



GOVERNMENT OF ODISHA  
DEPARTMENT OF WATER RESOURCES

**TENDER DOCUMENT**  
**(TECHNICAL BID)**  
**(COVER-I)**

**FOR THE WORK**

**Improvement to Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project.**

**ADDITIONAL CHIEF ENGINEER**  
**ANGUL IRRIGATION CIRCLE, ANGUL**

**GOVERNMENT OF ODISHA**  
**DEPARTMENT OF WATER RESOURCES**  
**OFFICE OF THE ADDITIONAL CHIEF ENGINEER**  
**ANGUL IRRIGATION CIRCLE, ANGUL, ODISHA**  
Pin – 759143

email : [aceangulirrigationcircle@gmail.com](mailto:aceangulirrigationcircle@gmail.com)

**Government of Odisha “e” PROCUREMENT NOTICE**  
**Bid Identification No. ACEAIC- 02/2026-27**

Sl. No.	Name of work	Cost of Work	Class of Contractor	Period of completion	Date and Time of availability of bid document in the portal	Last date/time for receipt of bid in the portal	Name & Address of the Officer Inviting Bid
01	Improvement to Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project.	Rs.268.61 lakh	“A” & “B”	08(Eight) Calendar Months including rainy season	23.06.2026 at 10.00 AM	07.07.2026 up to 5.30 PM	Additional Chief Engineer, Angul Irrigation Circle, Angul

Further details can be seen from the e-Procurement Portal <http://tendersodisha.gov.in>.  
Any corrigendum/ addendum/cancellation will be displayed in the **Govt.Website only**.

# CONTENTS

SECTION	ITEMS	PAGE NO.
SECTION-1	NIT & DETAILED TENDER CALL NOTICE	04-20
SECTION-2	INFORMATION & INSTRUCTION TO TENDERERS	21-34
SECTION-3	GOVERNMENT GUIDELINES	35-93
SECTION-4	GENERAL RULES AND DIRECTIONS	94-98
SECTION-5	CONDITION OF CONTRACT	99-131
SECTION-6	TECHNICAL SPECIFICATIONS	132-202
SECTION-7	FORMS	203-215
SECTION-8	DRAWINGS	216-220

# **SECTION-1**

**NOTICE INVITING TENDER (N.I.T.)**

**&**

**DETAILED TENDER CALL NOTICE**



**GOVERNMENT OF ODISHA**  
**DEPARTMENT OF WATER RESOURCES**  
**OFFICE OF THE ADDITIONAL CHIEF ENGINEER**  
**ANGUL IRRIGATION CIRCLE, ANGUL, ODISHA**  
pin – 759143 ,email :[aceangulirrigationcircle@gmail.com](mailto:aceangulirrigationcircle@gmail.com)  
**Government of Odisha “e” PROCUREMENT NOTICE**  
**Bid Identification No. ACEAIC- 02 /2026-27**

The Additional Chief Engineer, Angul Irrigation Circle, Angul on behalf of Governor of Odisha invites on-line percentage rate tenders in double cover system through e-procurement for execution of the works noted below. The bid should be submitted by eligible class of contractors as mentioned below registered with State Government & contractors of equivalent grade / class registered with Central Government / MES / Railway to be eventually drawn in P-1 form through On-line in the Govt. website [www.tendersodisha.gov.in](http://www.tendersodisha.gov.in). The bidders should have necessary portal enrolment (with own digital signature certificate). The registered bidders outside Odisha state can also participate in this on-line tender process after necessary portal enrolment but shall have to subsequently undergo registration with appropriate authority of the state government within a month of acceptance of bid. The bidders registered outside the state are required to submit an undertaking in the form of an affidavit, that they are not registered under the GST Act in the state of Odisha as they have not started any business in the state and they have no liabilities under the Act. But, the successful bidder registered out side the state has to produce GST Clearance Certificate in the form GST before signing of agreement.

SL No.	Bid Identification No.	Name of the work	Value of Work (Excluding GST)	EMD/Bid Security (Rs.) (On-line)	Cost of Bid Document (Rs.) (On-line)	Class of Contractor	Period of Completion
1	2	3	4	5	6	7	8
1	ACEAIC-02 /2026-27	Improvement to Canal Service Road of Angul Main Canal from RD 0.00Km to 5.00Km of Derjang Irrigation Project.	Rs. 2,27,23,716/-	2,27,237.00	10,000/-	“A” & “B”	08(Eight Calendar Months including rainy season)
2		Improvement to Approach road to Dam from NH-55 & Balance portion of Dam toe Road (RD 2405 m to 3750m) of Derjang Irrigation Project.	Rs. 2,06,05,380/-	206054.00	10,000/-	“A” & “B”	08(Eight Calendar Months including rainy season)
3		Improvement to Canal Service Road of Khalari distributary in between RD 00 km to 4.00km, Godisahi Minor from RD 0.88 Km to 1.70 Km, Nuagaon Minor in between RD 199m to RD 796m of Derjang Irrigation Project.	Rs. 2,44,21,979/-	244220.00	10,000/-	“A” & “B”	08(Eight Calendar Months including rainy season)
04		Improvement to Canal Service Road of Dangapal Minor from RD 00m to RD 3400m, Aunli main canal from RD 4372m to RD 4656m of Aunli Irrigation Project.	Rs. 2,39,69,034/-	239690.00	10,000/-	“A” & “B”	08(Eight Calendar Months including rainy season)

SL No.	Bid Identification No.	Name of the work	Value of Work (Excluding GST)	EMD/Bid Security (Rs.) (On-line)	Cost of Bid Document (Rs.) (On-line)	Class of Contractor	Period of Completion
1	2	3	4	5	6	7	8
05	ACEAIC-02/2026-27	Improvement to Right Service Bank Road of Sapua Link Channel from RD 2.100 Km to RD 5.330 Km of Sapua Badjore Irrigation Project.	Rs. 2,53,32,451/-	253325.00	10,000/-	“A” & “B”	08(Eight Calendar Months including rainy season)
06		Improvement of Inspection Road of Left Main Canal from RD 5860m to RD 10290m, Manarbeda Distributary, Belpunji Branch Canal and Tainsar Minor of Manjore Irrigation Project.	Rs. 2,44,28,528/-	244285.00	10,000/-	“A” & “B”	08(Eight Calendar Months including rainy season)
07		Improvement to Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project.	Rs.2,68,61,256/-	2,68,613.00	10,000/-	“A” & “B”	08(Eight) Calendar Months including rainy season

2. **E.M.D. & Cost of Tender Document** required: The bidder shall transfer the EMD and Cost of Bid Document On-line as mentioned for the specified work in Column 5&6 in the above table through a process as mentioned in DTCN.
3. **Mode of Submission of Tenders:** Tender should be submitted online in [www.tendersodisha.gov.in](http://www.tendersodisha.gov.in)
4. **Availability of Tender for Online Bidding :** **From 10.00 A.M. of Dt.23.06.2026 to Dt. 07.07.2026 up to 5.30 P.M.**
5. **Date & Time for Opening of Technical Bid :** **Dt.08.07.2026 at 11.30 A.M. in the O/O the Additional Chief Engineer, Angul Irrigation Circle, Angul.**
6. The bid must be accompanied with required **EMD/Bid Security and Cost of Tender Documents** specified for the work in Col. 5 and 6 of the table above through **ONLINE** mode only. The bidder shall transfer the required amount through electronic payment mode like Internet Banking/ NEFT/RTGS of designated banks (SBI/ICICI Bank/HDFC Bank) and their Aggregator Banks as per *Works Dept. Office Memorandum No. 17254 /W Dt.05.12.2017*. Only those bidders who successfully remit the EMD/Bid Security and cost of tender documents 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. The Tender Inviting Authority, State Procurement Cell, NIC, the designated Banks shall not be held responsible for such pendency or failure.
7. The bidders exempted from payment of EMD will be able to participate in the tender directly by uploading EMD Declaration towards their eligibility for such exemption. Schedule Caste/Schedule Tribe Contractors desiring to avail price preference as per relevant Govt. Circulars are required to submit an Affidavit to that effect. The bidders must upload all the documents in **PDF** format.
8. Bid document consisting of qualification, information and eligibility criteria of bidders, plans, specification and schedule of quantities along with rates of the works are available in web-site [www.tendersodisha.gov.in](http://www.tendersodisha.gov.in) and the set of

terms and conditions of contract and other necessary documents can be seen in the web-site till last date of availability of tender online for bidding.

9. The bids for the works shall remain **valid for a period of 90 days** from the **last date of receipt of bids**. If any bidder / tenderer withdraws his bid / tender before the said period or makes any modification in the terms and conditions of the bid, the EMD deposited at the time of submission of tender shall stand forfeited.
10. Additional Performance Security (As per Works Department OM No.173 dt.03.01.2026) shall be obtained from the bidder when the bid amount is less than estimated cost put to the 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 Additional Performance Security as per the following rate.  
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 additional to 1% of the bid price and this additional performance guarantee percentage shall be applied on the bid price.
  - (IV) The additional performance guarantee percentage shall be rounded off to the next lower percentage based on whether the decimal point of the percentage of bid price is below 0.5% or next higher percentage based on whether the decimal point of the percentage of bid price is 0.5% or more.
  - (V) The additional performance security shall be treated as part of the performance security.
  - (VI) Justification for abnormally low bids shall be scrutinized by the Departmental Technical Committee and recommended to the competent authority of the Administrative Department for the approval of the Additional Performance Security (APS). An abnormally low bid is one in which the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the contract at the offered price. Procuring Entity may, in such cases, seek written clarifications from the Bidder, including detailed price analyses of its Bid price in relation to scope, schedule, resource mobilization, allocation of risks and responsibilities, and any other requirements of the bid document. If, after evaluating the price analyses, the procuring entity determines that the Bidder has substantially failed to demonstrate its capability to deliver the contract at the offered price, the Procuring Entity may reject the Bid/Proposal. However, it would not be advisable to fix a normative percentage below the estimated cost, which would automatically be considered as an abnormally low bid.

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

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

The Additional Performance Security (APS) shall be in shape of National Savings Certificate/Post Office Savings Bank Account/Post Office Time Deposit Account / Kishan Vikash Patra / Deposit Receipt of any Nationalized/ Scheduled Bank duly **pledged in favour of the Superintending Engineer, Angul Irrigation Division, Angul** within **seven days** of issue of Letter of Acceptance (LoA) by the Division Officer (by e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled. Further proceeding for blacklisting shall be initiated against the bidder. If the APS is submitted in shape of Bank Guarantee by the bidder. then the validity of the Bank Guarantee should be for a minimum period equal to the period allowed for completion of the work plus defect liability period of one year and one month extra for transaction period.

11. The Technical Bid Document consisting of qualification information and eligibility criteria of bidders, plans, specification etc. and the Financial Bid consisting of the Bill of Quantities (BOQ) of works are available in web-site <https://tendersodisha.gov.in> . The bidder must upload scanned copies of valid Contractor Registration Certificate, GST Registration Certificate, PAN card, No Relation Certificate, Affidavit about the authenticity of documents / Bid Security Declaration / price preference, credentials establishing minimum eligibility criteria etc. in **PDF** format otherwise the bid shall be declared as non-responsive & liable for rejection.
12. The Original documents along with a set of its Xerox Copies against the scanned copy of Affidavit, R.C. (Registration Certificate), GST, PAN and other requisite documents submitted through web-site should be produced in the **O/o the Additional Chief Engineer, Angul Irrigation Circle, Angul for verification on demand after opening of the bid.**
13. Other details including details of Portal Registration, Submission of Bid, Resubmission and Withdrawal of Bid can be seen in the bidding document which is available in web-site [www.tendersodisha.gov.in](http://www.tendersodisha.gov.in).
14. Any addendum / corrigendum /cancellation of above tender will be published in the web-site [www.tendersodisha.gov.in](http://www.tendersodisha.gov.in). The system shall generate a mail to those bidders who have already uploaded their tenders and those bidders if they wish, can modify their tenders.
15. **The authority will not be held responsible for any technical problem/failure of network/ Malfunction or Interruption of server during the schedule dates of online bidding.**
16. The on-line bidder shall digitally sign on all statements, documents, certificates uploaded by him owning responsibility for their correctness/authenticity as per IT ACT 2000. If any of the information is found to be false/fabricated/bogus, his/her EMD/Bid Security shall stand forfeited and his/her registration in the portal shall be blocked and bidder is liable to be blacklisted.
17. The bidder should mention his/her valid **E-Mail Address/Phone No.** in the separate sheet for communication regarding the tender. The date of time of the lottery if required will be intimated to the qualified bidders through their valid **E-Mail Id/ Contact Number** provided in the tender website.
18. All the existing provision of OPWD Code with amendment from time to time will be applicable in deciding the tender. All correspondence regarding the tender process will be communicated by **valid E-mail address** provided in the tender website. All bidders are requested to check their E-mail from time to time regarding the tender. No claim whatsoever will be entertained for non-receipt of communication in hard copy.
19. Engineering contractors who are desirous availing the facility of exemption of EMD is required to submit the affidavit in original to the effect that he has not yet availed the facility for more than 02(two) works during the current financial year. Name of the works and authority to whom the tenders has been submitted must be mentioned in affidavit, failing which , the tender will be liable for rejection. However the original registration license of the Engineering contractor should be produced at the time of opening of tender.
20. Amendment to Para 3.5.18 of OPWD code vol-I & rule-29 of Appendix-IX of OPWD code Vol-II “ The single tender received in 1st call shall be cancelled without opening of the bid & fresh tender will be invited “ as per Office Memorandum No. 16 dt. 01.01.2015 of Works Department Govt. of Odisha and as per “ Works Department O.M. No. 16, dt. 01.01.2015 implies that single tender received in the first call shall be cancelled without opening of bid and in case when more than one tender have been received in the first call and only a single tender is found to be responsive, the same is also liable to be cancelled due to lack of competitive price bidding. (Vide Ir. No. 4410 dt. 19.02.2018 of DOWR & Memo no. 4714 dt. 13.02.2018 of the E.I.C. , W.R., Bhubaneswar.
21. Agreement shall be drawn only after due verification of ISD & APS of the successful bidder. If any fake documents are detected , criminal proceedings will be initiated against the defaulting bidder and action will be initiated for black listing through the license issuing authority.
22. Imposition of penalty in EOT/Deviation in case of complete work will be as per the DOWR Lr. No.699 dt. 07.01.2021.
23. **Authority reserves the right to reject any or all the tenders without assigning any reasons thereof. No tenderer can demand the cause of rejection of his offer.**
24. A bidder can submit only one bid for a particular work, submission of more than one bid by a bidder for a particular work will liable for rejection of all such bids.
25. **Name and Address of the Officer Inviting Bids.**

**Additional Chief Engineer,  
Angul Irrigation Circle, Angul ,Odisha-759143,  
email :[aceangulirrigationcircle@gmail.com](mailto:aceangulirrigationcircle@gmail.com)**

-Sd-

CONTRACTOR

Additional Chief Engineer  
Angul Irrigation Circle, Angul

SUPERINTENDING ENGINEER  
GUL IRRIGATION DIVISION, ANGUL

**GOVERNMENT OF ODISHA**  
**DEPARTMENT OF WATER RESOURCES**  
**OFFICE OF THE ADDITIONAL CHIEF ENGINEER**  
**ANGUL IRRIGATION CIRCLE, ANGUL**  
**At: Hakimpada, PO-Hakimpada,Dist- Angul – 759143**  
**Odisha**  
**email :[aceangulirrigationcircle@gmail.com](mailto:aceangulirrigationcircle@gmail.com)**

**DETAILED TENDER CALL NOTICE**

- 1.** The Additional Chief Engineer, Angul Irrigation Circle, Angul on behalf of Hon'ble Governor of Odisha, invites on-line **percentage rate** tender for the work **“Improvement to Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project”** through website in prescribed form to be eventually drawn on P1 Agreement Form from the Registered contractor of **“ A & B Class”** registered under Water Resources, Works and other Departments of Govt. of Odisha. C.P.W.D., Railway or military Engineering Services, Air and Naval or other State Govt., Govt of India, Central Govt. undertakings are also eligible to tender for the work. This invitation for Bids is open to eligible bidders who are registered in the portal. Successful Bidders registered under other state Govt. / CPWD / MES / Railway, Air & Naval has to register under State PWD before signing of the Agreement within a month of acceptance of bid.
- 2.** The tender documents can be downloaded from the website identified as <http://tendersodisha.gov.in> from **23.06.2026 at 10.00 A.M to 07.07.2026 upto 5.30 P.M.** The bidder for participation in online bidding will have to remit online Rs.10,000/-(Rupees ten thousand) only for each set. The Bid will be received through e-procurement portal from **23.06.2026 at 10.00 A.M to 07.07.2026 upto 5.30 P.M.** Each set of bid document contains Technical Bid (Cover-I) and Price Bid (Cover-II) i.e. an intelligent bill of quantity in MS Excel format. The cover-I bid will be opened on **08.07.2026 at 11.30A.M in the O/o Additional Chief Engineer, Angul Irrigation Circle, Angul** in presence of the tenderer or their authorized agents. The bidders who participated in the on-line bidding can witness opening of the bid from any system logging on to the portal away from opening place. The bids can only be opened by the pre-designated officials only after the opening time mentioned in the bid. In the event of the specified date of bid opening being declared a holiday the bid will be opened at the appointed time and location in the next working day.
- 3.** The value of the work tendered for is **Rs.2,68,61,256/-**
- 4.** The bidders shall prepare the documents and upload the scanned typed document in PDF format and BOQ in excel format (or as specified in the portal) in appropriate place.
- 5.** No tenderer will be permitted to furnish their tender in their own manuscript.

## 6. EMD/ BID SECURITY DEPOSIT

(a) The bid must be accompanied with the EMD / Bid Security shall transfer **online** specified for the works in the table Col- 05 above as part of its bid through process as mentioned in the DTCN.

(b) The bids without “EMD / Bid Security” will be summarily rejected. **Engineer contractor** who wants to avail EMD Exemption shall have to furnish scan copy of affidavit. **SC/ST contractors** desires of availing benefit as per Works Department **Resolution No. 16262 dated 30.10.2018 (Item No.1)** must submit affidavit for the same.

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

### 1. (a) **Providing facilities to the Engineer contractor**

- i) As per works Department No.FR-11/2001/10003/00 Bhubaneswar dtd 24.5.01, 5% price preference allowed to the Engineer contractor in the tender rates has been withdrawn.
  - ii) The Engineer contractor shall have to execute the work if awarded to him under his direct supervision and he will not be allowed to execute such work through his Power of Attorney Holder.
- (b) Adjustment of earnest money given with other tenders previously and submitted in other tenders shall not be entertained.
- (c) Engineering Contractor desirous to avail EMD exemption have to submit affidavit with uploading the same in the e-procurement portal declaring therein to the effect that they have not yet availed 2 (two) nos. of EMD exemption during the financial year 2026-27 and to show the original registration certificate to the tender inviting authority as and when required for confirmation.

### 2. **The EMD will be forfeited in any of the following cases.**

- a) If the bidder withdraws the bid after bid opening during the period of bid validity.
- b) If the bidder does not accept the correction of the bid price.
- c) In the case of a successful bidder if the bidder fails within the specified time limit to
  - (i) Sign the agreement or
  - (ii)Furnish the required performance security.
- d) If any of the statements, documents, certificate uploaded by the bidder through e- procurement portal, is found to be false / fabricated / bogus; the bidder will be black listed and his EMD / Bid Security forfeited.

