtaining economy, workability density, impermeability, durability, strength, mode of vibration and gradation of aggregates or other materials, the Engineer-in-charge of quality control shall after testing, make necessary changes in the proportion of the mix.

d. Concrete when deposited shall unless otherwise specified have placement temperature of not less than 4.5° C and not more than 32 ° C.

e. Concrete shall be so laid as to facilitate placing, vibrating, finishing and curing operations. The side lining concrete shall be screed up on the slope while the concrete is being vibrated ahead of the screed. Concrete required for key as shown on the drawings shall be laid integrally along with the side slope lining.
Alternatively, the contractor can select to use longitudinally operating self alignment, slip form machine with built-in vibrators attached to the slip forms, so as to effectively compact and finish the slope and bed concrete lining.

5.5.5. **FINISHING**.

a. All exposed concrete surfaces shall be cleared of impurities, lumps of mortar or grout and unsightly strains. The finished surface shall be even, smooth and free from pockets and equivalent to that obtainable by effective use of long handle steel trowel. Where the surface produced by lining machine meet the specified requirements, no further finishing operation shall be required. Surface irregularities, when tested with a straight edge of 1.5 meter length shall not exceed 6 mm in canal bed for bottom slab and 12mm on side slopes.

b. The surface of concrete finished against form shall be smooth and be free from projections, honey combing and other objectionable effects. Immediately on removal of forms, all ridges or lips shall be removed and undesirable local bulging on exposed surfaces shall be remedied by tooling and rubbing.

c. Repairs to concrete surface and additions where required shall be made by cutting regular openings into the concrete and placing fresh concrete to the required lines. Chopped openings shall be sharp and shall not be less than 75 mm in depth.

5.5.6. **CURING.**

5.5.6.1 GENERAL.

The concrete lining on slopes including curvatures portion, at junction of slope and bed lining shall be cured with specifications given in paragraph 4.2.19. The concrete lining in canal bed shall be cured with water in accordance with the specifications given in Paragraph 4.2.19. If water curing of lining in the canal bed is not carried out to the satisfaction of the Engineer-in-charge as per specifications the contractor shall be directed to switch over to liquid membrane forming curing compound for curing. Water curing of concrete is to follow strictly to spraying procedures and specifications as per clause 5.8 of IS: 3873 of 1993.

All equipment material etc. needed for curing and protection of concrete shall be at site and ready for installing before actual concreting begins. Detailed plans methods and procedures of curing and protection of concrete lining shall be got approved in writing from the Engineer-in-charge sufficiently in advance of the actual concreting in order to avoid interruption or damage to the work of other agencies.

5.5.6.2 MEMBRANE CURING.

a. These specifications cover curing of concrete using membrane forming compound to retard the loss of water during the early hardening period and to reduce the temperature rise in concrete exposed to radiation from the sun. This compound shall be suitable for use as curing media for fresh concrete and for further curing of concrete after removal of forms or after initial moist curing.
b. Concrete of canal lining on slopes including key at the top and curved portion at the bottom of the slope of canal shall be cured with liquid membrane forming white pigmented curing compound which shall form water retaining surface to achieve the desired effect of water curing at 28 days. The curing compound shall be white pigmented of approved qualify conforming to ASTM-C-309-81 Type-2.
c. White pigmented compound (Type-2) shall consist of finely divided white pigments and particle solids, ready mixed for immediate use without alteration. The compound shall present a uniform white appearance when applied uniformly to a fresh concrete surface at a specified rate of application. It shall be of such consistency that it can be readily applied by spraying to provide uniform coating at temperatures above 4 degree Centigrade. If two coats are to be applied then it shall be applied at an interval of approximately one hour. They shall adhere to freshly placed concrete that has stiffened or sufficient to resist marking during the application and to damp hardened concrete and shall form a continuous film when applied at the specified rate of application. When dry the covering shall be continuous flexible and without visible breaks or pin holes and shall remain as unbroken film for at least 28 days after application. It shall not react and should not have deleterious effect on concrete.
d. The compound shall meet with the requirement of water retention test as per ASTM designation C-150-80 .The loss of water in this test shall be restricted to not more than 0.55 Kg/ M^2 of exposed solution of exposed surface in 72 hours.
e. The white pigmented compound (Type–2) when tested as specified in accordance with method E-97 of ASTM shall exhibit a day light reflectance of not less than 60% of that of magnesium oxide.
f. It shall fulfil the requirement of drying time when tested in accordance with ASTM C-309-81. The compound applied shall be dry to touch in not more than 4 hours. After 12 hours, it shall not be tacky or track-off (peel off) concrete when walked upon nor shall it impart a slippery surface.