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

8. The tender is to be submitted in two covers. Cover-I(Technical Bid) which is to contain in pdf form, copy of **(i) Valid Original Contractors Registration Certificate (CDMS), (ii) Valid and active GST Registration Certificate, (iii) Original affidavit regarding authenticity of documents, (iv) No relation certificate, (v) Valid & active PAN Card & (vi) Bid Security /EMD in online mode (vii)All other required documents along with the technical bid duly filled-in as per the relevant clauses of this DTCN & NIT and special conditions if any and Cover-II(Financial Bid)is to contain BoQ in (xls) and any other special condition if any specifically mentioned by Officer Inviting Tender. During submission of Bids through the e-Procurement Portal, the bidder shall only submit single copy of the document. He is required to check the documents uploaded with the requirement asked for in the bid. Only after satisfying that all the documents have been uploaded, he should activate submit button. His bids shall not be considered responsive and action as per relevant clause shall be taken if he does not provide the required**

documents or provided illegible document. Clarity of the document may be ensured by taking out a sample printing.

9. The bidder can seek clarification on the bids as per mentioned date to the deadline for submission of bid from the authority inviting tender (AIT) and **Superintending Engineer, Angul Irrigation Division, Angul**. The AIT's response will be forwarded through the e-mail ID of the enquirer.
10. An applicant or any of its constituent partners of whose contract for any work has been rescinded or who has abandoned any work in the last three years having the contracted work is in-complete prior to the date of the bid, shall be disqualified.
11. All charges towards quality control test will be borne by the contractor.
12. The work is to be completed in all respect within 08 (Eight) calendar months from the date of issue of work order.
13. The plans specifications and scope for the work can be seen in the office of the **Superintending Engineer, Angul Irrigation Division, Angul** during any working days.
14. The tenderers shall carefully study the tentative drawings and specifications applicable to the contract and all documents which form part of the agreement to be entered into by the accepted tenderer and detailed specifications for Odisha and other relevant specifications and drawings which are available with the tender document or with the **Superintending Engineer, Angul Irrigation Division, Angul**.

Complaint at a future date that plans and specifications have not been seen by the tenderers can not be entertained.

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

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

16. Each tenderer must quote a definite percentage excess or less up to **two decimal** of the amount of work which will be included in the contract. Tenders containing indefinite terms such as estimated rates or schedules of rates will not be considered. During submission of Bids through the e- Procurement Portal, an intelligent Bill of Quantity in Microsoft Excel format shall be made available to the bidder. The bidder shall fill percentage excess or less of the tender amount and should not leave any cell blank. The line item total in words and the total amount shall be calculated by the system and shall be visible to the bidder.
17. The bidder shall submit the documents in the designated locations of technical bid (Cover-I) and Financial bid (Cover-II). Submission of bid documents shall be effected by using DSC of appropriate class and thus shall

be in encrypted form. The bidder shall only submit single copy of the document. He is required to check the documents uploaded with the requirement asked for in the bid. Only after satisfying that all the documents have been uploaded he should activate submit button. His bid shall not be considered responsive and action as per relevant clause shall be taken if he does not provide the required document or provides illegible documents. Clarity of the document may be ensured by taking out a sample printing.

18. All royalties payable, Income taxes & Surcharges as applicable will be borne by the contractor as admissible. It is implied that the quoted rates are inclusive of such elements.
19. Labour Welfare Cess @ 1% will be deducted from the work bill of the contractor as per resolution No. 12653 dt.15.12.2008 of Labour & Employment Department, Government of ODISHA.
20. Request for raising and lowering the rates or dealing with any point in connection with the tender will not be considered.
21. Conditional tenders will not be taken into consideration.
22. The tender containing extraneous conditions not covered by the tender notice are liable for rejection and quotations should be strictly in accordance with the tender call notice. Any change in the wording will not be accepted.
23. During submission of Bids through the e-Procurement Portal, it is allowed to modify the bid. The bidder shall have to log on to the system and resubmit the documents as asked for by the system including the price bid. In doing so, the bids already submitted by the bidder will be removed automatically from the system and the latest bid only will be admitted. But the bidder should avoid modification of bid at the last moment to avoid system failure or malfunction of internet or traffic jam. If the bidder fails to submit his modified bids within the designated time of receipt, the bids already in the system shall be taken for evaluation. During submission of Bids through the e-Procurement Portal, withdrawal of bid is allowed. The bidder must click on the “withdraw” button and record the necessary justification for the same in the space provided. In addition to this, he must write a letter addressed to the Officer inviting the bid and upload the scanned document to portal in respective bid. The system shall not allow any withdrawal after expiry of the closure time of the bid.
24. On **no account** the contract work should be sublet to anybody without the prior approval of the competent authority of the Department. In such an event the contract may be rescinded with penalty as will be deemed proper as per decision of the competent authority.
25. The e-procurement portal system shall reject submission of any bid through portal after closure of the receipt time. For all purpose the portal time displayed in the system shall be the time to be followed by the bidder.
26. All tenders received will remain valid for 90 days from the last date mentioned for receipt of tenders (online) and validity of tenders can also be extended if required without any monetary compensation.
27. **No Relation Certificate**

The contractor shall have to furnish certificate alongwith the tender to the effect that he is not related to any officer in the rank of an Assistant Engineer and above in the State P.W.D. or Under Secretary and above in the Water Resources Department., If the fact subsequently proved to be false the contract will be rescinded. The earnest money and the total security will be forfeited and shall be liable to make good the loss or damage resulting from such cancellation.

28. While determining the validity of tenders the following points shall be taken into consideration by the authority empowered to accept tenders and his decision in the matter shall be final.

- (a) Any special condition which does not find place in the tender notice and which are not acceptable.
- (b) In definite conditions which will make it difficult for access to the financial implications.
- (c) Tenders being incomplete in some important respects.
- (d) Incomplete schedule of time for completion of the work.
- (e) Failure to furnish the specified bid security.
- (f) Tendered rates being unduly low and unworkable.
- (g) Rates in different items of a tender being irrational.

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

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

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

The time and venue of the lottery shall be intimated to the respective bidders through their e-mail only. No other communication in this regard will be made.

32. The tenderer whose tender is selected for acceptance shall within a period of seven days upon intimation being given to him of acceptance of his tender make an Initial security deposit @ 2% of the accepted tender amount in shape of NSC /Post Office Savings Bank Account / Post Office Time Deposit Account / Kisan Vikas Patra / Bank Guarantee in favour of **Superintending Engineer, Angul Irrigation Division, Angul** from any Nationalised / Schedule 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 and sign agreement in the P.W.D. form No.P1 (Schedule XLV No.61) for the fulfillment of the contract in the office of the **Superintending Engineer, Angul Irrigation Division, Angul, District– Angul,Odisha.**

The security deposit of Initial Security money according to the provision of P1 agreement shall be retained as Security for the due fulfillment of this contract. Failure to enter into the required agreement and to make the security deposit as above shall entail forfeiture of the earnest money. The written agreement to be entered into between the contractor and the Govt. shall be the foundation of the rights of both the contractor and the Govt. and the contract shall be deemed to be incomplete until the agreement has first been signed by the contractor and then by the proper officer authorized to enter into the contract on behalf of the Govt. The bids of the technically qualified bidders will be opened for evaluation of the price bid.

**Additional Performance Security (As per Works Department OM No.173 dt.03.01.2026 & clarification vide Letter No.632 dt.09.01.2026)** shall be obtained from the bidder when the bid amount is less than estimated cost put to the 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 Additional Performance Security as per the following rate.

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 additional to 1% of the bid price and this additional performance guarantee percentage shall be applied on the bid price.
- (IV) The additional performance guarantee percentage shall be rounded off to the next lower percentage based on whether the decimal point of the percentage of bid price is below 0.5% or next higher percentage based on whether the decimal point of the percentage of bid price is 0.5% or more.
- (V) The additional performance security shall be treated as part of the performance security.
- (VI) Justification for abnormally low bids shall be scrutinized by the Departmental Technical Committee and recommended to the competent authority of the Administrative Department for the approval of the Additional Performance Security (APS). An abnormally low bid is one in which the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder to perform the contract at the offered price. Procuring Entity may, in such cases, seek written clarifications from the Bidder, including detailed price analyses of its Bid price in relation to scope, schedule, resource mobilization, allocation of risks and responsibilities, and any other requirements of the bid document. If, after evaluating the price analyses, the procuring entity determines that the Bidder has substantially failed to demonstrate its capability to deliver the contract at the offered price, the Procuring Entity may reject the Bid/Proposal. However, it would not be advisable to fix a normative percentage below the estimated cost, which would automatically be considered as an abnormally low bid.

The applicable Additional Performance Security (APS) shall have to be furnished by the successful bidder in shape of Term Deposit Receipt pledged in favour of **Superintending Engineer, Angul Irrigation Division, Angul** / Bank Guarantee in favour of the **Superintending Engineer, Angul Irrigation Division, Angul** from any Nationalised/ Scheduled Bank in India counter guaranteed by its local branch at Bhubaneswar within seven days of issue of Letter of Acceptance (LoA) by the **Superintending Engineer, Angul Irrigation Division, Angul** (by e-mail) to the successful bidder otherwise the bid of the successful bidder shall be cancelled. Further, proceeding for blacklisting shall be initiated against the bidder. (*Vide Office Memorandum No-14459/WE dated.20.09.2018 of Works Department, Govt. of Odisha*).

The security will be refunded after one year on completion of the work in all respect provided the final bill is passed and will not carry any interest. Any defect noticed during the period of one year after the actual date of completion shall be rectified by the contractor at his own cost. Failure to comply such rectification the cost involved to carry out the defective work shall be met from his dues available with Department. (Ref. works Deptt order No.17823/WE dt. 11.10.2006. The e-procurement portal system shall generate the award of the contract letter and intimate the bidder in his e-mail after acceptance of the tender.

33. 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 in case of failure on the part of the agency to achieve the milestone liquidated damage will be imposed.
34. The contractor shall sign as a token of final acceptance of the plans, sections and agreements for the work prior to take up the work for execution.
35. The date of commencement of work shall be as notified in work order.
36. On signing the agreement the site will be handed over to the contractor for execution and completion of works in all respect.
37. The authority reserves the right to make such increase or decrease in quantity of items of works mentioned in the scheduled attached to the tender notice as may be considered necessary for the satisfactory completion of the contract work. All such increase or decrease shall in no way invalidate/vitiate the contract rates. The contractor shall not be entitled for any compensation on this account, except grant of extension of time where considered necessary.
38. The work may be splitted up and distributed among several contractors if considered necessary on the exigency of the circumstances of the work and the contractor is not entitled to any compensation on this account.
39. That for the purpose of jurisdiction in the event of any dispute if any, the contract would be deemed to have been entered into within the State of Odisha and it is agreed that neither party to the contract will be competent to bring a suit in regard to the matter by this contract at any place outside the State of Odisha.
40. Under section-12 of contract labour (Regulation and Abolition Act 1970) the contractor who undertakes execution of work through labour, should produce valid license from licensing authority of labour department (labour license) to start the work.
41. The contractor shall be liable to fully indemnify the Department of any compensation under workmen compensation Act VII of 1993 on account of the workmen employed by the contractor and full amount of compensation paid will be recovered from the contractor. In the event of any claim sub-judice before any court of law, the claim amount shall be kept withheld till final disposal.
42. Contractor is required to abide by the fair wages clauses as introduced by Govt. of Odisha and will not pay less than the Fair wages fixed by Govt. to the labourers engaged by him for the work.
43. In case of any complaint by the labourer about the non payment of his wages as per latest minimum wages Act., the Superintending Engineer will have the right to investigate and if the contractor is found to be at fault,

Superintending Engineer may recover such amount due in any form from the contractor and pay such amount to the labourer directly under intimation to the local labour office of the Govt. The decision of the Superintending Engineer is final and binding on the contractor.

44. The contractor will have to submit the monthly return of labour both skilled and unskilled employed by him on the work site **to the Superintending Engineer, Angul Irrigation Division, Angul,**
45. The contractor should keep himself in touch with the Engineer-in-charge for smooth execution of the work and arrange adequate labour depending on the workload and working space available. No claim for detention for labour on any account will be entertained.
46. No compensation will be paid by the Department for any damage done by rain, flood, cyclone & earthquake tide or by any other natural calamities during the execution of the work.
47. It should be understood clearly that no claim whatsoever will be entertained in regard to extra items of work or extra quantity of any item besides estimated amount, unless written order is obtained from the Engineer-in-charge and rates settled before the extra items of work or extra quantity of any item of work is taken up.
48. The tenderer shall bear various incidentals, sundries and contingencies necessitated by the work in full within the following or similar category.
49. Rent, royalties and other charges of materials & all other taxes including ferry tolls, conveyance charges and other cost on account of land and buildings including temporary building and temporary electric connection to work site as well as construction of coffer dam, construction of service road, diversion road and its maintenance till completion of work required by the tenderer for collection of materials, storage housing of staff other purpose of the work will be paid by the contractor. No tenderer will however be liable to pay for temporary occupation of land owned by Govt. at the site of the work. GST on works contract as applicable at the time of payment of R/A bill shall be paid extra over the gross amount of R/A bill.
50. Labour camps or hutments including conservancy and sanitation arrangements upto the satisfaction of the local health authorities should be arranged by the contractor.
51. Suitable water supply including pipe water supply wherever available for the staff and labour as well as for the work.
52. Fees and duties levied by the municipal canal or water supply authorities.
53. Suitable equipment and wearing apparatus for the labour engaged in risky operations and medical aid to the labourer engaged for the work.
54. Suitable fencing, barriers, signals including paraffin and electric signals where necessary at work and approaches in order to protect public and employees from accident.
55. Compensation including cost of any suit for injury to persons or property due to neglect of any major precautions also become payable due to operation of the workmen compensation Act.
56. The contractor has to arrange adequate lighting arrangement for the work wherever necessary at his own cost.
57. In case of delay in acquisition of land handing over possession of work site no compensation will be admissible but extension of time will be allowed if applied in prescribed format within due time to keep the contract in force.
58. Over and above these conditions including the Technical specifications the terms, conditions, rules and regulations and specifications laid down in I.S.I. code are also binding on the part of the contractor.
59. Deduction of income tax at source and surcharge on income tax will be made from each running account bill for the work at the rate as per Income Tax Act and as amended from time to time. (Present rate 2% + surcharge)
60. (a) The rates quoted by the contractor shall be deemed to be exclusive of GST on all the materials that he will have to purchase for performance of this contract.

61. The rates quoted by the contractor in the tender for works shall exclusive of GST that may be levied on turnover on works contract according to the Laws and Regulations as applicable from time to time.
62. Deduction of GST at source will be made from each running account bill for the work at the rate of 2% prescribed by Odisha Goods & Service Tax Act-2017 or amended from time to time.
63. 1 % (One percent) of the gross amount of the bill will be deducted from the contractor bill towards labour cess as per Odisha building and other construction workers (RE & CS) rules 2002 and Amendment during 2008 and as amended by Govt. from time to time.
64. The amount on royalties of different materials as utilized by the contractor in the work will be recovered from his bill, basing on the rate fixed by the Govt. or as amended from time to time during the period of execution.
65. Schedule of quantity accompanies the tender notice: It shall be definitely understood that the Government do not accept any responsibility for the correctness and completeness of this schedule and this schedule is liable for alternations or omissions, deductions or additions as set forth in the condition of contract and such omissions, deductions, additions or alternations shall in no way invalidate/ vitiate the contract and no extra monetary compensation will be entertained.
66. Sample of stone, metal, chips, sand, cement, moorum etc to be used are to be deposited noting the quarry under dated initial of the tenderer in the Office of the **Concerned SDO, Derjang-Aunli Irrigation Sub-division, Angul** before the procurement for testing and acceptance. The transportation & testing charges of construction materials will be borne by the contractor.
67. Items of works not covered by the tender notice shall be paid at the current schedule of rates of the State and those not covered by the said schedule of rate will be paid on actual analysis approved by the competent authorities prevailing during the period of execution of work.
68. All preliminary works such as vats, mixing platforms etc are to be done by the contractor at his own cost. No payment will be made for benchmarks, level pillars, profiles, benching and leveling the ground where required. The rates to be quoted should be for finished items of works inclusive of such incidental items of works.
69. After the work is finished all surplus materials and debris's should be removed from 100 Mtr. clear away from the site of the work. Preliminary work such as vats, mixing platforms etc. should be dismantled and all materials removed from the site and premises shall be made neat and clean and this is inclusive of the rates quoted by him.
70. The contractor is to supply necessary labour and materials for the purpose of alignment lying recording of levels whenever required at his own cost.
71. The contractor should arrange necessary tools and plants such as Pumps, Excavator, Trucks, compressors, Tippers, batching plants, Concrete Mixer, steel shutter plates etc. required for the efficient execution work at his own cost. The running charges of such plant and cost of consumables and conveyance are to be borne by the contractor. Any deviation from this may lead recession of contract.
72. In the event of delay in supply of design reasonable extension of time shall be granted on the application of the contractor. But no claim for monetary compensation will be entertained under any circumstances.
73. Under no circumstances, interest is chargeable for the dues or any additional dues, if any payable for the work.
74. An affidavit shall be furnished by the contractor at the time of submission of tender paper about the authentication of tender documents. The scanned copy of the affidavit is to be uploaded through the e-procurement portal along with the technical bid. The affidavit in original is to be produced before the officer inviting tender after opening of the tender positively.
75. Prediction of flood/monsoon Damage:  
The contractor shall make his own arrangement at his cost to shift the machineries, equipment's, materials, labourer and departmental machineries if hired by the contractor to a safe place prior to flood. The work shall have to be resumed after the flood come to normal. No extension of time for the completion of the work may be considered by the Department if the discontinuance of the work is beyond the reasonable attempts of the contractor to such eventualities.
76. The debris, sand and other materials, accumulated in the work area during flood shall be removed by the contractor as required for continuing the work at his own cost. By any chance, if any excavated portion that

could not be filled up with concrete by the contractor, gets filled up during the monsoon period with earth such removal will not be paid again. The contractor will have to re-excavate the same at his own cost.

77. It shall be distinctly understood that it is entirely the responsibility of the contractor to make such arrangements may be required from time to time to protect the men, machinery, materials and the work under progress and work for which the measurements were recorded and payment made, against any damages either during working season or during the flood. The department accepts no liability, what so ever for any damage or loss of men, materials, machinery and type of hindrance caused to the progress of work.
78. The contractor should provide at his own cost adequate protection measures to the completed works at the end of working season or work in progress against such eventuality till completion and handing over the entire work to the Department.
79. Dewatering from the foundation of structures when and where necessary during execution will have to be done by the contractor and no extra payment will be made on that account. The rate of respective items of work is inclusive of the dewatering.
80. The term dewatering shall mean the execution or operation of the items due to standing water as well as due to percolation water.
81. No claim for idle labour etc. on any account will be entertained by the Department.
82. The clause of printed form of **P<sub>1</sub> contract** with latest addition/ deletion/ corrections/ substitution etc. will also be binding.
83. **GENERAL INSTRUCTION TO CONTRACTORS as per DoWR letter No.20415 dt.14.09.2015**

- (a) Any agency or contractor executing a work should be aware about the local festivals like Makar Sankranti, Raja Sankranti , Chaiti Parab, Danda Nata or any such festivals which may effect the work schedule. Therefore, the contractor should engage more work forces during working period available at his disposal to complete the work as per schedule.
- (b) In the peak summer season, working hour is curtailed by the Labour Department to avoid exposure to personnel to the scorching sun and heat. It is the duty of the agency to increase the number of work force and to employ the existing work force during morning and afternoon hours as per Government orders.
- (c) Rainfall is a normal occurrence during monsoon in Odisha. So, unless there is unusually heavy rainfall resulting in a declared calamity, the contractor is not eligible for any extension of time. The contractor should plan the deployment of workforce and machinery , so as to complete the work as per schedule considering ordinary vagaries of nature.

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

- (d) The contractor should take up the work with due diligence in the acquired land without waiting for acquisition of entire land. This should be completed in proportionally less period depending on the quantum of available work front.
- (e) The Agency should plan his work programme and mobilize men and machineries considering the canal closure programme of a particular system or area. Khariff / Rabi closure can't be imposed arbitrarily on the farmers as per the convenience of the agency. Closure of canal for the interest of work will be solely at the discretion of the Engineer-in- charge and can't be claimed as a matter of right.
- (f) There will be always be standing crop before harvesting season as per crop schedule and this fact has to be clearly understood by the agency. Extension of time on this ground may not be considered by the Division officer.

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

#### **84. 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 execution, or completion, maintenance of the works or temporary works but does not include materials or other things intended to form or forming part of the permanent work.
- c) Contract – means the instruction and information for tenderers General and Special conditions of the contract, Technical Specification, drawings, tender (including the schedule of quantities and tender prices) the formal agreement and all agenda and attachment related to the above.
- d) Contractor – means the particular person, firm or corporation with whom the contract has been made for executing the work.
- e) Drawing – Means the drawings referred to in the specifications, any modifications of such drawings approved in writing by the **Superintending Engineer, Angul Irrigation Division, Angul** 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.
- k) Year - Means Financial Year.

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

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

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

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

Works Department Memorandum No.16 dt.01.01.2015.

- 89.** Security for the due fulfillment 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 Schedule Bank in India counter guaranteed by its local Branch at Bhubaneswar/e-Bank Guarantee executed on the National-Governance Services Limited (NeSL) Digital Document Execution Portal towards E.M.D/Initial Security Deposit/any other security deposit from the contractor or supplier.

# **SECTION-2**

## **INFORMATION AND INSTRUCTION TO TENDERERS**

## SECTION-2

### **1. Preparation of Tender Documents**

The intending tenderer shall log in to the e-procurement portal identified as <http://tendersodisha.gov.in> and download the technical bid (Cover-I) and price bid (Cover-II) in shape of a bill of quantity in MS Excel format. As per the requirement of the bid document the bidder will fill up the required informations and fill up the percentage in figures on the bill of quantity in MS Excel sheet. The bidder is to scan his registration certificate, GSTIN, PAN Card, Affidavit, No relation certificate and certificate issued by competent authorities required for fulfilling the eligibility criteria specified in the bid document for the work. The bidder is also required to scan the other documents as specified in the bid document.

### **2. Method of submission of Tender Documents**

The tenderer shall upload the scanned copy / copies of the documents and information as per requirement of the bid documents through the e-procurement portal. All documents and scanned copies are to be uploaded in the designated location of the technical bid (Cover-I) except the filled up bill of quantity in excel sheet. The filled up intelligent bill of quantities in Excel format will be uploaded in the designated location of price bid (Cover-II). The bidder is required to upload the required documents in appropriate location of Technical and Financial bid failing which the bid will be rejected. All the uploaded documents should be clear and legible. Before activating the submit button the clarity of the document may be ensured by taking out a sample copy. In the e-procurement tendering system the bidder is required only to submit the required information as per bid document instead of submitting the entire technical bid document. The “online” bidder shall digitally sign on all statements, documents, clarifications uploaded by him owning responsibility for their corrections/ authenticity. **If any of the information furnished by the bidder is found to be false/ fabricated/ bogus, the bidder will be blacklisted.**

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

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

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

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

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

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

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

### **3. Opening of Tender Documents.**

The tender documents (Technical Bid) will be **opened on 08.07.2026 at 11.30A.M** in the office of the **Additional Chief Engineer, Angul Irrigation Circle, Angul** in the presence of tenderers or their authorized representative, who wish to be present.

### **4. DELETED.**

### **5. Final Decision making authority**

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

### **6. Further Clarification**

The **Superintending Engineer, Angul Irrigation Division, Angul / Additional Chief Engineer, Angul Irrigation Circle, Angul** may be contacted during office hours on any working days for any further clarification. Online clarification may also be obtained as per the date line mentioned in the NIT.

### **7. Sample of all material:**

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

8. **Trial Boring** : The foundation level as indicated in the body of the departmental drawing is purely tentative and for the general guidance only. The Department have no responsibility for the suitability of actual strata at the foundation level. The contractor has to conduct his own boring before starting the work and get the samples tested at his own cost to ascertain the S.B.C. and credibility of the strata at founding level. While quoting his rates for tender the contractor shall take in to account of the above aspects.

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

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

11. The tenderer should conduct three bores at each pier and SBC of soil at foundation level and abutments location and furnish the test results in conformity with IRC code at his own cost before execution of the work and rates quoted by the contractor should be inclusive of such bores and SBC tests etc without any extra cost to the Department.

## Procedure to participate in online bidding e-procurement

1. PARTICIPATING IN THE BID IN THE E-PROCUREMENT PORTAL: The Contractor/ Bidder intending to participate in the bid is required to register in the Portal using his /her active personal/ official e-mail ID as his Login ID and attach his/her valid Digital Signature Certificate (DSC) to his/her unique Login ID. The DSC used must be of appropriate class (Class II or Class III) issued from a registered Certifying Authority such as n-Code , Sify, TCS, MTNL etc. He/She has to submit the relevant information as asked for about the firm/ contractor. The portal registration of the bidder/ firm is to be authenticated by the State Procurement Cell after verification of original valid certificates/ documents such as (i) PAN and (II) Registration Certificate (RC)/ GST Registration Certificate and GSTIN (for procurement of goods) of the concerned bidder. The time period of validity in the portal is at par with validity of RC/GST Registration Certificate and GSTIN. Any change of information by the bidder is to be re-authenticated by the State Procurement Cell. After successful authentication bidder can participate in the online bidding process.

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

- a. To log on to the portal the Contractor/Bidder is required to type his/her *user name* and password. *The system will again ask to select the DSC and confirm it with the password of DSC.* For each login, a user's DSC will be validated against its date of validity and also against the Certificate Revocation List (CRL) of respective CAs stored in system database. The system checks the unique ID, password and DSC combination and authenticates the login process for use of portal.
- b. The bidder can download the tender of his choice and save it in his system and undertake the necessary preparatory work off-line and upload the completed tender at his convenience before the closing date and time of submission.
- c. The tender documents uploaded by the Tender Inviting Officer in the website <https://tendersodisha.gov.in> will appear in the section of "Upcoming Tender" before the due date of tender sale. Once the due date has arrived, the tender will move to "Active Tender" Section of the *home page*. Only a small notification will be published in the newspaper specifying the work details along with *mention* of the specific website for details. The publication of the tender will be for specific period of time till the last date of submission of bids as mentioned in the 'Invitation for Bid' after which the same will be removed from the list of Active tenders. Any bidder can view or download the bid documents from the website.

- d. Contractor exempted from payment of EMD will be able to participate in the tender directly by uploading documentary evidences towards his eligibility for such exemption.
  - e. The *software* application has the provision of payment of cost of tender document through payment gateways of *authorized* bankers by directly debiting the account of the bidders.
- Bidders participating through Joint Venture shall declare the authorized signatory through Memorandum of Understanding duly registered and enroll in the portal in the name and style of the joint venture company. It is mandatory that the DSC issued in the name of the authorized signatory is used in the portal.
  - In the case of any failure, malfunction, or breakdown of the electronic system used during the e-procurement process, the tender inviting officer shall not accept any responsibility for failures or break downs other than in those systems strictly within their own control.
  - Any third party/company/person under a service contract for operation of e-procurement system in the State or his/their subsidiaries or their parent companies shall be ineligible to participate in the procurement processes that are undertaken through the e-procurement system irrespective of who operates the system.
  - For submission of Bids through the E-Procurement Portal, the bidder shall upload the scanned copy/copies of document in prescribed format wherever warranted in support of eligibility criteria and qualification information. The online bidder shall have to produce the original documents in support of the scanned copies and statements uploaded in the portal before the specified date as per DTCN.
  - Each bidder shall submit only one bid for one package. A bid is said to be complete if accompanied by cost of bid document and appropriate bid security. The system shall consider only the last bid submitted through the E-Procurement portal.
  - The bidder may ask question related to tender online in the e-procurement portal using his/her DSC, provided the questions are raised within the period of seeking clarification as mentioned in tender call notice/Bid. The Officer inviting the Bid/ Procurement Officer-Publisher will clarify queries related to the tender.
  - The details of drawings and documents pertaining to the works available with the officer inviting the Bid as well as in the office of the Superintending Engineer as mentioned in the Contract Data will be open for inspection by the bidders. The bidder is required to download all the documents for preparation of his bid. It is not necessary for the part of the Bidder to up-load other Bid documents (after signing) while up-loading his bid. He is required to up load documents related to his eligibility criteria and qualification information and Bill of Quantities duly filled in. It is assumed that while participating in the bid, the bidder has referred all the drawings and documents. Seeking any revision of rates or backing out of the bid claiming for not having referred to any or all documents provided in the Bid by the Officer Inviting the Bid will be construed as plea to disrupt the bidding process and in such cases the bid security shall be forfeited.
  - Any addendum / corrigendum/ cancellation of tender shall be published in the website <https://tendersodisha.gov.in>, notice board Only, and such notice shall form part of the bidding documents.

The system generates a mail to those bidders who have already uploaded their tenders and those bidders if they wish can modify their tenders. The bidders are required to check the website till last date and time of bid submission for any addendum/ corrigendum/ cancellation thereof. Tender inviting authority is not responsible for communication failure of system generated mail.

All the volumes/documents shall be uploaded / provided in the portal by the Officer inviting the bid. The bidder shall carefully go through the document and prepare the required documents and upload the scanned documents in Portable Document Format to the portal in the designated locations of Technical Bid. He will fill up the rates of items or percentage in the BOQ downloaded for the work in designated Cell and up loads the same in designated locations of Financial Bid. Bidders are to submit only the original BoQ uploaded by publisher after entering the relevant fields without any alteration/deletion/modification. Multiple BoQ submission shall lead to cancellation of bid. In case of item rate tender, bidders shall fill in their rates other than Zero value in the specified cells. In the percentage rate tender, the bidder quoting Zero value is valid and will be taken as Schedule of Rates. Submission of document shall be affected by using DSC of appropriate class.

2. PAYMENT OF EMD/ BID SECURITY AND COST OF BID DOCUMENTS: The Bidder shall furnish, as part of his Bid, a Bid security for the amount mentioned under DTCN in online mode. Non-submission of bid security within the designated period shall debar the bidder from participating in the on-line bidding system.

The EMD or Bid Security payable along with the bid is 1% of the estimated contract value (ECV) or as mentioned in the bid document.

The tender accepting authority will verify the originals of all the scanned documents of the successful lowest bidder only within 5 days of opening of the tender (price bid). In the eventuality of failure on the part of the lowest successful bidder to procedure the original documents, he will be debarred in future from participating in tender for 3 years and will be black listed by the competent authority. In such as situation, successful L-2 bidder will be required to produce his original documents for consideration of his tender at the negotiated rate equal to L-1 bidder.

Contractor exempted from payment of EMD will be able to participate in the tender directly by uploading documentary evidences towards his eligibility for such exemption.

Government of Odisha has introduced e-payment gateway in to the portal for payment of cost of Bid and Bid Security/ Earnest Money Deposit. The process of using e-payment gateway is mentioned in the “**Procedure for Electronic receipt, accounting and reporting of Cost of Tender Paper and Earnest Money Deposit on submission of bids**”.

FORMAT AND SIGNING OF BID: (Logging to the Portal)-The Contractor/ Bidder is required to type his/her Login ID and Password. The system will again ask to select the DSC and

confirm it with the password of DSC as a second stage authentication. For each login, a user's DSC will be validated against its date of validity and also against the Certificate Revocation List (CRL) of respective CAs stored in system database. The system checks the unique Login ID, Password and DSC combination and authenticates the login process for use of portal.

- 3.1 The bidder can download the tender of his choice and save it in his system and undertake the necessary preparatory work off-line and upload the completed tender at his convenience within the final date and time of submission. The bidder shall only submit single copy of the required documents and Price Bid in the portal. In the Financial bid, the bidder can not leave any figure blank. He has to only write the figures; the words will be self generated. The Bidders are advised to upload the completed Bid document well ahead of the last date & time of receipt to avoid any last moment problem of power failures etc.
- 3.2 The Bidder shall go through the Bid carefully and list the documents those are asked for submission. He shall prepare all documents including Declaration form, price bid etc and store in the system.
- 3.3 The bidder shall log on to the portal with his DSC and move to the desired tender for uploading the documents in appropriate place one by one simultaneously checking the documents. Once the Bidder makes sure that all the documents have been up-loaded in appropriate place he clicks the submit button to submit the bid to the portal.
- 3.4 The bids once submitted can not be retrieved or corrected. Tender cannot be pre-opened and cannot be submitted after due date and time. Therefore only after satisfying that all the documents have been uploaded, the Bidder should activate submit button.
- 3.5 In the e-procurement process each processes are time stamped. The system can identify each individual who has entered in to the portal for any bid and the time of entering into the portal.
- 3.6 The Bidder should ensure clarity of the document uploaded by him to the portal especially the scanned documents by taking out sample printing. Non-submission of legible documents may render the bid non-responsive. However, the Officer inviting the Bid if so desires can ask for legible copies or original copies for verification within a stipulated period provided such document in no way alters the Bidder's price bid. If the Bidder fails to submit the original documents within the stipulated date, his bid security shall be forfeited.
- 3.7 SUBMISSION OF BIDS:-

The bidder shall carefully go through the tender and prepare the required documents. The bid shall have a Technical Bid and a Financial Bid. The Technical bid generally consists of GSTIN, PAN, Registration Certificate, Affidavits and any other information required by OIT. The Financial Bid shall consist of the Bill of Quantities (BOQ) and any other price related information/undertaking including rebates.

Bidders are to submit only the original BOQ ( in .xls format) uploaded by Procurement Officer Publisher (Officer Inviting Tender) after entering the relevant fields without any alteration/ deletion/ modification. Multiple BOQ submission by bidder shall lead

to cancellation of bid. In case of items rate tender , bidders shall fill in their rates other than zero value in the specified cells without keeping it blank. In the percentage rate tender the bidder quoting zero percentage is valid and will be taken at par with the estimated rate of the work put to tender.

The bidder shall upload the scanned copy/ copies of document in support of eligibility criteria and qualification information in prescribed format in Portable Document Format (PDF) to the portal in the designated locations of Technical Bid.

- a. The bidder shall write his name in the space provided in the specified location in the Protected Bill of Quantities (BOQ) published by the Officer Inviting Tender. The bidder shall type rates in figure only in the rate column of respective items(s) without any blank cell in the rate column in case of item rate tender and type percentage excess or less upto two decimal place only in case of percentage rate tender.
- b. The bidder shall log on to the portal with his/ her DSC and move to the desired tender for uploading the documents in appropriate place one by one simultaneously checking the documents.
- c. Bids cannot be submitted after due date and time. The bids once submitted can not be viewed, retrieved or corrected. The Bidder should ensure correctness of the Bid prior to uploading and take print out of the system generated summary of submission to confirm successful uploading of bid. The bids cannot be opened even by the OIT or the Procurement Officer Publisher/opener before the due date and time of opening.
- d. Each process in the e-procurement is time stamped and the system can defect the time of login of each user including the Bidder.
- e. The Bidder should ensure clarity/legibility of the document uploaded by him to the portal.
- f. The system shall require all the mandatory forms and fields filled up by the contractor during the process of submission of the bid/tender.
- g. The bidder should check the system generated confirmation statement on the status of the submission.
- h. The bidder should upload sufficiently ahead of the bid closure time to avoid traffic rush and failure in the network.
- i. The Tender Inviting Officer is not responsible for any failure, malfunction or breakdown of the electronic system used during the e-procurement process.
- j. The Bidder is required to upload documents related to his eligibility criteria and qualification information and Bill of Quantity duly filled in. It is not necessary for the part of the bidder to upload the drawing and the other Bid documents (after signing) while uploading his bid. It is assumed that the bidder has referred all the drawings and documents uploaded by the Officer Inviting the Bid.
- k. The Bidder will not be able to submit his bid after expiry of the date and time of submission of bid (server time). The date and time of bid submission shall remain unaltered even if the specified date for the submission of bids declared as a holiday for the Officer Inviting the Bid.

l. Seeking any revision of rates for backing out of the bid claiming for not having referred to any or all documents provided in the bid by the officer inviting the bid will be construed as plea to disrupt the bidding process and in such cases the bid security shall be forfeited.

m. The 'Online bidder' shall digitally sign on all statements documents, certificates uploaded by him, owning responsibility for their correctness/ authenticity as per IT ACT 2000. If any of the information furnished by the bidder is found to be false/ fabricated/ bogus, his EMD/BID Security shall stand forfeited and his registration in the portal shall be blocked and the bidder is liable to be blacklisted.

#### **4 SECURITY OF BID SUBMISSION:**

All bid data uploaded by the Bidder to the portal will be encrypted by the DSC of the opener(s). The system shall require all the mandatory forms and fields filled up by the contractor during the process of submission of the bid/tender.

The Bid shall be received in encrypted format by the system which can only be decrypted /opened by the authorized openers only on or after the due date and time.

#### **5 DEADLINE FOR SUBMISSION OF THE BIDS:**

The online bidding will remain active till the last date and time of the bid submission. Once the date and time (Server date and time) is over, the bidder will not be able to submit the bid. The date & time of bid submission shall remain unaltered even if the specified date for the submission of bids declared as a holiday for the Officer inviting the Bid.

#### **RESUBMISSION AND WITHDRAWAL OF BIDS:**

Resubmission of bid by the Bidders for any number of times before the final date and time of submission is allowed.

Resubmission of bid shall require uploading of all documents including price bid afresh.

If the bidder fails to submit his modified bids within the pre-defined time of receipt, the system shall consider only the last bid submitted.

The bidder should avoid submission of bid at the last moment to avoid system failure or malfunction of Internet of traffic jam of power failure etc.

The Bidder can withdraw his bid before the closure date and time of receipt of the bid by uploading scanned copy of a letter addressing to the Procurement Officer Publisher (Officer Inviting Tender) citing reasons for withdrawal. The system shall not allow any withdrawal after expiry of the closure time of the bid.

#### **6 LATE BIDS:**

6.1. The system shall reject submission of any bid through portal after closure of the receipt time. For all purpose the server time displayed in the e-procurement portal shall be the time to be followed by the bidder and concerned officers.

## **7 MODIFICATION AND WITH DRAWAL OF BIDS:**

In the E-Procurement Portal, it is allowed to modify the bid any number of times before the final date and time of submission. The bidder shall have to log on to the system and resubmit the documents as asked for by the system including the price bid. In doing so, the bids already submitted by the bidder will be removed automatically from the system and the latest bid only will be admitted. But the bidder should avoid modification of bid at the last moment to avoid system failure or malfunction of internet or traffic jam or power failure. If the bidder fails to submit his modified bids within the designated time of receipt, the bid already in the system shall be taken for evaluation.

In the E-Procurement Portal, withdrawal of bid is allowed. But in such case he has to write a letter with appropriate reasons for his withdrawal addressed to the Officer inviting the bid and upload the scanned document to portal in the respective bid before the closure date and time of receipt of the bid. The system shall not allow any withdrawal after expiry of the closure time of the bid.