5.5.6.3 TESTING.

a. The liquid membrane forming curing compound to be brought in the manufacture's original clear containers. Such container shall be legibly marked with the name of the manufactures the trade name of the compound the type of

compound and class of vehicle/solids the nominal percentage of volatile material and batch or lot number. The lot number will be assigned to the quantity of compound mixed sampled and tested as single product. The manufacturer shall exercise the care in filling the container so that all are equally representative of the compound produced.

b. Curing compound to be used on site shall be got tested at least 14 days in advance so that the result of water retention tests reflectance test, drying etc. are available before it can be permitted for use. All of the filled containers represented by the approved sample shall then be sealed to prevent leakage substitution or dilution. The Engineer-in-charge or authorized representative should mark each container represented by the samples with a suitable identification mark for later identification and correlation and shall be kept in store with double lock arrangements. One key shall be kept with the contractor and the other with Engineer-in-charge. Random samples shall be collected from every batch of the compound. Frequency of random sampling shall be done as directed by the Engineer-in-charge. The contractor shall provide samples and labour for collecting samples free of cost. Testing shall be carried out by the department.

5.5.6.4 METOD OF APPLICATION.

The compound shall be sprayed using mechanical sprayer of approved design to ensure uniform and continuous membrane on the concrete surface. The coverage shall be at the rate specified by the manufacture or at the rate of 4 to 5 m. per litres. Field trials shall be conducted to decide effective coverage rate which depends upon surface finish. With a view to ensure through and complete coverage approximately on half of the compound for a given area should be applied by moving the spray gun back and forth in one direction and the remaining half at right angles to this direction. In case the application is still not found uniform the contractor shall have to apply the second coat as and where directed by the Engineer-in-charge. If a second coat is to be applied it should be applied approximately after an interval of one hour. The curing compound shall be applied as soon as the bleeding water or shine disappears, leaving dull appearance. Equipment for spraying curing compound shall be of pressure tank type (5 to 7 kg/cm2) with provision of continuous agitation. A curing jumbo with multiple travelling spray guns shall be provided for effective spray. Spraying on concrete lining shall be done in such a way that the green concrete is not disturbed or damaged or any foot impressions left. Necessary schemes on spraying by mechanized means shall be got approved from the Engineer-in-charge. However, in emergency for very small areas (Patches) it can be applied with wire or bristle brush. Such compounds shall be used on the work only after production of test results and approval of the schematic plan on spray curing compounds. Adequate care shall be taken to prevent any movements on cured surface up to 28 days after application of curing compound. Under unavoidable circumstances created by non availability or short supply of specified curing compound, the contractor shall be allowed to resort to water curing of concrete lining on slopes after obtaining prior approval of the Engineer-in-charge in writing. Such water curing shall be carried out in accordance with the following specification.

5.5.6.5 WATER CURING.

The surface of invert of the canal shall be kept continuously moist by covering it completely with wet burlap as soon as the concrete has hardened sufficiently. The burlap shall be kept continuously wet by spraying water for at least 12 hours. Thereafter curing by ponding shall be resorted to. The concrete to be cured with water shall be kept wet by ponding for at least 14 days. Water lost by evaporation shall be replenished periodically to keep the surfaces continuously submerged under water. The period of 14 days specified above shall be increased to 21 days when Pozzolana has been used in the concrete as part of replacement of cement.

When the curing of concrete in the canal bed is not found satisfactory the Engineer-in-charge may ask the contractor to resort to membrane curing.

5.6. TESTING OF CONCRETE AND ACCEPTANCE OF WORK:

5.6.1 GENERAL.

Testing of concrete shall be carried out at the cost of the department by the Quality Control Division on representative samples taken at the site of laying the concrete in accordance with relevant clauses of IS: 119-1959.The samples to be provided by the contractor at his cost.