## **8. OPENING OF THE BID:**

8.1. Bid opening date is specified during tender creation or can be extended with corrigendum. This date is available in IFB, tender document as well as the home page of portal. Bid opening can be done by the authorized users which are defined during the tender publication / approval stage. The bids are encrypted using their public keys and can be decrypted only on or after the Bid Opening due date and time. The bid openers private key will be required to open the bids and all the openers have to log on to the portal during that time.

8.1.1. The bidders who participated in the online bidding can witness opening of the bid from any system logging on to the portal with the DSC away from opening place. Contractors are not required to be present during the bid opening at the opening location if they so desire.

8.1.2. Each activity is date and time stamped with user details. For time stamping, server time is taken as the reference.

8.2. In the event of the specified date of bid opening being declared a holiday for the Officer inviting the Bid/Engineer-in-Charge, the bids will be opened at the appointed time on the next working day.

8.2(a) Combined bid security for more than one work is not acceptable.

8.3. In case bids are invited for more than one package, the order for opening of the "Bid" shall be that in which they appear in the "Invitation for Bid".

8.4. The Bid openers; who have been pre-defined shall log on to the portal with their respective DSC. Unless all the Officers who have been declared as Opening officers, log on the portal with their DSC the Tender cannot be opened.

8.5. In case of non-responsive tender the officer Inviting tender should complete the e-Procurement process by uploading the official letter for cancellation/ re-tender.

### **EVALUATION OF BIDS:-**

All the opened bids shall be downloaded and printed for taking up evaluation. The officer authorized to open the tender shall sign and number on each page of the documents downloaded and furnish a certificate that "the documents as available in the portal containing..... nos. of pages".

- 8.5.1. After opening of technical bid, the bidder may be asked in writing / online (in their registered e-mail ID) to clarify on the uploaded documents provided in the Technical Bid, if necessary, with respect to any doubts or illegible documents required for Technical Evaluation. The Officer Inviting Tender may ask for any other document of historical nature during Technical Evaluation of the tender. Provided in all such cases, furnishing of any document in no way alters the bidders price bid. Non submission of legible documents may render the bid non-responsive. The authority inviting bid may reserve the right to accept any additional document.
- 8.5.2. The bidders will respond in not more than 7 days of issue of the clarification letter, failing which the bid of the bidder will be evaluated on its own merit.
- 8.5.3 The Technical evaluation of all the bids shall be carried out as per information furnished by Bidders.
- 8.5.4. Immediately, on receipt of these clarifications, the Evaluating Officers; predefined in the system for the bid, will finalize the list of responsive bidders. They will log on to the site with their DSC and record their comments on the Technical evaluation page in the system. The Officer Inviting the Bid if also the accepting authority, shall log on to the system with his digital signature and check the technical evaluation. He can either accept or pass on to the evaluating officers for re-evaluation. Upon acceptance of technical evaluation by the Accepting authority in the system, the system shall automatically generate letter to all the responsive bidders and the system shall forward the letter to all the responsive bidder that their technical bid has been evaluated responsive with respect to the data/information furnished by him and the letter shall also intimate him the date & time of opening of financial bid. The system shall also inform the non-responsive bidders in their e-mail ID that their bid has been found non-responsive.
- 8.6. The Technical evaluation of all the bids shall be carried out up as per the information furnished by the Bidders. But evaluation of the bid does not exonerate the bidders from checking their original documents and if at a later date the bidder is found to have misled the evaluation through wrong information, action as per relevant clause of DTCN shall be taken against the bidder/contractor.
- 8.7 The Procurement officer-Evaluators will evaluate bid and finalized list of responsive bidders. Opening of price bid and evaluation of lowest bidder is subject to satisfaction of other qualification information.
- 8.7.1 The financial bids of the technically responsive bidders shall be opened on the due date of opening. The Procurement Officer-Openers shall log on to the system in sequence and open the financial bids.
- 8.7.2 The Financial Bid will be opened on the notified date & time in the presence of bidders or their authorised representative who wish to be present.
- 8.7.3 At the time of opening of “Financial Bid”, the names of the bidders whose technical bids were found responsive will be announced and the bids of only those bidders will be opened. The remaining bids will be rejected.
- 8.7.4 The responsive bidders’ name, the bid prices, the item wise rates, the total amount of each item in case the item rate tender and percentage above or less in case of percentage rate tenders will be announced. any discounts and withdrawals, and such other details as the officer inviting the tender may consider appropriate, will be announced by him or his authorized representatives at the time of opening.
- 8.7.5 The Financial bid of the bidders shall be opened one by one by the designated officers. The system shall auto-generate the Comparative statement.

- 8.7.6 The Bidder can witness the principal activities and view the documents/summary reports for that particular work by logging on to the portal with his DSC from anywhere.
- 8.7.7 Procurement Officer-Openers shall sign on each page of the download BOQ and the Comparative Statement and furnish a certificate to that respect.
- 8.7.8 System provides an option to Procurement Officer Publisher for reconsidering the rejected bid with the approval of concern Chief Engineer/ Head of Department.

**9. CLARIFICATION AND NEGOTIATION OF BIDS:**

- 9.1. For examination, evaluation, and comparison of bids, the officer inviting the bid may, at his discretion, ask the lowest bidder for clarification of his rates including reduction of rate on negotiation and breakdowns of unit rates.
- 9.2. On opening of the price bid the system shall arrange the financial bids in order of their value (L1 first, followed by L2, L3 ....) for subsequent evaluation. The evaluation status (Sheet) will be visible to all the participating bidders after opening on their respective logins. Each activity is recorded in the system with date and time stamping.

**10. NOTIFICATION OF AWARD AND SIGNING OF AGREEMENT:**

- 10.1. In the E-Procurement Portal, the system shall generate the template of award letter and the Officer Inviting the Bid shall mention the amount of Performance Security and additional security required to be furnished in the letter and intimate the bidders in his e-mail ID.
- 10.2. The Employer/ Engineer-in-Charge shall notify acceptance of the work prior to expiry of the validity period by cable, telex or facsimile or e-mail confirmed by registered letter. This letter of Acceptance will state the sum that the Engineer-in-Charge will pay the contractor in consideration of execution and completion of the works by the contractor as prescribed by the contract and the amount of performance security and Additional Performance Security required to be furnished. The issue of the letter of Acceptance shall be treated as closure of the Bid process and commencement of the contract.
- 10.3. The Contractor after furnishing the required acceptable Performance Security and Additional Performance Security, “ Letter of Proceed” or “Work Order” shall be issued by the Engineer-in-Charge with copy thereof to the Procurement Officer-Publisher. The Procurement Officer-Publisher shall up load the summery and declare the process as complete.
- 10.4. If the L1 bidder does not turn up for agreement after finalisation of the tender then he shall be debarred from participation in bidding for three years and action will be taken to blacklist the contractor. Besides the consortium/ JV/firm where such an agency/ firm already happens to be or is going to be a partner/ member/ proprietor, he/ they shall neither be allowed for participation in bidding for three years nor his/ their application will be considered for registration and action will be initiated to blacklist him/ them. In that case, the L2 bidder, if fulfils other required criteria would be called for drawing agreement for execution of work subject to condition that the L2 bidder negotiates at par with the quoted by the L1 bidder, otherwise the tender will be cancelled.

**11. BLOCKING OF PORTAL REGISTRATION**

- 11.1 If the registration Certificate of the contractor is cancelled/ suspended by the registering authority/ blacklisted by the competent authority his portal registration shall be blocked automatically on receipt of information to that effect.
- 11.2 The portal registration blocked in the ground mentioned in the above Para- 11.1 shall be unblocked automatically in receipt of revocation order of cancellation/ suspension/ blacklisting from the concerned authority.

- 11.3 The Officer Inviting Tender shall make due inquiry and issue show cause notice to the concerned contractor who in turn shall furnish his reply, if any, within a fortnight from the date of issue of show cause notice. Thereafter the Officer Inviting Tender is required to issue an intimation to the defaulting bidder about his unsatisfactory reply and recommend to the Chief Manager (Tech) for blocking of portal registration within 10 days of intimation to the defaulting bidder regarding his unsatisfactory reply with intimation to the Registering Authority and concerned Chief Engineer/ Heads of Office if any of the following provisions are violated.
- 11.3.1 Fails to furnish original Technical Documents before the designated officer within the stipulated date and time.
- 11.3.2 Backs out from the bid on any day after the last date of receipt of tender till expiry of the bid validity period (including till the extended bid validity period)
- 11.3.3 Fails to execute the agreement within the stipulated date.
- 11.3.4 If any of the information furnished by the bidder is found to be false/ fabricated/ bogus. Accordingly the officer Inviting Tender shall recommended to the Chief Manager (Tech) State Procurement Cell, Odisha for blocking of portal registration of bidder and simultaneously action shall also be initiated by OFFICER INVITING TENDER for blacklisting as per Appendix-XXXIV of OPWD code Volume-II.

The minimum period of blocking of Portal Registration shall in no case be less than 180 days.

## **SECTION – 3**

### **Government Guidelines**

**GOVERNMENT GUIDELINES**

**Appendix - I**

**Executive Instruction regarding calling for and acceptance of tenders in e-Procurement in Govt. of Odisha.**

**Government of Odisha  
Works Department**

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**Office Memorandum**

**File No.07556900042013 (Pt-II) – 7885/W Dated 23.07.2013**

**Sub: Codal Provision regarding e-Procurement**

After introduction of e-procurement in Government of Odisha, necessary guidelines / procedures has been issued in Works Department Office Memorandum No.1027 dt.24.01.2009 which consists of the procedural requirement for e-procurement of tenders. After careful consideration Government have been pleased to make following modifications to codal provisions by way of addition as Appendix – IX(A) of OPWD Code Vol.II) as follows:

**(Appendix-IX (A) of OPWD Code, Vol-II)**

**Executive instructions regarding calling for and acceptance of tenders in e-Procurement.**

1. This office memorandum consists of the procedural requirement of e-procurement and shall be made part of the Detailed Tender Call Notice or Instruction to Bidder for all “works” tenders hoisted in the portal.
2. The e-procurement portal of Government of Odisha is “<https://tendersodisha.gov.in>”.
3. Use of valid Digital Signature Certificate of appropriate class (Class II or class III) issued from registered certifying authorities (CA) as stipulated by Controller of Certifying Authorities (CCA), Government of India such as n-Code, Sify, TCS, MTNL, e-Mudhra is mandatory for all users.
4. The DSC issued to the Department users is valid for the period of two years only. All the Department users are responsible to revalidate their DSC prior to expiry.
5. For all purpose, the server time displayed in the e-Procurement portal shall be the time to be followed by all the users.
6. Government after careful consideration have decided to hoist all tenders costing 10 lakhs or above in the e-procurement portal. This will be applicable across all Engineering Departments such as Works Department, Department of Water Resources, Rural Development and DEPARTMENT OF WATER RESOURCES. Government of Odisha also welcomes hoisting of tenders by any other departments, authority, corporations, local bodies etc. of the State with prior approval from Works Department. Works Department is the Nodal Department for the implementation of e-Procurement in the State.
7. The e-procurement shall be operated compliant to relevant provisions of OGFR/ OPWD code/ Accounts code/ Government statues including any amendments brought from time to time to suit to the requirement of the best national practice.
8. Registration in the e-procurement portal is without levy of any charges but Government reserves the right to levy any charges for such value added services in future.
9. Contractor not registered with Government of Odisha, can participate in the e-Procurement after necessary enrolment in the portal but have to subsequently register themselves with the appropriate registering authority of the State Government before award of the work as per prevalent registration norms of the State.

10. For the role management “Department” is the Administrative Department, Organisation or wing is the Chief Engineer or highest tender accepting authority or equivalent officer, Division is the Superintending Engineer or equivalent Officer and Subdivision is the Assistant Engineer or equivalent officer.
11. The e-Procurement software assigns roles for operation of the module for specific function. The terminologies used in the portal and their respective functions in the software are as follows.
  - a. Application Administrator (NIC & State Procurement Cell)
    - i. Master Management
    - ii. Nodal Officer Creation
    - iii. Report Generation
    - iv. Transfer of Officer’s login ID.
    - v. Blocking & unblocking of officer’s and bidder’s login ID.
  - b. Nodal Officer (At organization level not below the Superintending Engineer or equivalent rank)
    - i. Creation of Users
    - ii. Role Assignment
    - iii. Report Generation
    - iv. Transfer of Officer’s login ID.
    - v. Blocking & unblocking of officer’s Login ID.
  - c. Procurement Officer Publisher (Officer having tender inviting power at any level)
    - i. Publishing of Tender
    - ii. Publishing of Corrigendum / addendum / cancellation of Tender
    - iii. Bid Clarification
    - iv. Uploading of Pre-Bid minutes.
    - v. Report generation.
  - d. Procurement Officer Administrator (Generally sub-ordinate officer to Officer Inviting Tender)
    - i. Creation of Tender
    - ii. Creation of Corrigendum / addendum / cancellation of Tender
    - iii. Report generation.
  - e. Procurement Officer Opener (Generally sub-ordinate officer to Officer Inviting Tender)
    - ii. Opening of Bid
  - a. Procurement Officer Evaluator (Generally Sub-Ordinate Officer to Officer Inviting Tender)
    - i. Evaluating Bid
  - b. Procurement Officer-Auditor (Procurement Officer Publisher and/or Accounts Officer / Finance Officer)
    - i. To take up auditing

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

- a. The Notice Inviting Bids (NIB) and Bid documents etc., shall be in the Standard formats as applicable to conventional Bids and will be finalized / approved by the officers competent as in the case of conventional Bids.
- b. The officers competent to publish NIB in case of conventional Bids will host the NIB in portal. Simultaneously, a notification should also be published in the newspapers, as per existing rules preferably, in the following format, to effect economy:-

Government of Odisha “e”procurementNotice	
<b>Bid Identification No.</b> -----	
1.	Nameofthework: .....
2.	Estimatedcost: Rs.....
3.	Period of completion -----
4.	Date&Time of availability of bid document in the portal _____
5.	Last Date / Time for receipt of bids in the portal _____
6.	Name and address of the O.I.T.:.....
Further details can be seen from the e-procurement portal “ <a href="https://tendersodisha.gov.in">https://tendersodisha.gov.in</a> ”	

- c. The tender documents published by the Tender Inviting Officer (Procurement Officer Publisher) in the website <https://tendersodisha.gov.in> will appear in the “Latest Active Tender”. The Bidders/ Guest Users can download the Bid documents only after the due date & time of sale. The publication of the tender will be for specific period of time till the last date of submission of bids as mentioned in the ‘Notice inviting Bid’ after which the same will be removed from the list of “Latest Active tenders”.

13. **ISSUE OF ADDENDA/ CORRIGENDA/ CANCELLATION NOTICE:**

- a. The Procurement Officer Publisher (Officer Inviting Tender) shall publish any addendum/ corrigendum/ cancellation of tender in the website <https://tendersodisha.gov.in>, notice board and through paper publication and such notice shall form part of the bidding documents.
- b. The system generates a mail to those bidders who have already uploaded their tenders and those bidders if they wish can modify their tenders. The bidders are required to watch the website till last date and time of bid submission for any addendum/ corrigendum/ cancellation thereof. Tender Inviting Authority is not responsible for communication failure of system generated mail.

14. **CREATION AND PUBLISHING OF BID:**

- a. All the volumes/documents shall be uploaded in the portal by the tender creating officer (Procurement Officer Administrator) and published by the Officer Inviting Tender (Procurement Officer Publisher) using their DSCs in appropriate format so that the document is not tampered with
- b. The tender document comprise the notice inviting tender, bid document/ SBD, drawings in .pdf format and the schedule of quantities / BoQ in .xls format to be uploaded by the Officer Inviting Tender.

c. Procurement Officer Administrator creates tender by filling up the following forms:

- i. BASIC DETAILS
- ii. COVER CONTENT: The Procurement officer Administrator should briefly describe the name and type of documents to be uploaded by the bidder in the following format:

(a) For Double cover/Package:

Sl No	Cover Type	Document Description	Type
1	Fee/ Prequal/ Technical/ Finance	Tender Cost, EMD, VAT, PAN, Contractor RC	.pdf
		Affidavits, undertakings and any other document as per SBD/DTCN.	.pdf
		BoQ	.xls

(b) For Two Cover/Package:

Sl No	Cover Type	Document Description	Type
1	Fee/ Prequal/ Technical	Tender Cost, EMD, VAT, PAN, Contractor RC	.pdf
		Affidavits, undertakings and any other document as per SBD/DTCN.	.pdf
2	Finance	BoQ	.xls
		Special condition if any specifically mentioned by Officer Inviting Tender	.pdf

- iii. TENDER DOCUMENT: The Procurement Officer Administrator should upload the NIT in .pdf format.
- iv. WORK ITEM DETAILS
- v. FEE DEATILS: The Procurement Officer Administrator should mention the cost of tender paper and EMD amount as laid down in DTCN/SBD.
- vi. CRITICAL DATES: The Procurement Officer Administrator should mention the critical dates of tender such as publishing date, document download start date & end date, seek clarification start date & end date (optional), bid submission start date & closing date, bid opening date as per DTCN/SBD.
- vii. BID OPENER SELECTION: The Procurement Officer creator can select two / three / four bid openers for a particular bid. If required the bid openers can also be selected within an organization from other procurement units (Circles /Divisions).
- viii. WORK ITEM DOCUMENTS: The Procurement Officer Administrator should upload the digitally signed tender document (SBD/DTCN) or any other addition document/drawings in .pdf format and Bill of Quantities in .xls format.
- ix. PUBLISHING OF TENDER: The Procurement Officer Publisher shall publish the tender using his/her DSC after detail scrutiny of the fields created and documents uploaded by the Procurement Officer Administrator. Procurement Officer Publisher can publish tenders for multiple procurement units using multiple DSCs procured for each post separately. After being relieved from the additional charges he has to surrender the additional DSCs to the Nodal Officer of the concerned organisation.

15. **PARTICIPATION IN BID:**

a. **PORTAL REGISTRATION:** The Contractor/Bidder intending to participate in the bid is required to register in the portal using his/her active personal/official e-mail ID as his/her Login ID and attach his/her valid Digital signature certificate (DSC) to his/her unique Login ID. He/She has to submit the relevant information as asked for about the firm/contractor. The portal registration of the bidder/firm is to be authenticated by the State Procurement Cell after verification of original valid certificates/documents such as (i) PAN and (ii) Registration Certificate (RC) / VAT Clearance Certificate (for procurement of goods) of the concerned bidder. The time period of validity in the portal is at par with validity of RC/ VAT Clearance. Any change of information by the bidder is to be re-authenticated by the State Procurement Cell. After successful authentication bidder can participate in the online bidding process.

- i. Bidders participating through Joint Venture shall declare the authorised signatory through Memorandum of Understanding duly registered and enrol in the portal in the name and style of the Joint venture Company. It is mandatory that the DSC issued in the name of the authorised signatory is used in the portal.
- ii. Any third party/company/person under a service contract for operation of e-Procurement system in the State or his/their subsidiaries or their parent companies shall be ineligible to participate in the procurement process that are undertaken through the e-Procurement system irrespective of who operates the system.

b. **LOGGING TO THE PORTAL:** The Contractor/Bidder is required to type his/her *Login ID* and password. *The system will again ask to select the DSC and confirm it with the password of DSC as a second stage authentication.* For each login, a user's DSC will be validated against its date of validity and also against the Certificate Revocation List (CRL) of respective CAs stored in system database. The system checks the unique Login ID, password and DSC combination and authenticates the login process for use of portal.

c. **DOWNLOADING OF BID:** The bidder can download the tender of his choice and save it in his system and undertake the necessary preparatory work off-line and upload the completed tender at his convenience before the closing date and time of submission.

d. **CLARIFICATION ON BID:** The bidder may ask question related to tender online in the e-procurement portal using his/her DSC; provided the questions are raised within the period of seeking clarification as mentioned in tender call notice/Bid. The Officer Inviting the Bid / Procurement Officer-Publisher will clarify queries related to the tender.

e. **PREPARATION OF BID**

- i. The bids may consist of general arrangements drawings or typical or any other drawings relevant to the work for which bid has been invited. Bidder may download these drawings and takeout print for detail study and preparation of his bid. Any other drawings and documents pertaining to the works available with the Officer Inviting The bid will be open for inspection by the bidders.
- ii. The Bidder shall go through the Bid carefully and list the documents those are asked for submission. He shall prepare all documents including cost of Bid Document, Bid Security, Declaration form, price bid etc. and store in the system.

f. **PAYMENT OF EMD/BID SECURITY AND COST OF BID DOCUMENTS:**

- i. The Bidder shall furnish, as part of his Bid, a Bid security for the amount mentioned under NIT/Contract Data. The bidder shall scan all the written/printed pages of the bid security and up load the same in portable document format (PDF) to the system in designated place of the technical BID. Furnishing scanned copy of such documents is mandatory otherwise his/her bid shall be declared as non-responsive and liable for rejection.
- ii. The EMD or Bid Security payable along with the bid is 1% of the estimated contract value (ECV) or as mentioned in the bid document. The validity period of the EMD or Bid Security shall be as mentioned in the bid document. Any bid not accompanied by an acceptable Bid Security and not secured as indicated in the bid document shall be rejected as non-responsive. The bid security shall be retained till such time the successful bidder furnishes Initial Security Deposit (ISD) or Performance Security acceptable to the Officer

Inviting the Bid. Failure of the successful Bidder to comply with the requirements shall constitute sufficient grounds for cancellation of the award and forfeiture of the Bid Security. The Bid security in the form of FD / BG shall be from a Nationalized Bank valid for a period of 45 days beyond the validity of the bid. Bid security in other form is acceptable if the bid documents provides for it.

- iii. The Fixed Deposit / Bank Guarantee or any other form as mentioned in detailed tender call notice in respect of Earnest Money Deposit / Bid Security and the Bank Draft in respect of cost of Bid are to be scanned and up loaded in portable document format (PDF) along with the bid.
- iv. The tender accepting authority will verify the originals of all the scanned documents of the successful lowest bidder only within 5 days of opening of the tender. In the eventuality of failure on the part of the lowest successful bidder to produce the original documents, he will be debarred in future from participating in tender for 3 years and will be black listed by the competent authority.
- v. Contractor exempted from payment of EMD will be able to participate in the tender directly by uploading documentary evidences towards his eligibility for such exemption
- vi. Government of Odisha has been actively considering integrating e-payment gateway in to the portal for payment of Cost of Bid and Bid Security/ Earnest Money Deposit. The process of using e-payment gateway shall be issued separately after it is established.

**16. SUBMISSION OF BID:**

- a. The bidder shall carefully go through the tender and prepare the required documents. The bid shall have a Technical Bid & a Financial Bid. The Technical bid generally consist of cost of Bid documents, EMD/ Bid Security, VAT, PAN / TIN, Registration Certificate, Affidavits and any other information required by OIT. The Financial Bid shall consist of the Bill of Quantities (BOQ) and any other price related information/undertaking including rebates.
- b. Bidders are to submit only the original BoQ (in .xls format) uploaded by Procurement Officer Publisher (Officer Inviting Tender) after entering the relevant fields without any alteration/ deletion / modification. Multiple BoQ submission by bidder shall lead to cancellation of bid. In case of item rate tender, bidders shall fill in their rates other than zero value in the specified cells without keeping it blank. In the percentage rate tender the bidder quoting zero percentage is valid and will be taken at par with the estimated rate of the work put to tender.
- c. The bidder shall upload the scanned copy/copies of document in support of eligibility criteria and qualification information in prescribed format in Portable Document Format (PDF) to the portal in the designated locations of Technical Bid.
- d. The bidder shall write his name in the space provided in the specified location in the Protected Bill of Quantities (BoQ) published by the Officer Inviting Tender. The bidder shall type rates in figure only in the rate column of respective item(s) without any blank cell in the rate column in case of item rate tender and type percentage excess or less up to two decimal place only in case of percentage rate tender.
- e. The bidder shall log on to the portal with his/her DSC and move to the desired tender for up loading the documents in appropriate place one by one simultaneously checking the documents.
  - i. Bids cannot be submitted after due date and time. The bids once submitted can not be viewed, retrieved or corrected. The Bidder should ensure correctness of the bid prior to uploading and take print out of the system generated summary of submission to confirm successful uploading of bid. The bids cannot be opened even by the OIT or the Procurement Officer Publisher/ opener before the due date and time of opening.
  - ii. Each process in the e-procurement is time stamped and the system can detect the time of log in of each user including the Bidder.
  - iii. The Bidder should ensure clarity/legibility of the document uploaded by him to the portal.
  - iv. The system shall require all the mandatory forms and fields filled up by the contractor during the process of submission of the bid/tender.
  - v. The bidder should check the system generated confirmation statement on the status of the submission.

- vi. The Bidder should upload sufficiently ahead of the bid closure time to avoid traffic rush and failure in the network.
- vii. The Tender Inviting Officer is not responsible for any failure, malfunction or breakdown of the electronic system used during the e-procurement process.
- viii. The Bidder is required to upload documents related to his eligibility criteria and qualification information and Bill of Quantity duly filled in. It is not necessary for the part of the Bidder to up-load the drawings and the other Bid documents (after signing) while uploading his bid. It is assumed that the bidder has referred all the drawings and documents uploaded by the Officer Inviting the Bid.
- ix. The Bidder will not be able to submit his bid after expiry of the date and time of submission of bid (server time). The date and time of bid submission shall remain unaltered even if the specified date for the submission of bids declared as a holiday for the Officer Inviting the Bid.

f. **SIGNING OF BID:** The 'online bidder' shall digitally sign on all statements, documents, certificates uploaded by him, owning responsibility for their correctness / authenticity as per IT ACT 2000. If any of the information furnished by the bidder is found to be false / fabricated / bogus, his EMD/Bid Security shall stand forfeited & his registration in the portal shall be blocked and the bidder is liable to be blacklisted.

17. **SECURITY OF BID SUBMISSION:**

- a. All bid uploaded by the Bidder to the portal will be encrypted.
- b. The encrypted Bid can only be decrypted / opened by the authorised openers on or after the due date and time.

18. **RESUBMISSION AND WITHDRAWAL OF BIDS:**

- a. Resubmission of bid by the bidders for any number of times before the final date and time of submission is allowed.
- b. Resubmission of bid shall require uploading of all documents including price bid afresh.
- c. If the bidder fails to submit his modified bids within the pre-defined time of receipt, the system shall consider only the last bid submitted.
- d. The bidder should avoid submission of bid at the last moment to avoid system failure or malfunction of internet or traffic jam or power failure etc.
- e. The Bidder can withdraw his bid before the closure date and time of receipt of the bid by uploading scanned copy of a letter addressing to the Procurement Officer Publisher (Officer Inviting Tender) citing reasons for withdrawal. The system shall not allow any withdrawal after expiry of the closure time of the bid.

19. **OPENING OF THE BID:**

- a. Bid opening date and time is specified during tender creation or can be extended through corrigendum. Bids cannot be opened before the specified date & time.
- b. All bid openers have to log-on to the portal to decrypt the bid submitted by the bidders.
- c. The bidders & guest users can view the summary of opening of bids from any system. Contractors are not required to be present during the bid opening at the opening location if they so desire.
- d. In the event of the specified date of bid opening being declared a holiday for the Officer Inviting the Bid, the bids will be opened at the appointed time on the next working day.
- e. Combined bid security for more than one work is not acceptable.
- f. The electronically submitted bids may be permitted to be opened by the predefined Bid opening officer from their new location if they are transferred after the issue of Notice Inviting Bid and before bid opening. Further, action on bid documents shall be taken by the new incumbent of the post.

g. In case of non-responsive tender the officer inviting tender should complete the e-Procurement process by uploading the official letter for cancelled / re-tender.

## 20. EVALUATION OF BIDS :

- a. All the opened bids shall be downloaded and printed for taking up evaluation. The officer authorized to open the tender shall sign and number on each page of the documents downloaded and furnish a certificate that “the documents as available in the portal containing \_\_\_\_\_ nos. of pages”.
- b. The bidder may be asked in writing/ online (in their registered e-mail ids) to clarify on the uploaded documents provided in the Technical Bid, if necessary, with respect to any doubts or illegible documents. The Officer Inviting Tender may ask for any other document of historical nature during Technical Evaluation of the tender. Provided in all such cases, furnishing of any document in no way alters the Bidder’s price bid. Non submission of legible documents may render the bid non-responsive. The authority inviting bid may reserve the right to accept any additional document.
- c. The bidders will respond in not more than 7 days of issue of the clarification letter, failing which the bid of the bidder will be evaluated on its own merit.
- d. The Technical evaluation of all the bids shall be carried out as per information furnished by Bidders.
- e. The Procurement Officer-Evaluators; will evaluate bid and finalize list of responsive bidders.
- f. The financial bids of the technically responsive bidders shall be opened on the due date of opening. The Procurement Officer-Openers shall log on to the system in sequence and open the financial bids.
  - i. The Financial Bid will be opened on the notified date & time in the presence of bidders or their authorised representative who wish to be present.
  - ii. At the time of opening of “Financial Bid”, bidders whose technical bids were found responsive will be opened.
  - iii. The responsive bidders’ name, bid prices, item wise rates, total amount of each item in case of item rate tender and percentage above or less in case of percentage rate tenders will be announced.
  - iv. Procurement Officer-Openers shall sign on each page of the downloaded BOQ and the Comparative Statement and furnish a certificate to that respect.
  - v. Bidder can witness the principal activities and view the documents/summary reports for that particular work by logging on to the portal with his DSC from anywhere.
  - vi. System provides an option to Procurement Officer Publisher for reconsidering the rejected bid with the approval of concern Chief Engineer / Head of Department.

## 21. NEGOTIATION OF BIDS:

- a. For examination, evaluation, and comparison of bids, the officer inviting the bid may, at his discretion, ask the lowest bidder for clarification of his rates including reduction of rate on negotiation and breakdown of unit rates.

## 22. NOTIFICATION OF AWARD AND SIGNING OF AGREEMENT:

- a. The Employer/Engineer-in-Charge shall notify acceptance of the work prior to expiry of the validity period by cable, telex or facsimile or e-mail confirmed by registered letter. This Letter of Acceptance will state the sum that the Engineer-in-Charge will pay the contractor in consideration of execution & completion of the Works by the contractor as prescribed by the contract & the amount of Performance Security and Additional Performance Security required to be furnished. The issue of the letter of Acceptance shall be treated as closure of the Bid process and commencement of the contract.

- b. The Contractor after furnishing the required acceptable Performance Security & Additional Performance Security, “Letter to Proceed” or “Work Order” shall be issued by the Engineer-in-Charge with copy thereof to the Procurement Officer –Publisher. The Procurement Officer-Publisher shall up load the summary and declare the process as complete.
- c. If the L-1 bidder does not turn up for agreement after finalization of the tender, then he shall be debarred from participation in bidding for three years and action will be taken to blacklist the contractor. Besides the consortium / JV / firm where such an agency / firm already happens to be or is going to be a partner/member/proprietor, he/ they shall neither be allowed for participation in bidding for three years nor his/ their application will be considered for registration and action will be initiated to blacklist him / them and the tender will be cancelled.

**23. BLOCKING OF PORTAL REGISTRATION:**

- a. If the Registration Certificate of the Contractor is cancelled /suspended by the registering authority/ blacklisted by the competent authority his portal registration shall be blocked automatically on receipt of information to that effect.
- b. The portal registration blocked in the ground mentioned in the above Para-23. a shall be unblocked automatically in receipt of revocation order of cancellation / suspension/ blacklisting from the concerned authority.
- c. The Officer Inviting Tender shall make due inquiry and issue show cause notice to the concerned contractor who in turn shall furnish his reply, if any, within a fortnight from the date of issue of show cause notice. Thereafter the Officer Inviting Tender is required to issue an intimation to the defaulting bidder about his unsatisfactory reply and recommend to the Chief Manager (Tech.) for blocking of portal registration within 10 days of intimation to the defaulting bidder regarding his unsatisfactory reply with intimation to the Registering Authority and concerned Chief Engineer/ Heads of Office if any of the following provisions are violated.
  - i. Fails to furnish original Technical / Financial (Tender Paper Cost, EMD/Bid Security) instruments before the designated officer within the stipulated date and time.
  - ii. Backs out from the bid on any day after the last date of receipt of tender till expiry of the bid validity period.
  - iii. Fails to execute the agreement within the stipulated date.
  - iv. If any of the information furnished by the bidder is found to be false / fabricated / bogus.

Accordingly the Officer Inviting Tender shall recommend to the Chief Manager (Tech.), State Procurement Cell, Odisha for blocking of portal registration of bidder and simultaneously action shall also be initiated by OFFICER INVITING TENDER for blacklisting as per Appendix- XXXIV of OPWD Code, Volume-II.

**24. GUIDELINES FOR UNBLOCKING OF PORTAL REGISTRATION:**

**a. UNBLOCKING OF PORTAL REGISTRATION:**

Unblocking of portal registration of a contractor shall be done by a Committee consisting of the following members.

EIC (Civil)-cum-CPO,	-	Chairman
Engineer-in-Chief (WR)	-	Member
Concerned Chief Engineer	-	Member
Sr. Manager (Finance), SPC	-	Member
Officer Inviting Tender	-	Member
Chief Manager (Technical), SPC	-	Convener

- b. The Chief Manager (Tech), State Procurement Cell will be the convener and he will maintain all records for this purpose. The Committee shall meet not less than once in a month if required & shall consider the recommendation of the officer inviting tender for unblocking of portal registration. The quorum of the meeting will be four.
- c. The minimum period of blocking of Portal Registration shall in no case be less than 90 days. After blocking of Portal Registration, the Contractor whose Portal Registration has been blocked may file application to the concerned officer inviting tender showing sufficient ground for unblocking of his portal registration along with a Treasury Challan showing deposit of Rs. 10,000/- (Rupees ten thousand) only (non-refundable) under the head of accounts ‘0059 -

Public Works' as processing fees. The officer inviting tender shall forward the application filed by the contractor to the Chief Manager (Tech), State Procurement Cell.

- d. On receipt of recommendation from the concerned Chief Engineer along with the copy of challan as mentioned above, the Chief Manager (Tech) being the member Convener of the Committee shall place the case before the Committee for examination and taking a decision in this regard. After examination the Committee may recommend for unblocking of the portal registration of said contractor if the Committee is satisfied that the fault committed by the contractor is either unintentional or done for the first time.
- e. After scrutiny by the State Procurement Cell if it is found that the portal registration of a contractor has been blocked for the 2<sup>nd</sup> time the Chief Manager (Tech), SPC may not consider his case to be placed before the Committee and may advise the concerned officer inviting tender to issue show cause notice to the contractor asking him to explain as to why his portal registration shall not remain blocked. On receipt of show cause reply from the contractor the officer inviting tender shall examine the same & if considered proper he may report to the Chief Manager (Tech), SPC along with his views furnishing the copy of the show cause reply for placement of the same before the Committee for taking a decision in respect of blocking/ unblocking. If the Committee found that the contractor is in habit of committing such fault again and again intentionally the committee may advise the concerned officer inviting tender to initiate proceeding for blacklisting as per the existing rule.
1. These amendments shall take effect from the date of issue of the order.
  2. This amendment is an addition to the existing provision and will be placed below Appendix-IX to OPWD Col, Vol-II.
  3. Accordingly Office Memorandum No.1027 dt.24.01.2009 stands modified.
  4. This has been concurred in by the Finance Department vide their UOR No.3-WF-1 dt.04.01.2013.

*Sd/19.07.2013*

**E.I.C-cum-Secretary to Govt.**

Appendix – II

**Online Receipt of Tender Paper Cost & Earnest Money Deposit  
through e-Procurement Portal  
as per Works Department Letter No.17276/W Dt.06.12.2017**

**Government of Odisha  
Works Department**

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Office Memorandum

File No.07556900012016–17254/W Dt.05.12.2017

**Sub: Electronic receipt, accounting and reporting of Cost of Tender Paper and Earnest Money Deposit on submission of bids.**

1. The State Government have formulated 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>".
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.
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) **Log on to e-Procurement Portal:** 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, 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.
- 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-head-wise challans separately for **Cost of Tender Paper** and instruct the designated Banks to remit the money to the State Government account under different heads. 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 State Procurement Cell shall generate Bank-wise list of challans and instruct the designated Banks to remit the money through the Odisha Treasury portal. 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, 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.

**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 DAG (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 an 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.
- 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 suo moto 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, earnest money deposit in OPWD Code and OGFR would stand modified to the extent prescribed.