5.6.2 SAMPLING PROCEDURE AND FREQUENCY:

a. Sampling Procedure: A random sampling procedure shall be adopted to ensure that each concrete batch has a reasonable chance of being tested i.e. the sampling 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.

Quantity of concrete in cum	**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 every 50 cum of part thereof.

Note: At least one sample shall be taken during each shift.

5.6.3 TEST SPECIMEN:

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking form work or to determine the duration of curing or to check the testing cubes cured by accelerated methods as described in IS 901-1978. The specimen shall be tested as described in IS: 516-1956.

5.6.4 TEST STRENGTH OF SAMPLES:

a. The test strength of the sample 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 cores etc. and shall remain present at the time when the samples, cores etc. are taken. Testing shall be carried out at the testing laboratories set up at 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. All testing charges will be borne by the department.

5.6.5 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 confirm 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 the tendered rate and as approved by him. Whenever necessary, for the purpose of obtaining economy, workability,

density, impermeability, durability and 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 Division shall after testing, make necessary changes in the proportion of mix. Contractor shall have to effect these changes immediately.

5.7. INSERTION OF PVC CRACK-INDUCING JOINTS.

5.7.1 GENERAL

a. The transverse and longitudinal PVC (Polyvinyl Chloride) strips shall be provided with the shapes confirming to dimensions shown on the drawing. The finished PVC crack inducing joints shall be extruded from virgin Pigmented, Plasticized Polyvinyl chloride (PVC). The PVC crack inducing joints shall be dense homogeneous free from holes and other imperfections. The cross section of the PVC crack inducing joints shall be uniform along its length and thickness shall be symmetrical transversely. Tolerance for dimensions in overall length and width shall be 5% and thickness 10%. The finished PVC crack inducing joints shall meet the following requirements:

Sl.No	Characteristics	Unit	Values
1.	Tensile strength	Kg/Cm2	116 Minimum
2.	Tear Resistance	Kg/Cm2	49 Minimum
3.	Stiffness in Flexure	Kg/Cm2	24.6 Minimum
4.	Accelerated extraction		
	a) Tensile Strength	Kg/Cm2	105 Minimum
	b) Ultimate elongation	Kg/Cm2	250 Minimum
5.	Effect of alkali (7days)		
	a) Weight measure	%	0.25 Maximum
	b) Weight decreased	%	0.10 Maximum
	c) Hardness change	Point	1.50
6.	Effective of alkali (28 days)		
	a) Weight increase	%	0.4 Maximum
	b) Weight decrease	%	0.3 Maximum
	c) Dimension change	%	1.1

b. Weight of the PVC strip shall be a minimum of 460gm/meter for the longitudinal strip and a minimum of 420 gm/meter for the transverse strip.

c. The above determination shall be made in accordance with the specification of C.W.C. in vogue. The surface finish of PVC strips shall be mat finish and of white colour.

d. Contractor shall arrange for getting the finished PVC crack inducing joint tested in recognized Test Laboratories by the Government. The manufacturers shall furnish test sample of PVC crack inducting joints in 30 cm. length reel, free of cost. Each sample shall be marked with the number of the reel from which sample is obtained and with certificate that the samples are from the reels to be furnished.

e. It is mandatory for the manufacturer of the PVC strips from whom the contractors shall procure PVC strips to have a full-fledged testing laboratory in the factory to enable pre-despatch testing of the products. Test reports from Government test laboratory shall also be binding on the manufacturer based on samples drawn by the Engineer-in-charge from consignments received at site. The contractor shall get the sample of PVC strip approved by the Engineer-in-charge. He shall furnish the name of manufacturer the details of the in-house testing arrangements with the manufacturer and shall also furnish a test report from the in-house testing facilities along with the sample.