**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.

*Sd/05.12.2017*

**E.I.C-cum-Secretary to Govt.**

*[For any Technical related queries please call at Help desk numbers of State Procurement Cell (SPC), Govt. of Odisha – 1800 3456 765, 0674-2530998, 2530996]*

ANNXURE-I of Appendix - II

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

	<b>Cost of Tender Paper on submission of bids</b>	<b>Earnest Money Deposit on submission of bids</b>
Government Departments	<p>I. The payment towards the <b>cost of Tender Paper</b>, in case 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.</p> <p>II. With reference to the Notice Inviting Tender/ Bid Identification Number, the amount so realized 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.</p>	<p>I. In case of tenders of Government Departments, amount towards <b>Earnest Money Deposit</b> 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.</p> <p>II. In case of forfeiture of <b>Earnest Money Deposit</b> 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.</p>
State PSUs Statutory Corporations, Autonomous Bodies and Local Bodies.	<p>I. In case of State PSUs, Statutory corporations, Autonomous Bodies and Local Bodies etc. the amount towards <b>Cost of Tender Paper</b>, on submission of bids shall be collected in separated pooling accounts opened in Focal Point Branch called e-FPB of respective designated Banks at Bhubaneswar on T+1 days.</p> <p>II. The <b>Paper cost</b> will be transferred to the respective current accounts of concerned State PSUs, Statutory Corporation, Autonomous Bodies and Local Bodies etc. after opening of bid.</p>	<p>I. Amount towards <b>EMD</b> 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 account on receipt of instruction from TIA through refund and settlement of e-procurement system within two working days from receipt of such instruction.</p> <p>II. In case of forfeiture of <b>Earnest Money deposit</b> 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.</p>

**OFFICE OF THE  
LABOUR COMMISSIONER, ODISHA, BHUBANESWAR**

+++

**NOTIFICATION**

**No 3920 /Dated 01.05.2026**

Whereas as per Notification No. 5308 dated 18.07.2024 issued by the Labour & ESI Department, Government of Odisha, the minimum rate of wages have been revised in the scheduled employments for unskilled, semi-skilled, skilled and highly skilled categories of workers working in the State, published in the Odisha Gazette vide Notification No. 1367 dated 18.07.2024;

Whereas as per the said notification, a special Variable Dearness Allowance (VDA) is declared twice a year i.e. on 1st April and on 1st October @ Rs. 2.60 per point increase in the Consumer Price Index Number for industrial workers (base 2016=100) by the Labour Commissioner, Odisha;

Whereas during the last half-year, the Consumer Price Index for industrial workers has increased from 143.58 to 147.50 on an average and thereby increased by 3.92 points and accordingly, it is necessary to increase the Variable Dearness Allowance (VDA) on the said basis for the half-year starting from 1st April, 2026;

Therefore, I, Shri Indramani Tripathy, IAS, Labour Commissioner, Odisha, in exercise of the power conferred by the above notification, hereby notify that the Variable Dearness Allowance (VDA) for unskilled, semi-skilled, skilled and highly skilled categories of employees in all 91 scheduled employments (as per enclosed list) has been increased by an amount of Rs. 10/- per day with effect from 1st April, 2026, in addition to the Variable Dearness Allowance (VDA) declared earlier. Accordingly, the minimum rate of wages with variable dearness allowance from 1st April 2026 shall be as follows:

Category of employees	Daily minimum rate of wages prior to 01.04.2026 (with VDA)	Increase in VDA per day w.e.f. 01.04.2026	Daily minimum rate of wages with VDA w.e.f. 01.04.2026
Unskilled	Rs. 462/-	Rs. 10/-	Rs. 472/-
Semi-skilled	Rs. 512/-	Rs. 10/-	Rs. 522/-
Skilled	Rs. 562/-	Rs. 10/-	Rs. 572/-
Highly Skilled	Rs. 612/-	Rs. 10/-	Rs. 622/-

Labour Commissioner, Odisha



**GUIDELINES FOR CANAL LINING &  
SYSTEM REHABILITATION PROGRAMME  
(CLSRP)**

GOVERNMENT OF ODISHA  
DEPARTMENT OF WATER RESOURCES

FEBRUARY 2013

(Approved vide DoWR letter no. Irr.I.WB-12/2013-8984 dtd 16.03.13)

Sl. No.	Contents	Page
1	Introduction	
2	Objective	
3	Selection Criteria	
4	Preparation, Examination & clearance of Project Report(PR)	
5	Procedure for submission & approval of Project proposals for funding	
6	Implementation & Financial Arrangements	
7	Monitoring & Evaluation Mechanism	
8	Submission of Completion Reports	

**Introduction:**

The state has made a considerable progress in development of surface water resources. The benefits of flow irrigation are evident. However, a good number of irrigation projects (major, medium and minor) in the state are quite old and have been operating below their potential due to various reasons including lack of maintenance of the canal systems. The main canals and distribution system are not capable of carrying the designed capacity. Seepages in canals are observed near the structures, high embankments and in areas passing through permeable soils. This has resulted in the problem of unreliability in the availability of irrigation water at farm level causing low efficiency of water usage and low productivity. Farmers in the tail end areas of the project are the worst sufferers. Sometimes farmers of high reaches damage the earthen canal embankment and draw excess water. To alleviate these deficiencies in the system above the outlet and for efficient management of water for irrigation, a new scheme namely "Canal Lining & System Rehabilitation Programme (CLSRP)" is being proposed under State Plan from the financial year 2013-14.

**Objective:**

1. To improve the performance of an irrigation system and to increase the water use efficiency of canals.
2. To enhance water availability at farm level and reduce seepage losses in distribution system.
3. To reclaim the valuable agricultural land getting unsuitable for use due to water logging and salinity resulting out of seepage from canals.
4. To reduce the gap between irrigation potential created and irrigation potential utilized in various projects.

**Selection Criteria:**

- a. Canal systems (Main canal, Branch Canals, Distributaries, Minor Canals) passing through permeable soils where substantial water is lost due to seepage and percolation. Lining in vulnerable reaches would minimize the seepage and percolation loss.
- b. Canals not carrying the design discharge due to deterioration. Renovation of the system would improve its performance including water use efficiency.
- c. Canals not receiving any other form of financial assistance except O&M grant.
- d. The selection of projects shall be demand based i.e. it shall be based on the application of Pani Panchayats.

To identify the deficiencies in the canal systems, Participatory Walk Through (PWT) is required to be taken up jointly by the Pani Panchayat representatives and field engineers of DoWR.

Priority would be accorded to following category of the distribution systems

- i. Canal systems of medium/major irrigation projects with life span of more than 20 years.
- ii. Where tail end farmers are deprived of getting irrigation facility
- iii. Where additional area can be brought under irrigation coverage especially during Rabi season (Big Storage Projects)

**Preparation, Examination & clearance of Project Report(PR):**

**Project Preparation**

The Project Reports (PR) are to be prepared addressing the following issues.

- Background, present status with reasons for deteriorating condition, remedial measures proposed and outcome after completion. The Project Authority should ensure that this project has not received any financial assistance in last five years from any other funding agencies except normal maintenance and would submit a certificate to this effect while submitting the project proposal.
- Salient feature of the project proposal, Cost, procurement plan and implementation schedule
- Description of the different components of work likely to be included because of Lining such as Repair & Renovation of structures and gates, Construction of new structures, renovation of canals etc should be clearly brought out. The Original L.S. & D.S of canal system has to be included in the report, which will serve as a reference to assess the changes likely to be incorporated into it and the positive impact created in the canal system.
- Total command area coming under the system, status of existing conveyance system with deficiencies hampering the water use efficiency/ performance of the system, details of potential created and utilized and targeted after completion of the project.
- Tee-diagram indicating canal features and proposed interventions
- Benefit Cost Ratio of the project and analysis like internal rate of return may also be included.
- Provisions for measuring device for volumetric measurement of water to be included.

### **Examination of PR**

Project Reports will be furnished to EIC, WR by the concerned Chief Engineers/Chief Construction Engineers for Major and Medium Projects. Inspection note of concerned Superintending Engineers indicating present field conditions and proposed interventions in the Project report is mandatory. For Minor Irrigation Projects, the proposal will be submitted through the Chief Engineer, Minor Irrigation.

**One dedicated team** to be constituted by EIC, WR for examination of Project Reports. The team will comprise of one Executive Engineer and five Assistant Engineers one each from PP&F, Design, OWPO, Minor irrigation and M&E unit. The team will function under the guidance of Director, Planning of CE, PP&F.

(An approach paper indicating broad outlines of design of lining of unlined canals in vulnerable and strategic locations with its impact and possible intervention and of various alternatives of lining of canals and renovation and replacement of structures will be prepared by the DR&QC unit. The same may be drawn up from the expertise gained from OIIAWMIP and OWRCP schemes and their efficacy. The approach paper will be prepared within two months. )

### **Project Clearance**

Technical Clearance: The note prepared by the dedicated team will be placed before the respective state TAC with respect to Major, Medium and Minor Projects for consideration and clearance. After TAC clearance, the Project will be eligible for inclusion under this scheme. Prioritization of the projects for implementation will be made by EIC(WR) and CE,MI in consultation with Project Authority and submit for approval by DOWR.

Administrative Approval: Administrative approval will be accorded by Competent Authority to the project approved by DOWR.

**Implementation and Financial Arrangements:**

The scheme would be implemented by existing field divisions following standard codal procedures and implementation arrangements.

Budgetary Provision under State Plan would be made for execution of the projects under this scheme. After inclusion of project under this scheme, requisite funds will be provided on annual basis.

**Monitoring & Evaluation Mechanism:**

A monitoring team would be constituted at EIC level to monitor physical and financial progress at field level. Besides, quarterly physical and financial progress reports in the prescribed formats would be submitted by field units to DOWR monitoring unit/ Monitoring unit of EIC office in respect of major and medium irrigation projects. For Minor irrigation projects, CE, Minor Irrigation would send the report to DOWR monitoring unit with a copy to monitoring unit of EIC for record.

**Submission of Completion Reports:**

On successful completion of the project, a Completion report is required to be prepared by the field units and to be submitted to DOWR & EIC office for considering the project for its deletion from the Programme. The Completion report should also include details regarding achievements, success stories, pre-project and post-project analysis. The Completion report may also bring out clearly the constraints, if any, encountered during the course of implementation of the Programme in the Project.

\*\*\*\*

Office of the Engineer-in-Chief,  
Water Resources, Odisha, Bhubaneswar.

No. Proc- Misc-Guideline-8/18  
From

4437 / OR

Dated. 16-02-19

To Sri D.K. Samal,  
Chief Engineer (M&E).

The All Chief Engineer & Basin Managers/  
Chief Engineers/Chief Construction Engineers.

Sub: Approval of Guideline /Manual for Canal Lining works.


Sir,

AM/MP  
19/02/19

With reference to the subject cited above, it is to enclose herewith copy of the DoWR Lr.No.3503/WR dated 7.2.2019 for approved Guideline /Manual for Canal Lining works and you are requested to strictly follow the guidelines in execution of Canal Lining works. The above Guideline/Manual has been uploaded in the DoWR website [www.dowrodisha.gov.in/Downloads](http://www.dowrodisha.gov.in/Downloads).

Encl:As above

Yours faithfully,

  
14-02-19  
Chief Engineer (M&E).

Memo No .

44.38 / OR  
Dated.

16 - 02 - 19

Copy forwarded to Deputy Director, M.I.S., O/o the Engineer-in-Chief, W.R., Bhubaneswar for information and necessary action. He is requested to upload the above Guideline/Manual for Canal Lining works in the DoWR website [www.dowrodisha.gov.in/Downloads](http://www.dowrodisha.gov.in/Downloads). The copy of the DoWR Lr.No.3503/WR dated 7.2.2019 and the Guideline/Manual is enclosed.

Encl:As above

  
14-02-19  
Chief Engineer (M&E).

GOVERNMENT OF ODISHA  
DEPARTMENT OF WATER RESOURCES  
BHUBANESWAR

No.WR.MAJI-SCH-0005-2018 <sup>\*\*\*</sup> 3503 WR, dated 7/2/19  
From

Sri N.R. Swain,  
F.A-cum-Additional Secretary to Government.

To

The Engineer-in-Chief, Water Resources,  
Sechasadan, Bhubaneswar

Sub:- Approval of Guideline /Manual for Canal Lining works.

Sir,

Inviting reference to the subject mentioned above, I am directed to intimate that the Government in Water Resources Department have been pleased to approve the draft **Guideline / Manual for Canal Lining** works received vide your letter No. 30370, dated 05.11.2018 and to return the same herewith for taking further necessary action at your end. The approved guideline be circulated among all field level Authorities / Officers under your administrative control with instruction / advice to strictly follow the guideline in executing the works under the scheme.

Yours faithfully,

*[Signature]*  
F.A-cum-Additional Secretary to Government.

Memo No. 3504 WR, dated 7/2/19

Copy forwarded to the E.I.C-cum-Special Secretary to Government, DOWR, for information and necessary action.

*[Signature]*  
F.A-cum-Additional Secretary to Government.

*[Signature]*  
D.D. Pooe

*[Signature]*  
11.2

*[Signature]*  
11/02



Draft Copy  
Only for Official Use

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## GUIDELINES FOR LINING OF IRRIGATION CANALS

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**Government of Odisha**  
**Department of Water Resources**

## CONTENTS

Sl.No	Description	Page No
1	Introduction	4
2	Types of Lining	4
3	Selection of Type of Lining	5
4	Lining of existing earthen canal	5
5	Cement Concrete lining	5
	Preparation & compaction of subgrade for concrete lining	5
	Thickness of in-situ concrete lining	6
	Grade, mixing, placing & lining section	6
6	Cement concrete tiles (is 10646:1991)	6
	Dimensions	6
	Tolerance, shape, flexural strength	6
7	Parameter for design of lined canals (is10430:2000)	7
	Innerside slopes	7
	Outerside slopes	7
	Free board	7
	Berm	7
	Coping	8
	Cross sections & velocity	8
	Under drainage	8
	Pressure relief arrangements	9
	Longitudinal drains	9
	Transverse drains	10
	Pressure relief valves	10
8	Lining of canal in expansive soil (is:9451-2004)	11
	General	11
	Criteria for fixing minimum thickness of CNS layer	11
	Construction procedure	11
	Pride	12
	Use of Polythene Sheet below Concrete Lining	12
	Under drainage arrangements and joints in lining	12
9	Other important works	12
	Anti-salt treatment	12
	Curing	13
	Quality control	13

10 Re.  
11 Prepp.

	Tests for lining	13
10	Rehabilitation/ remodelling of structures	13
11	Preparation of DPR	13
	Specification of materials	13
	Specification of works	14
	Quality control and assurance	14

# GUIDELINES FOR LINING OF IRRIGATION CANALS

\*\*\*\*\*

## 1.0 INTRODUCTION

Irrigation canals are important infrastructure and contribute to the development of sustainable agriculture and agricultural activities. At present, there are sixty(60) major & medium irrigation projects and a good number of MIPs with vast canal networks are operational in the state. Most of these Projects are quite old and serve the state for more than thirty(30) years. The canal systems of these projects are earthen and gets deteriorated during course of its use. Seepage losses in these canals are prominent and they are unable to carry the design discharge. Renovation, re-sectioning & reduction in seepage loss are essential for smooth functioning of these canals. With this background, department of Water Resources has formulated a proposal viz. Canal Lining & System Rehabilitation Programme (CLSRP) during 2013 and placed it for approval of Government. Considering its importance, the State Cabinet in its meeting held on 27.11.2013 approved the scheme formulated by the department. Further, in the same meeting, Cabinet had also taken a decision that all the new canals in the State will be designed as lined canals and existing canals may also be considered to be converted to lined canals in due course in a phased manner for prevention of seepage loss and for optimal and judicious use of water.

To implement the CLSRP scheme, one operating guideline containing Project Selection Criteria, preparation and approval of Project Reports, financial arrangement, monitoring and evaluation etc. for the said scheme was prepared and approved by DOWR vide letter no. Irr.I.WB-12/2013-8984 dtd 16.03.13. It is observed that field officers are more often facing difficulties in preparation of Detailed Project Report (DPR) due to want of technical guidelines. To obviate this difficulty and to follow a unified approach, it is felt that one technical guideline may be prepared and circulated to field engineers for their use.

## 2.0 TYPES OF LINING

Lining is an impermeable layer provided for the bed and sides of canal to improve the life and discharge capacity of canal. 60% to 80% of water lost through seepage in an unlined canal can be saved by construction of appropriate canal lining.

- **Rigid Lining** : In situ Cement concrete/Cement fly ash concrete/ Reinforced Cement Concrete
- **Semi-Rigid Lining** : Pre-cast Cement Concrete Tile/ Cement concrete slab/ Cement fly ash concrete tile/Fly ash brick or tile lining
- **Flexible Lining** : Geo-membrane like High density polyethylene(HDPE)/ Poly vinyl Chloride(PVC)/Low density polyethylene(LDPE)
- **Combination Lining** : Membrane in the bed and brick/tile or concrete lining on sides.

## 3.0 SELECTION OF TYPE OF LINING

While selecting the type of lining, the Engineer in Charge should collect information on the position of water table, climatic conditions, availability of construction materials, type of subgrade, time schedule, performance of lining in the existing canals in the adjoining areas.

After collecting the above information, the entire canal or specific reaches of canal to be lined may be decided. Besides, for selection of particular type of lining, seepage loss, economy, structural stability, strength and durability, reparability and ease of maintenance, resistance to erosion, maximum-hydraulic efficiency etc. are required to be taken in to consideration.

*Selection of Canals/ stretches of canals should be judicious and based on adequate justification. Project Authority has the final choice to decide the type of lining.*

#### **4.0 LINING OF EXISTING EARTHEN CANALS**

It is seen that design section of earthen canals during course of use gets deformed/deteriorated and loses its original shape (Designed Trapezoidal section). Therefore, before taking up the lining work, proper sectioning of canals to pass the design discharge are required to be done. The lining work in existing earthen canals may be done in such a way that the canal hydraulic particulars such as Full supply level (FSL) and Full supply design discharge will remain unaltered after lining. After lining of earthen canal, Manning's Rugosity Coefficient (n) will be reduced and there will be increase in the velocity. The Engineer in charge should see that the FSL should not be lowered, otherwise the outlets and off-taking canals will be affected in drawing it's full discharge due to reduction in the driving head. To take care of the above problem, the canal section is to be redesigned keeping the full supply level as per the approved LS & DS and by adjusting the full supply depth, bed width and side slope as per site requirement. using the Manning's coefficient (n) for lined canal in accordance with the relevant IS codes.

In expansive soils such as canal in black cotton soil, suitable provision of CNS layer as per the recommendation of relevant IS codes may be made. Similarly in cutting reaches with high ground water table, unstable side slopes etc., necessary measures as recommended in relevant IS codes, Manuals on canal lining (revised) prepared by INCID may be adopted.

#### **5.0 CEMENT CONCRETE LINING (IS 3873:1993)**

Plain cement concrete lining will be suitable for all size of canals on firm soils. Reinforcement in canal linings is normally not required if transverse joints are provided at proper intervals (less than 6 m) to avoid cracks except in specific areas. RCC lining is justified under unusual conditions such as high back pressure, high flow velocities, swelling soils, unstable sub-grade and in reaches where the canal crosses large cross drainage works.

##### **a. PREPARATION & COMPACTION OF SUBGRADE FOR CONCRETE LINING**

The subgrade should be prepared, dressed and rolled true to level and according to the required cross section of canal to form a firm compacted subgrade for the lining. For preparation of subgrade IS 9451 : 1985 may be followed for expansive soil, IS 3873:1993 may be followed for ordinary soil, rock and sandy soil.

##### **b. THICKNESS OF IN-SITU CONCRETE LINING**

The thickness of lining should be fixed depending upon the nature of the canal requirement, namely, hydel channel or irrigation channel, full supply depth and channel capacity. Hydel channel should have a greater thickness than channels meant for irrigation because of drawdown effects and where closure for repairs may not be usual. Deeper channels should have greater thickness than shallow depth channels. Minimum thickness of canal lining based on canal capacities is given in table below.

5

In /r

**Table No :1**  
**Thickness of In-Situ Concrete Lining (IS: 3873-1993)**

Capacity of Canal (cumecs)	Depth of Water (m)	Thickness of Lining (mm)
0-5	0 - 1	50-60
5-50	1 - 2.5	60-75
50-200	2.5- 4.5	75-100
200-300	4.5 – 6.5	90-100
300-700	6.5 – 9.0	120-150

**Table No :2**  
**Tolerance in Concrete thickness, Alignment, grade (IS: 3873-1993)**

Description	Allowable Limit
Departure from established alignment	± 20 mm on straight reaches ± 50 mm on partial curves or tangents
Departure from established grade	± 20 mm on small canals
Variation in concrete, lining thickness	± 10 mm provided average thickness is not less than specified thickness

**c. GRADE, MIXING, PLACING & LINING SECTION**

The concrete used for lining should be design mix concrete of grade **M 15** and should confirm to requirement of IS 456:2000 The concrete should be mixed by mechanical means, hand mixing is not allowed. All the in-situ concrete lining are to be done strictly using paver. Manual placing of concrete for concrete lining is not allowed under any circumstances for any type of canal. Trapezoidal section of lining should be adopted in all canals. In vulnerable reaches, in toe of hillocks and in extra ordinary cases in view of stability of side slopes, rectangular section with vertical RCC retaining walls may be adopted under approval of the competent authority. Suitable transition in 3:1 is to be provided to negotiate to the trapezoidal section. However, the canal section up to 1.5 m bed width (width of lined section) may be provided with rectangular lining section with RCC cantilever walls with grade of RCC as per the exposure conditions as recommended in IS: 456-2000 when the trapezoidal lining using paver is not feasible.

For water course & Field channels( CAD), rectangular RCC section with bed width of 300 mm along with provision of 8 mm diameter reinforcement @ 200 mm c/c on both ways with a clear cover of 30mm may be made. The reinforcement is to be provided on earthen side of both the walls and the bed. Thickness of the RCC should be 100mm.

**6.0 CEMENT CONCTRE TILES (IS 10646:1991)**

**a. DIMENSIONS**

The nominal dimension shall be 500 mm x 500 mm, 500 mm x 250 mm, 400 mm x 400 mm, 300 mm x 300 mm and 250 mm x 250 mm. Each of these shall be manufactured in the thicknesses 60, 50 and 40 mm. However, other sizes other than given above may also be manufactured if required.

**b. TOLERANCE, SHAPE, FLEXURAL STRENGTH**

In length and breadth shall be  $\pm 3$  mm and thickness shall be  $+ 2.0$  mm. The tile shall have its all sides at right angles to the faces. When tested according to the method as given IS10646:1991, minimum breaking load per cm length of tile shall not be less than 41 kg for 60 mm, 29 kg for 50 mm and 18 kg for 40 mm tiles thickness.

## 7.0 PARAMETER FOR DESIGN OF LINED CANALS (IS10430:2000)

### (i) INNERSIDE SLOPES

Before taking up the lining work, the Engineer in charge should ensure that inner side slopes of the canal are stable. No earth pressure or any other external pressure is exerted over the back of the lining. Sudden drawdown of water level in the lined canal should be avoided. Wherever, there is chance of sudden drawdown, the canal slopes should be checked for stability using slip circle analysis as given in IS 7894. Besides, adequate drainage arrangements as required should be provided before commencement of lining work. For general guidance following side slopes as mentioned below in the table are recommended. The slopes recommended below are applicable for depth of cutting/height of embankment up to six (6) meter. For depth / height in excess of six (6) meter, special studies for the stability of slopes are recommended.

**Table No.3**  
**Recommended Side Slopes**

Type of Soil	Side Slopes (Horizontal : Vertical)
i) Very light loose sand to average sandy soil	2 : 1 to 3 : 1
ii) Sandy loam	[Cutting - 1.5 : 1 to 2 : 1] [Embankment - 2 : 1]
iii) Sandy gravel / moorum	[Cutting - 1.5 : 1] [Embankment - 1.5 : 1 to 2 : 1]
iv) Black cotton	[Cutting - 1.5 : 1 to 2.5 : 1] [Embankment - 2 : 1 to 3.5 : 1]
v) Clayey soils	[Cutting - 1.5 : 1 to 2 : 1] [Embankment - 1.5 : 1 to 2.5 : 1]
vi) Rock	0.25 : 1 to 0.5 : 1

### (ii) OUTERSIDE SLOPES

The engineering properties of soil shall govern the design of outer slopes. Due consideration should be given to the stability of slopes for functional situations like moist conditions of fill etc. The need for introduction of berms will also be kept in view where the fill height is in excess of six (6) meter. For typical cross section of outer slopes, Pl. refer Fig. IA, IB, 2A, 2B of IS 10430 :2000.

### (iii) FREE BOARD

**Table No.4**

Canal Discharge	Minimum Free Board	Remark
Less than 0.1 cumec (Water course)	0.15 m	Free board shall be measured from FSL to top of lining
Less than 1 cumec	0.30 m	
1 cumec to 3 cumec	0.50 m	
3 cumec to 10 cumec	0.60 m	
More than 10 cumec	0.75 m	

### (iv) BERM

In deep cut reaches of canals with discharge capacity exceeding 10 cumecs, berms of 3m to 5m width should be provided in each side for stability as well as for easy maintenance. Turfing is to be done on the inner side slopes above the berms.

**(v) COPING**

The Engineer in charge should take adequate measures so that no rainwater shall be allowed to flow or percolate towards the canal slope behind lining. To check the ingress of rain water behind the lining of side slopes of the canals, horizontal cement concrete coping 100 mm to 150 mm thick, depending upon size of canal should be provided at the top of lining. The width of coping at the top shall not be less than 225 mm for discharge up to 3 cumecs, 350 mm for discharge more than 3 cumec and 550 mm for discharge more than 10 cumec.

**(vi) CROSS SECTIONS & VELOCITY**

Trapezoidal section is the preferred section for all types of lined canals. However, for small canals with discharge capacity up to 3 cumecs, cup shaped sections may be used. The maximum permissible velocities for different types of linings are as follows.

- ✓ Cement concrete lining - 2.7 m/s
- ✓ Burnt clay tile or brick lining - 1.8 m/s
- ✓ Stone-pitched lining - 1.5 m/s

While designing lining, critical velocity ratio should be aimed at higher than unity so that silting will not take place in the lined canal.

**(vii) UNDER DRAINAGE**

Embankments of relatively permeable soil do not need drainage measures behind the lining. However, drainage measures to be provided if the lined canal passes through an area where seasonal ground water level is higher than water level inside the canal, where sub-grade is sufficiently impermeable to prevent free drainage of seepage or leakage from canal, where there is built up pressure due to time lag drainage of the sub-grade following drawdown of canal.

**TableNo.5  
Drainage Details**

Sl.No	Types of Sub-grade	Position of Water Table		
		Below Canal Bed Level	Between Canal Bed Level and F.S.L	Above Canal F.S.L.
1	<b>Subgrade Free Draining</b> [Soil comprising gravel with sand, or sandy soil having permeability (K) greater than 10 <sup>-4</sup> cm/sec]	No drainage arrangement is required	Drainage arrangement required. 150 mm to 200 mm thick layer of well designed filter below lining should be	Drainage arrangement is required. 150 mm to 200 mm thick layer of well designed filter below lining should be provided
2	<b>Subgrade Poor Draining</b> [Soil comprising very fine sand, admixture of sand, silt and clay or soil having permeability (K)]	Drainage arrangement required. 150mm to 200 mm thick layer of well designed filter below lining	Drainage arrangement required. 150 mm to 200 mm thick layer of well designed filter below lining should be provided	Drainage arrangement is required. 200 mm to 300 mm thick layer of well designed filter below lining

	between $10^{-4}$ cm/sec and $10^{-6}$ cm/sec]	should be provided		should be provided
3	<b>Subgrade Practically Impervious</b> [Soil comprising of homogeneous clay with permeability (K) less than $10^{-6}$ cm/sec]	Drainage arrangement required. The subgrade should be removed to a depth of 600 mm and replaced by sand, murrom or suitable pervious material	Drainage arrangement required. The subgrade should be removed to a depth of 600 mm and replaced by sand, murrom or suitable pervious material	Drainage arrangement is required. The subgrade should be removed to a depth of 600 mm and replaced by sand, murrom or suitable pervious material

(viii) PRESSURE RELIEF ARRANGEMENTS

Embankments of relatively permeable soil do not need drainage measures behind the lining. However, drainage

TableNo.6  
Pressure relief arrangement details

Sl.No	Types of Sub-grade	Position of Water Table		
		Below Canal Bed Level	Between Canal Bed Level and F.S.L	Above Canal F.S.L.
1	<b>Subgrade Free Draining</b> [Soil comprising gravel with sand, or sandy soil having permeability (K) greater than $10^{-4}$ cm/sec]	No pressure relief arrangement required	<b>Bed-</b> Longitudinal & Transverse drains with pressure relief valves provided. <b>Sides-</b> Pressure relief valves in pockets filled with filter material should be provided	<b>Bed-</b> Longitudinal & Transverse drains with pressure relief valves provided. <b>Sides-</b> Transverse drain with Pressure relief valves should be provided
2	<b>Subgrade Poor Draining</b> [Soil comprising very fine sand, admixture of sand, silt and clay or soil having permeability (K) between $10^{-4}$ cm/sec and $10^{-6}$ cm/sec]	<b>Bed-</b> Longitudinal & Transverse drains with pressure relief valves provided. <b>Sides-</b> Pressure relief valves in pockets filled with filter material should be provided	-do-	-do-
3	<b>Subgrade Practically Impervious</b> [Soil comprising of homogeneous clay with permeability (K) less than $10^{-6}$ cm/sec]	-do-	-do-	-do-

(ix) LONGITUDINAL DRAINS

The section of longitudinal drain should be trapezoidal with bottom width 500 mm, depth 525 mm and sides as steep as practicable. The drain should be carefully filled up to the bottom of the lining with graded filter with pipe as shown in Fig. and properly compacted so as to form an even bedding for lining. The pipe may be asbestos cement pipe or PVC pipe. It should be perforated. Usually 150 mm diameter pipes are used. The perforations/holes should be 12 mm in diameter and should be done by drilling. On an average there should be a minimum of 100 perforations/holes per meter length of pipe and the perforations/holes in adjacent rows should be staggered. The pipe should be properly shrouded with suitable filter. The number of longitudinal drains should depend on the bed width of canal. In the bed of the canal, at least one drain for every 10 m width should be provided. The drains should be placed symmetrically with reference to the centre line of canal. Care should be taken that the filter does not get clogged during lining.

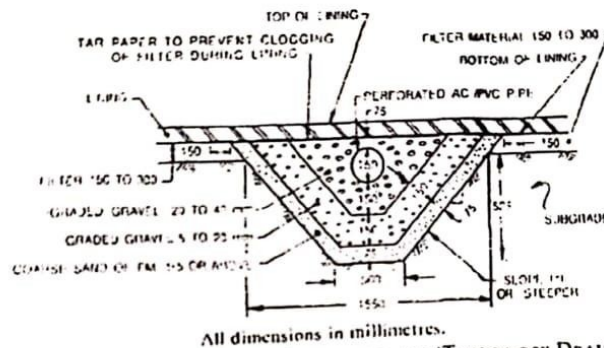


FIG. 1 TYPICAL SECTION OF LONGITUDINAL/TRANSVERSE DRAIN  
(PRESSURE RELIEF VALVE NOT SHOWN)

#### (x) TRANSVERSE DRAINS

Transverse drains, where necessary, should be provided in the bed and on the side slopes up to free board level. Section and all other specification of transverse drain should be same as that of longitudinal drain. Spacing of transverse drains should depend on size, location and efficiency of pressure relief valves. However, in general, transverse drain should be provided at 10 m interval.

#### (xi) PRESSURE RELIEF VALVES

Pressure relief valves should be provided on the longitudinal/transverse drains. If there are no transverse drains, the PRV may be provided in pockets filled with graded filter underneath the lining. Pockets may be square with sides of 600 mm or cylindrical with diameter 600 mm. Pockets on slopes should be excavated with their sides at right angles to the slope. The perforated PVC housing pipe for the PRV should be 750 mm long for sides and 430 mm long for bed. It should be placed in the centre of the pocket. Graded filter as shown in Fig. 3 should then be carefully placed in the pocket and compacted to form an even bedding for canal lining. Perforations in the housing pipe should be as shown in Fig below.

For placing of Pressure Relief Valves (PRVs) in rows, in general, one row at every 4 m should be provided on the sides. The first row should be about 50 cm above curve line and top

row at 50 cm to 100 cm below full supply level. If the water depth is less than 1-5 m, one row should be adequate. Valves in adjacent rows should be staggered.

For spacing of Pressure Relief Valves (PRVs), in general, one pressure relief valve for every 100 Sqm should be provided in the canal bed; while on the sides, one pressure relief valve for every 40 Sqm should be provided. However, the spacing should be decided on this general consideration, keeping in view the site conditions.

#### 8.0 LINING OF CANAL IN EXPANSIVE SOIL (IS:9451-2004)

##### (i) GENERAL

Expansive soils are soils that expand when water is added, and shrink when they dry out. These soils are exerting a swelling pressure ranging from 50 to 300 KN/sqm when comes in contact with water. To counteract the swelling pressure and to prevent deformation of the rigid lining, a Cohesive Non-Swelling Soils (CNS) of required thickness depending on the swelling pressure of expansive soil, is placed below the rigid lining. The CNS material usually contains 15 to 20% clay (less than 2 microns), 30 to 40% silt (0.06mm to 0.002 mm), 30 to 40% sand (2mm to 0.06 mm) & 0 to 10% gravel (greater than 2mm). The liquid limit of CNS is in between 30 to 50 and Plasticity index is in between 15 to 30. CNS material should be non-swelling with a maximum swelling pressure of 10KN/m<sup>2</sup>.

##### (ii) CRITERIA FOR FIXING MINIMUM THICKNESS OF CNS LAYER

Table No-7

###### ✓ Canal discharge less than 2 cumecs

Discharge in Cumecs	Thickness of CNS Layer in cm (Minimum)	
	Swell pressure 50 - 150 KN/m <sup>2</sup>	Swell pressure more than 150 KN/m <sup>2</sup>
1.4 - 2.0	60.0	75.0
0.7 - 1.4	50.0	60.0
0.3 - 0.7	40.0	50.0
0.03 - 0.3	30.0	40.0

###### ✓ Canal discharge more than 2 cumecs

Swell pressure in KN /m <sup>2</sup>	Thickness of CNS Layer in cm (Minimum)
50-150	75.0
150-300	85.0
300-500	100.0

##### (iii) CONSTRUCTION PROCEDURE

###### A. Canals in cutting zone

- Proper moisture to be added to CNS material. CNS material should be compacted in layers by appropriate equipment to ensure proper density. It is advisable to provide CNS right up to ground level.
- In deep cuts, It is advisable to provide CNS right up to ground level. The CNS above canal prism may be of lesser thickness say 150-200mm. However full design thickness behind the lining should be continued at least 1000mm above the top level of lining.

#### **B. Canals in Embankment**

- Proper moisture should be added to CNS material and expansive soil surface.
- Expansive soil and CNS Soil above GL should be compacted simultaneously in layers with appropriate equipment to ensure proper density. The compaction may be done either with sheep foot rollers or 8 to 10 ton ordinary roller.
- A rock toe with inverted filters may be provided at either end of canal bank.
- A thickness of 150-200mm CNS layer on rear slopes may be provided simultaneously with expansive soil and proper turfing is to be provided to protect slope.
- CNS layer below sand blanket at rock toe portion shall be provided.

#### **C. Pride**

- The problem of effectively compacting the subgrade for side lining on slopes is very important in case of black cotton expansive soil zone in cutting or embankments, where backfill of CNS material is required to be placed for the sides and bed, in addition to design thickness. Twenty (20) cm or so ( perpendicular to side slope) of extra pride may be provided and compacted in horizontal layers to the required density. This pride should be removed only just prior to the placement of lining, thus making a fresh and well compacted surface available for bedding.

#### **D. Use of Polythene Sheet below Concrete Lining**

- The use of polyethylene sheet below concrete lining could be either for achieving better ultimate imperviousness of the lining as a whole or it may be used only for limited purpose as an assistance, during construction, for avoiding the cement slurry from concrete escaping in the subgrade below. Use of LDPE sheets 200, gauge ( 50 micron) is to achieve only the latter' limited purpose. If overall imperviousness is proposed to be achieved, it would be necessary to use HDPE-HM sheet of sufficient thickness, strength, toughness and durability.

#### **(iv) UNDER DRAINAGE ARRANGEMENTS AND JOINTS IN LINING**

- The drainage properties of CNS material itself need to be given due consideration as water locked up in this saturated layer is likely to cause pore pressure on the lining during -canal draw down conditions. To release the same if holes are provided for drainage in concrete lining, care will have to be taken to provide inverted filters at the back of the holes so as to avoid the CNS material being washed away by fluctuating water levels in the canal. Such drainage holes are, however, not advocated for general adoption,
- It is recommended to provide regular drainage arrangements using porous concrete sleepers, 7.7 cm x 20 cm with 50 mm perforated G.I pipes at 3m centre to centre coming out through the sides of the lining. Two porous concrete sleepers on either side of the bed, below the side may be provided. 'A 50 to 75 mm thick sand mat below the bed and side cast *in-situ* lining ( below the polyethylene sheet) should be provided. Where the sand mat is not economically feasible additional porous concrete sleepers may instead be provided at right angles to the longitudinal rails ( along the cross section of the canal) at 3 m centre to centre. The porous concrete sleepers have to be encased in filter material.

### **9.0 OTHER IMPORTANT WORK**

#### **a. ANTI-SALT TREATMENT**

Soil in all reaches should be tested for salt content before the lining is started. Where the salt content is over 1.00 percent or sodium sulphate is over 0.36 percent, the subgrade should be first covered with about 2 mm thick layer of bitumen obtained by evenly spraying bitumen at

a rate of about 2-35 kg/m<sup>2</sup>. To get a good bond between bitumen and soil, crude oil at a rate of 60-5 lit/m<sup>2</sup> should be sprayed over it in advance of spraying bitumen. In case such a situation is encountered only in small packets the replacement of subgrade up to a suitable depth by suitable earth from adjoining reaches should be considered, if economical.

b. **CURING:** Curing is of utmost importance for any concrete. Curing by ponding water in the canal upto minimum 14 days is to be done in case of availability of water otherwise curing compound shall be used for curing of in-situ-concrete lining.

c. **QUALITY CONTROL:** Utmost care is to be taken for stringent quality control to get proper strength and durability and to maintain the thickness of lining / CNS layer if any as well as to achieve the properly compacted base before lining.

d. **TESTS FOR LINING** (non – destructive rebound hammer test): To test the effectiveness of vibration, permeability, strength of concrete cores at suitable places from the sides of canal as well as from the bed canal concrete shall be taken.

*Typical cross-section of lined canal and providing joint at canal lining shown in Annexure-II to VI.*

#### 10. REHABILITATION/ REMODELLING OF STRUCTURES

Where-ever the entire length of existing canal is proposed for lining, it is necessary to rehabilitate/ modernize /replace the structures and construct of additional structures, wherever necessary in the lining reaches for efficient functioning of canals. Engineer in charge must ensure that all the structures associated with canal must function properly. The total system need to be reviewed by the field authorities considering the health of the structures in view of strength & durability, leakage, crest level, gate size, vent size, discharge through canal siphon, CR,HR, Outlets etc. Measuring devices shall be provided at the D/S of Head Regulators of all off-taking canals for measurement of discharge as per the norms laid down in I.S. codes. Cross Regulators/Duck bill weirs , wherever necessary, may be provided to maintain full supply depth for better regulation in distribution of water.

#### 11. PREPARATION OF DPR

During preparation of DPR, the present guidelines and the guidelines approved for CLSRP circulated vide letter No.1717(WE) dt.19.2.2013 of EIC,WR shall be followed . DPR should contain an exhaustive report & Check List as given in Annexure-I duly signed by Chief Engineer/ Chief Construction Engineer. The revised L.S. & D.S. of the canal adopting reduced lined section as per the design with proposed interventions, modifications / rehabilitation is to be approved by the concerned C.E. / CE& BM / CE,FC&BM / CCE of the project. The technical team constituted by EIC will scrutinize the DPRs.

##### 1. Specification of Materials

The detailed specification of the materials to be used may not be described in detail. Rather relevant IS Codes / Manuals/ CBIP Publications may be specified to refer for this purpose. Any specific materials not covered under above records of reference may be described in detail.

## 2. Specification of Works

Normal specification of works which are described in relevant IS codes need not be mentioned rather relevant IS Codes /Manuals/ CBIP Publications may be specified to refer to for this purpose. Any specific work not covered under above records of reference may be described in detail.

## 3. Quality Control and Assurance

The detailed specification for quality control and assurance to be followed may not be described in detail. Rather relevant IS Codes /Manuals/ CBIP Publications may be specified to refer to for this purpose. Any specific measures in this regard not covered under above records of reference may be described in detail.

State Quality Monitoring (SQM) guidelines shall be followed for this project. Hence, these guidelines/ provisions shall be specified in the technical specification.

Relevant IS codes numbers of latest revision without mentioning the year of revision may be mentioned to refer for different items.