5.7.2 PLACING

a. The PVC crack inducing joints shall be inserted in the concrete lining when concrete is plastic. The longitudinal PVC crack inducing joints shall be inserted before the transverse PVC cracks inducing joints is inserted. The PVC crack inducing joints at edges shall be plastered in position fixed with longitudinal channels by clips or such other arrangement prior to lying of concrete. The PVC crack inducing joints shall be inserted in position in concrete lining as shown in drawings. The insertion of the longitudinal and or transverse PVC crack inducing joints at the predetermined locations of joints requires special attention to ensure proper location (depth is especially important) plumb installation and consolidated concrete around the PVC crack inducing joints. The longitudinal PVC crack inducing joint includes a cellular upper fin. The inspection fin shown on the drawings shall be comparatively thin and shall remain above the top surface of lining. It is important that top of the upper fin be at or near the concrete surface. The manner of installation shall include mechanical vibration that produces through consolidation of the concrete around the crack inducing joint and provides a continuous contact between the concrete and all surfaces of the crack inducing joints. The longitudinal crack inducing joint shall be fed into the fresh concrete from reels mounted in front of the pavers through guides and tension rollers so placed as to ensure proper depth and orientation of the crack inducing joints. Installation of transverse crack inducing joint shall be made by suitable joint inserted contrivance capable to insert into freshly placed concrete lining.
b. At intersection of longitudinal and transverse joints containing PVC crack inducing joints the top vertical members of the longitudinal crack inducing joints shall be removed for 10 to 15 cm. in width without pulling the crack inducing joint from the concrete lining and transverse crack inducing joint shall be placed within the notch so formed. Depression of the longitudinal cracks inducing joint below the specified positions in the concrete shall be permitted at intersection only to the extent necessary to place the transverse crack inducing joint to the specified depth. However, tolerances and concrete consolidation requirements of the preceding paragraph shall apply at intersections.
c. The manner of making the intersections shall produce transverse and longitudinal crack inducing joints and provide a nearly continuous weakened plan normal to the lining surface in both directions through the intersection.

5.7.3 JOINTS.

In RCC lining construction, joints shall be provided to accommodate expansion and contraction of the concrete or to provide continuity between the breaks in construction work. Joints shall be provided as shown on the drawings or as directed by Engineer-in-charge. The depth of joints to be cut in the bed of the canal as well as on slope shall be as specified in the drawings. The joints are not to be filled with sealants but only to be cut at specified intervals. The sealants shall be filled in joints later but before functioning of canal. The tools to be used by the contractor for providing joints shall be got approved from Engineer-in-charge.

5.8. TOLERANCES IN EXECUTION OF LINING.

a. The interest of this paragraph is to establish tolerances that are consistent with modern construction practice and yet be governed by the effect that permissible deviations shall have upon the structural action or operational function of the structure. Deviations from the established lines, grades and dimensions shall be permitted to the extent set forth herein provided that the department reserves the right to diminish the tolerance set forth herein if such tolerance imparts the structural action or operational function of the lining.
b. Tolerance for lining shall be permitted within the following limits.

i)	Departure from established alignment:	± 20 mm on straight reaches. ± 50 mm on tangents. ± 100 mm on curves.

ii)	Departure from established grade:	± 20 mm on straight reaches.
iii)	Variation in concrete lining thickness:	± 10 mm of lining thickness provided average thickness is not less than specified.

Any departure from alignment or grade shall be uniform and no corrections in assignment be made in less than 50m. No over run in concrete quantity shall be paid to the contractor.

5.9. DEWATERING.

In canal reaches where subsoil water is met with above the canal bed level, dewatering shall be resorted to and continued during preparation of sub-grades, providing under drainage arrangement and placing of concrete for lining till such period the concrete attains necessary strength. No separate payment shall be made for dewatering operations as the same is deemed to have been included in rate of related item in Schedule of quantities.

5.10. MEASUREMENT AND PAYMENT:

5.10.1 PLAIN CEMENT CONCRETE LINING:

a. Measurement shall be on the basis of square meter/cum of plain concrete lining and payment shall be at the unit rate bid in bill of quantities for concreting works. Payment for lining shall be made for the thickness shown on the drawings and on square meter/cum basis of the area/volume including key on both sides. The thickness of lining as shown in the drawing shall be maintained by setting of paver machine in relation to final sub-grade on which lining is to be laid. The thickness shall be cross checked by (i) volume of concrete placed and area covered (ii) use of probe when concrete is being placed and (iii) coring if required. Any overrun in quantity of concrete in lining shall not be paid to the contractor.
b. The unit rate for lining shall include cutting of grooves for crack inducing joints to specified depth in panels as directed by the Engineer-in-charge including cost, carriage, royalty and taxes of all materials with all leads, lifts, mixing, form work, conveying, placing, compacting, finishing, curing and also dewatering during placing of concrete lining as required.
c. The unit rate of lining shall also include the cost of producing samples and cost of all incidental work needed to make the cracks inducing joints cost of all operation equipment labour tools, etc. required for carrying out this work.

5.10.2 RCC LINING:

The quantity of reinforced cement concrete lining shall be measured on square meter/cum basis on the same lines as of plain concrete lining. Payment of RCC lining shall be made at the unit rate as provided in the bill of quantities. Reinforcement shall be paid separately as per item rate in bill of quantities. The rate for RCC lining is inclusive of costs of all other material, transport with all leads, lifts, cutting of grooves, mixing, conveying, placing, vibrating, compacting, smooth finishing curing etc. and also dewatering during the placing of reinforcement and concrete for lining as required.

5.11. SAFETY LADDERS:

5.11.1 GENERAL

Safety ladders should be constructed in canal lining as directed by the Engineer-In-Charge. Safety ladders consisting of ladder rungs should be constructed in canal lining about 30 m upstream of the point where the canal enters some underground structure. In other reaches safety ladders may be provided at a spacing of about 300 m, the ladders being provided alternatively on either side.

Ladder rungs should be smooth, round mild steel bars, galvanized or coated with coaltar after installation.

Typical details of safety ladders are illustrated in the approved drawing.

5.11.2 MEASUREMENT AND PAYMENT:

Safety ladders shall be measured by weight of M.S. bar. Payment therefore shall be made at the unit rate in schedule of quantities. The rate shall include the cost, carriage, taxes for providing and fixing the ladders as indicated on the drawings.

5.12. CANAL LINING USING CEMENT CONCRETE SLABS

5.12.1 GENERAL

Lining of canals with pre-cast cement concrete slabs shall be adopted for rehabilitation of the damaged pre-cast slab lining in canals or new lining in the old or new canals or in places as shown in the drawings or as directed by the Engineer-in-Charge.

5.12.2 PREPARING FOUNDATION

The provisions detailed in the paragraph 5.3 shall apply.

5.12.3 MODEL (PROFILE) SECTIONS OR TEMPLATES

Model sections or templates of cement concrete M-15 shall be constructed in the bed and sides of the canal to the required sections with the top of model section level to the finished surface of the lined section of the canal portion. The spacing of the model sections shall be 15 meters in straight reaches and 7.5 meters in curved reaches. The exposed face of the model sections constructed with cement concrete M-15 or shall be plastered with cement mortar as shown in the drawing or as directed by the Engineer-in-Charge. The dimensions of the model sections will be the given in the drawings or as directed by the Engineer-in-Charge.

Suitable super elevation in curved reaches shall be given after the approval of the Engineer-in- Charge.

Since the model sections are to be used as reference for excavation and trimming of sub grade for the lining and for laying accordingly, finishing the lining of the required grade and profile, it should be constructed with in a tolerance limit of 30 mm in a length of 3 meters. Model sections beyond the permissible tolerance will be removed and redone by the Contractor at his own expense.

5.12.4 MATERIALS

All materials cement, sand, aggregate and water shall conform to specifications given in section 4.2.

5.12.5 PRECAST SLABS

Mix for the slab shall be of cement concrete M-15 using 20mm hard machine broken stone aggregates. The face of the slab shall be square or rectangular. The dimensions of the slab shall be 45 cm x 30 cm x 5 cm or 22.5 cm x 30 cm x 5 cm. Toe wall blocks shall be 15 cm x 20 cm x 30 cm or as directed by the Engineer-in-charge. The permissible tolerance on length and width shall be $\pm$ 5 mm. The difference in length of two diagonals of slab shall be not more than 4.5 mm. The thickness shall not be less than the specified value. The permissible tolerance on thickness shall be ±2.0 mm. The slabs shall be either with all its sides right angles to the faces or with two of its sides bevelled at a particular angle to the faces or as directed by the Engineer-in-Charge. The bevelled slabs shall be provided with tongues and grooves as per paragraph 6.1.2.1 of I.S. 3860- 1966.

The slabs shall have minimum flexure strength as specified in I.S. 4060-1968.

5.12.6 CASTING OF SLAB

5.12.6.1 EQUIPMENT

Manufacturing of slabs required for lining shall be done in the casting yard using concrete mixers for mixing, steel moulds and table vibrators. They shall be cured in curing ponds. The casting yard with the required infrastructure shall be constructed by the Contractor at his cost.

The measuring boxes for the ingredients shall be accurate and maintained in serviceable conditions. The concrete mixer shall conform to I.S. 1971-1968.

The table vibrators to be used shall conform to I.S. 2514-1963. For all sizes of vibrating table, the height of the table top from the ground level shall be sufficient to allow for easy placing and removal of the moulds and shall not exceed 0.75 meter. The capacity of vibrating table shall be indicated for the effective vibration by the maximum weight in tones of the mould plus the concrete in the mould.

The frequency of vibration for the table operating at its maximum load capacity shall be between 3000 to 6000 cycle per minute. The vibration acceleration of the table operating at its maximum load capacity shall not be less than four times the acceleration due to gravity. The minimum frequency of the table under loaded state for determining the acceleration shall not be less than 3000 cycles per minute.

The reduction in amplitude of the table while operating from 'zero load' to full load condition shall not exceed 25%.

A source for giving copious water, required for mixing, casting and curing concrete shall be provided at the Contractor's cost. Sufficient numbers of steel moulds of required size with necessary base plates shall be procured by the Contractor.

The payment shall be for finished work and the payment includes all materials, equipment, machinery, casting yard and all other inputs including water supply etc. complete.

5.12.6.2 CASTING AND CURING

Prior to the batching operation, steel moulds and base plates shall be cleared of all dirt and well oiled on all surfaces and kept ready for placement of concrete. The table vibrator and concrete mixer should be checked to ensure that they are in working condition. Cement, sand and aggregate shall be fed in to the mixer after measuring each volumetrically in required proportion. Required water shall be added while the ingredients are fed into the drum from the hopper. The mixing time shall not be less than two minutes and unloading of the mixed concrete to the platform shall be done only after the steel mould and the table vibrator are ready to receive concrete. The concrete shall be laid in the oiled steel moulds and vibrated using vibrating table with a frequency of not less than 3000 cycles per minute and the vibrating time shall not generally be less than 20 minutes for 10 sqm of slab of size of 5 cm thick and 30 minutes for 10 sqm in the case of 7.5 cm thick slab.

After the specified vibration period is completed, the slab shall after finishing the top surface be allowed to cure under polythene sheet of wet sack for 24 hours. After the lapse of 24 hours the slabs shall be cured in curing ponds for 7 days. Before placing the slab in the curing ponds care shall be taken to finish the top surface smooth and after 7 days of immersed curing under water, the slabs shall be cured

with sprinkling water for next 21 days covering the slab with straw, gunny etc., for keeping the surface always moist.

(iii) LAYING OF SLABS

The slabs shall be removed to the canal site for lying only after they are cured for the prescribed period. While loading, transporting and unloading at the site, care shall be taken to prevent any damage to the slab. Slabs which are with rough damaged surfaces or with broken corners or cracks or with irregular edges shall not be allowed to be used in lining.

The laying slab shall be commenced after completing the preliminary works namely preparing the bed construction of model sections or templates, trimming the surface to the bottom line of lining as specified in paragraph 7.12.2 and 7.12.3.

The slabs shall be laid on finished surface true to line and grade using model sections as a guide starting from the bottom layer, the joints shall be filled in with cement mortar of mix 1:3 to the full depth of joint, the width of the joint shall not exceed 12 mm. The joint should be flush pointed in cement mortar 1 :3. Curing shall be done for a period not less than 14 days. Any portion of the work not in line or grade, joints not packed with mortar and not cured for the prescribed period shall be removed and redone at the Contractor's cost.

(D) MEASUREMENT AND PAYMENT

The measurement for the toe wall will be in cubic meter in the case of toe wall built cement concrete blocks. The lining work slabs be measured in square meter.

The unit price bid in the bill of quantities shall include cost of all materials including water, labour and charges for manufacture conveyance, laying furnishing, and casting. Payment shall be made at unit price in the bill of quantities including manufacture and laying of slabs etc. complete.

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CHAPTER - 6

FINE DRESSING AND TURFING

6.1 DESCRIPTION

This work shall consist of supplying and laying live sods on the slope and other locations as ordered by the Engineer in accordance with the following specifications.

6.2 MATERIALS

The sods shall consist of a dense well rooted growth of permanent and desirable grasses. Indigenous to the general locality where it is to be used, and shall be practically free from weeds or undesirable grasses. At the time the sods is out. The grass on the sod shall have a length of approximately 2 inches (if longer, the grass shall be cut to approximately this length and the sod shall have been raked from debris.

The sod shall be cut in uniform strips cot larger than it is convenient for handling and transport. The thickness of the sod shall be as uniform as possible approximately ¾ inch or more depending on the nature of the sod, so that practically all of the dense root system of the grasses will be retained but exposed in the sod strip and so that the sod can be handled without undue tearing or breading.

In the event the sod which is to be cut is in a dry condition, so as to cause crumbling or breaking during cutting operations, the contractor at his own expense, shall at least 12 hours before cutting the sod, apply water to the same in sufficient

quantity to provide a well moistened condition of the sod to the depth to which it is to be cut.

Top soil of the area to be turfed shall consist of soil adapted to the sustenance's of plant life.

6.3 CONSTRUCTION METHOD

6.3.1 PREPARATION OF THE EARTH BED

All areas desired to be covered with sod shall be fine dressed to required contour, to an extent such that the finished work after laying sod with necessary top soil incorporated in the bed will be in accordance with required lines, grades, slopes and cross section.

The area to sodden shall be free from stones, roots or other undesirable foreign materials. The soil of the area to be sodden shall be loosened to a depth of approximately not less than and top soil shall be spread evenly over the prepared bed to a depth of 2 inches and the clods and lumps shall be broken down to provide a uniform texture to the soil.

6.3.2 PLACING THE SOD

The earth bed upon which the sod to be placed shall be moistened to the depth, manipulated, if naturally not sufficiently moist, and the sod after the same has been cut and shall be properly protected and sprinkled with water until placed be laid in horizontal strips beginning at the bottom of the slopes and working onwards, when placing sods the length to the strips shall be laid at right angles to the direction of flow of water. Sods shall be laid so that the joints caused by abutting ends of sods strips were not continuous, each sod strip shall be so laid to about against the strip previously laid.

As the sod is being laid shall be firmly and lightly tamped with suitable wooden or metal tampers to press the sod into the underlying soil. After tamping, the sod shall present a smooth even surface free from bumps or depressions, at such point. Where water will start flowing over a sodden area the upper edge of the sod strip shall be turned into the soil and layer of earth placed over this, which earth shall be thoroughly compacted to conduct the surface water over the upper edge of the sod. No sods shall be laid during the dry months of March to July.

6.3.3 WATERING

The sod shall be thoroughly watered immediately after placing and shall be kept thoroughly wet for a period of at least seven days after laying and shall be maintained in a satisfactory condition.

6.4 METHOD OF MEASUREMENT AND PAYMENT

Measurement of turfing shall be made after full and satisfactory growth of the turfing. The unit and price shall contain all the specification as mentioned in the tender schedule.

Sod shall be measured by units of 100 square meters and will be paid for at the contract unit price of 100 square meter/ square meter of sod in place which shall include all operation for preparing the earth bed, for furnishing, placing, top dressing and watering the sod and for all labour, equipment, tools and incidentals necessary to complete the work in accordance with contract.

CHAPTER -7

OTHER ITEMS

7. 1. WEEP HOLES

Providing weep holes and placing in position 10 cm dia Asbestos Cement pipes with non-corroding jalli as per design and drawings.

7.2. 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 a channel so formed slabbed over with stones/ concrete lintels not less than 150 mm and each side including centring 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 of 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.

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