Some of the relevant I.S. Codes/Manuals/CBIP Publications are listed below for ready reference. However other relevant references may also be referred.

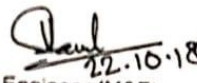
Sl.No.	Name	Code Number/Publisher
1. ✓	Criteria for design of lined canals and guidance for selection of type of lining.	IS:10430
2. ✓	Laying cement concrete/stone slab lining on canals- code of practice	IS:3873
3.	Canal linings — cement concrete tiles — specification	IS:10646
4.	Guidelines for lining of canals in expansive soils.	IS:9451
5.	Code of practice for under drainage of lined canals.	IS:4558
6.	Lining of canals with polyethylene film- Code of practice.	IS:9698
7.	Code of practice for Plain and reinforced concrete	IS:456
8.	Manual on canal lining	INCID
9.	Classification and identification of soils for general purpose	IS:1498
10.	Sealing Expansion joints in Concrete lining of Canals	IS:5256
11.	Code of practice for lining water courses and field channels.	IS:12379

12.	Guide lines for seepage losses for canals by analytical method.	IS:9447
13.	Methods of sampling and analysis of concrete	IS:1199
14.	Methods of test for soils (Relevant parts)	IS-2720
15.	Workshop on Canal Lining	CBIP
16.	Stability analysis of slopes	IS: 7894
17.	A manual on LDPE film for water conservation	Indian Petrochemicals Corporation Limited

  
 Director, Coastal  
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 Chief Construction Engineer,  
 Anandapur Barrage Project.

  
 Superintending Engineer,  
 Eastern Circle No-II

  
 Chief Engineer (M&E)  
 O/o the E.I.C., W.R.

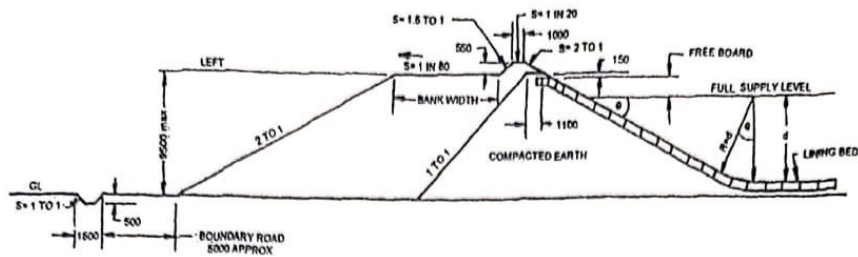
  
 Director, Procurement,  
 O/o the E.I.C., W.R.

  
 Asst. to E.I.C., W.R.  
 O/o the E.I.C., W.R.

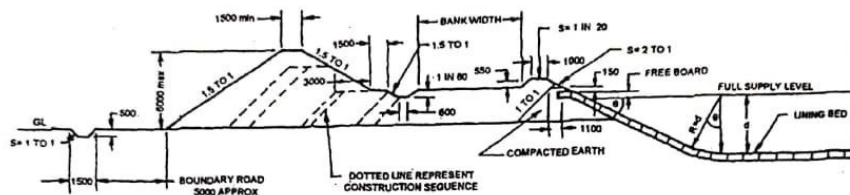
**CHECKLIST**

Sl No	Particulars	Yes	No	Remarks
1	Salient feature of the Project attached			
2	The project has received any financial assistance in last five years from any funding agency except normal maintenance grant			
3	Certificate of EE to the fact under Sl. 2 with c/s of SE/CE attached			
4	Ground verification certificate by SE			
5	Certificate regarding the canal system having lifespan more than 20 years.			
6	Status of existing canal system with identified deficiencies responsible for low water use efficiency and details of interventions required with inspection report of concerned Superintending Engineer in this regard attached			
7	Details of potential created and utilized for the last 5 years attached.			
8	Details of potential created / stabilized attached.			
9	Original L.S/D.S of the canal system attached			
10	Existing Crest Level of all off taking canals and outlets attached			
11	Revised L.S/D.S of the canal system including the proposed interventions under CLSRP and countersigned by concerned CCE/CE attached			
12	Approved cross section drawing			
13	Tee-diagram of the canal system indicating proposed interventions attached			
14	Description of different components of works such as repair and renovation of structures and gates, construction of new structures, renovation/re-sectioning of canal attached			
15	Whether provision of Measuring Device(MD) incorporated			
16	Geo tagged photograph attached			
17	Implementation schedule attached			
18	PWT report taken up by Pani Panchayat representative & Field engineers attached			
19	B.C. ratio/ I.R.R. calculation details attached.(taking into account all the benefits including reclamation of saline & water logged land)			
20	Ayacut map attached			

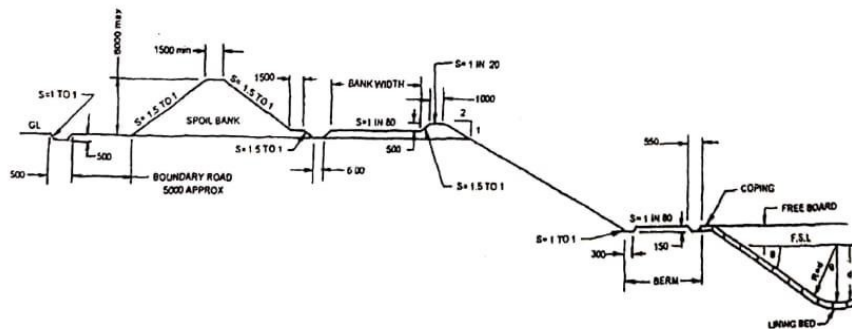
Typical Cross-Section of lined canal



All dimensions in millimetres.  
FIG. 1A NATURAL GROUND BELOW BED



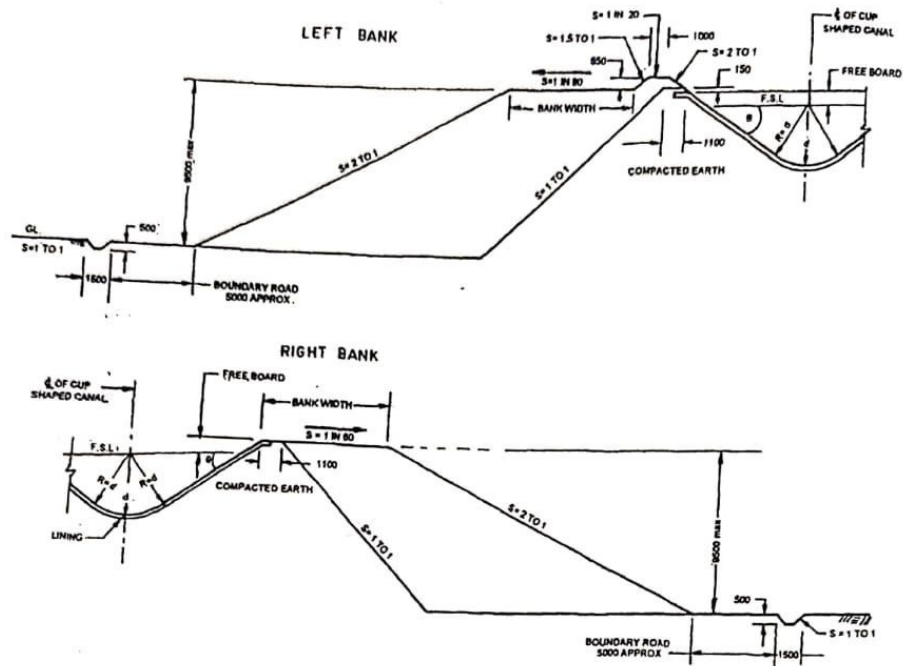
All dimensions in millimetres.  
FIG. 1B NATURAL GROUND BETWEEN BED AND FULL SUPPLY LEVEL



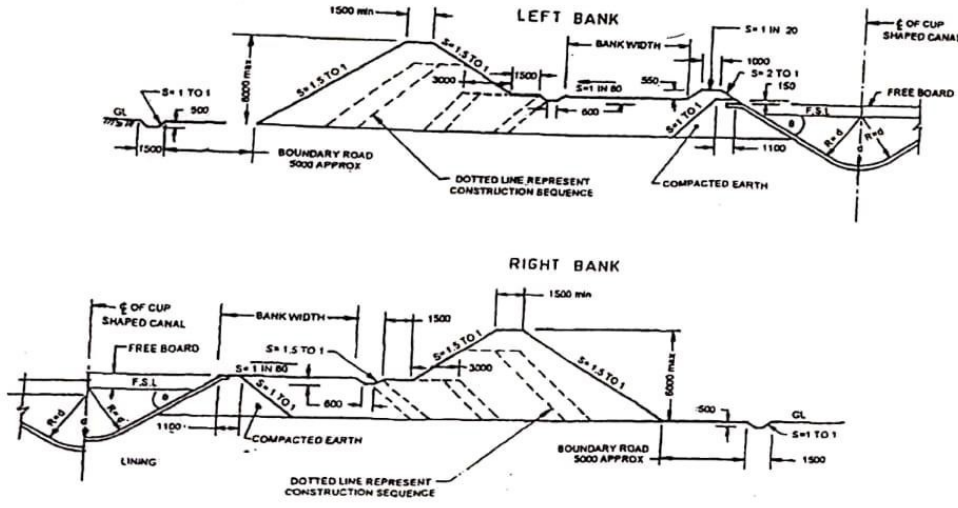
All dimensions in millimetres.  
FIG. 1C NATURAL GROUND IS ABOVE TOP OF LINING

Typical Cross-Section of lined canal

IS 10430 : 2000

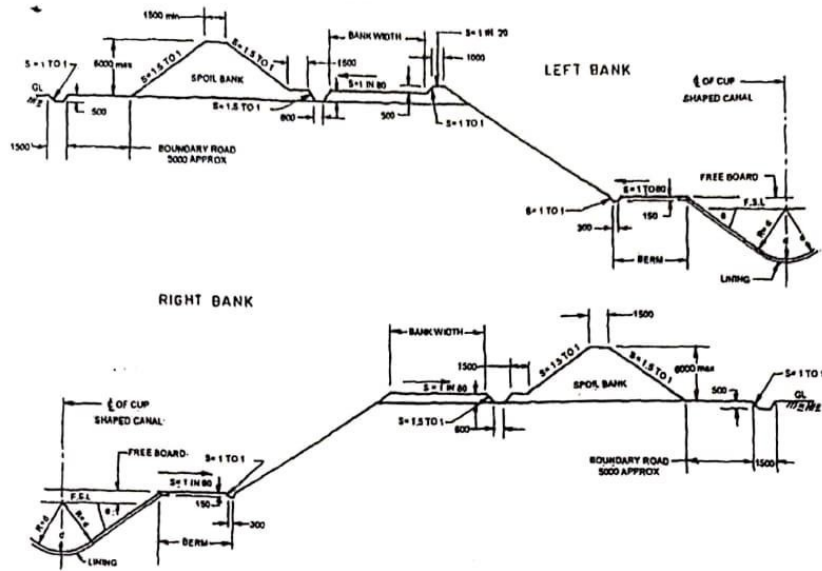


All dimensions in millimetres.  
FIG. 2A NATURAL GROUND BELOW BED



All dimensions in millimetres  
FIG. 2B NATURAL GROUND BETWEEN BED AND FULL SUPPLY LEVEL

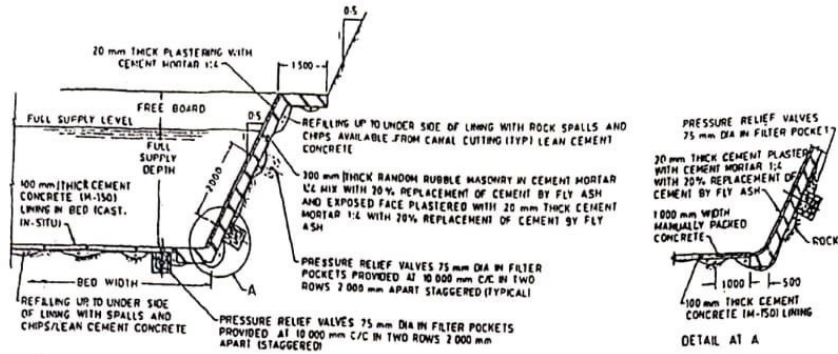
Typical Cross-Section of lined canal IS 10430 : 2000



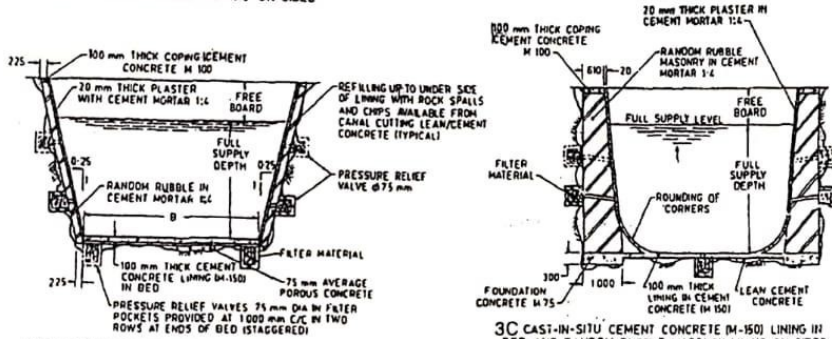
All dimensions in millimetres.  
FIG. 2C NATURAL GROUND IS ABOVE TOP OF LINING

IS 10430 : 2000

Typical Cross-Section of lined canal



3A CAST-IN-SITU CEMENT CONCRETE LINING IN BED AND RANDOM RUBBLE MASONRY LINING ON SIDES



3B CAST-IN-SITU CEMENT CONCRETE (M-150) LINING IN BED AND RANDOM RUBBLE MASONRY LINING ON SIDES

3C CAST-IN-SITU CEMENT CONCRETE (M-150) LINING IN BED AND RANDOM RUBBLE MASONRY LINING ON SIDES

NOTES

- 1 In case of sound rock, cement concrete lining may be provided in bed and sides. On sides, the lining may be anchored suitably to the rock behind.
- 2 All the dimensions are in millimetres unless otherwise specified.

FIG. 3 TYPICAL CROSS-SECTIONS OF LINED CANALS IN ROCK CUTTING

## JOINTS

Joints shall be spaced and located as shown in the drawing or as directed by the Engineer-in-charge. The grooves at the joints shall be of size and shape as shown on the drawing and filled with hot applied sealing compound. Filling of the joint with hot applied sealing compound should be taken up after completion of all other canal work. In the mean time the grooves shall be filled with clean coarse sand.

**Expansion Joints:** Expansion joint shall not be provided except where structure intersect the canal. At intersecting structures an expansion joint of 25 mm width filled with sealing compound conforming to IS : 5256-1968 or with P.V.C. water stops shall be provided.

**Construction Joint:** Construction joints is placed at any location where it is suited as an exigency to construction (interruption of work.). The construction joints are provided in the canal lining, wherever there is discontinuity of concrete work for a period of time leading to creation of cold joint. Generally, bed lining is executed in advance of the laying side lining. As such construction joints are required on either side of canal bed at the junction of bed and side lining. Normally longitudinal construction joints are provided at about 500 to 1000 mm from the tangent point of the curve at the junction of canal bed and the side slope on either side of the bed. In the case of small channels, where bed and side lining are laid simultaneously, longitudinal construction joints are not provided. Transverse construction joints should be provided, where discontinuity of work for considerable time is expected. 200 mm x 150 mm size CC M15 grade sleepers are provided under the construction joints. The joint should be filled with hot pour sealing compound as per specifications in IS: 5256 – 1992.

**SPECIFICATIONS OF SEALING COMPOUND FOR FILLING LONGITUDINAL AND TRANSVERSE CONTRACTION JOINT GROOVES:** The sealant is prepared from the materials as under:

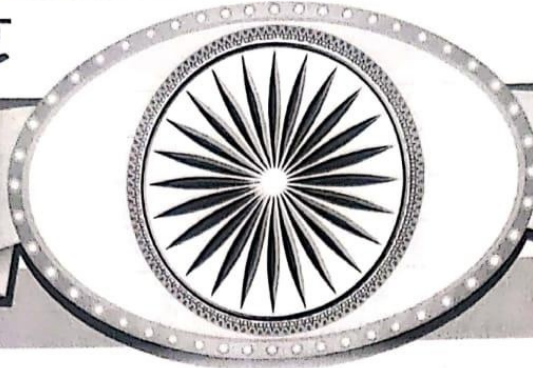
- (i) Bitumen 85/25 ..... 55%  
 (ii) Sand (fineness modulus 1.0 to 1.5)..... 43%  
 (iii) Asbestos powder ..... 2%

**Contraction joints :** Contraction joints should be provided in canal lining at interval of not more than 36 times the thickness of lining, in both longitudinal and 38 transverse directions. The following spacing is adopted for different thicknesses of lining.

Sl No.	Thickness of lining in MM	Spacing of contraction joint in MM
1	60	2000
2	75	2500
3	100	3500
4	120	4000

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मानक ★



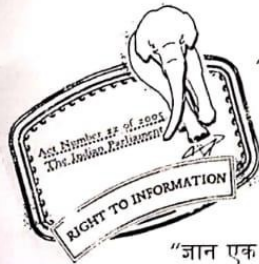
### Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”  
Mazdoor Kisan Shakti Sangathan  
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”  
Jawaharlal Nehru  
“Step Out From the Old to the New”

IS 9451 (1994): Guidelines for lining of canals in expansive soils [WRD 13: Canals and Cross Drainage Works]



“ज्ञान से एक नये भारत का निर्माण”  
Satyanarayan Gangaram Pitroda  
“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”  
Bhartrhari—Nitiśatakam  
“Knowledge is such a treasure which cannot be stolen”

REAFFIRMED 2004  
IS 9451 : 1994

भारतीय मानक  
प्रसरणशील मृदा में नहरों के आस्तर के मार्गदर्शी सिद्धान्त  
( दूसरा पुनरीक्षण )

*Indian Standard*

**GUIDELINES FOR LINING OF CANALS  
IN EXPANSIVE SOILS**

*( Second Revision )*

UDC 626.823.917 (1026)

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

February 1994

Price Group 3

AM-ENDMENT NO. 1 SEPTEMBER 2000  
TO  
IS 9451: 1994 GUIDELINES FOR LINING OF CANALS  
IN EXPANSIVE SOILS  
(Second Revision)

(Page 2, clause 5.2, Table 1A) — substitute 'swelling pressure' for 'swell pressure'.

(Page 3, clause 6.5, line 7) — Substitute 'Low density polyethylene (LDPE)' for 'LDPE'.

(Page 3, clause 6.5, line 11) — Substitute 'High molecular mass high density polyethylene (HDPE-HM)' for 'HDPE-HM'.

(Page 4, Fig. 2) — Substitute 'Cast-in-situ' for 'CIS'.

(Page 4, Annex A) — Insert '(second revision)' at the end of the title of IS 3873 : 1993.

(Page 5, Annex A) — Insert '(first revision)' at the end of the title of IS 4515 : 1993.

(Page 5, Annex A) — Substitute the title of IS 11809 : 1993 by the following:

'Lining for canals by stone masonry — Code of practice'.

(WRD 13)

Reprography Unit, BIS, New Delhi, India

**AMENDMENT NO. 2 NOVEMBER 2011  
TO  
IS 9451 : 1994 GUIDELINES FOR LINING OF CANALS  
IN EXPANSIVE SOILS**

*( Second Revision )*

*(Page 1, clause 4.1, para 1, second sentence)* — Substitute 'This characteristic of swelling and the swelling pressures of expansive soils is attributed to the presence of montmorillonite or combination of montmorillonite and illite clay minerals in such soils.' for 'This characteristic of swelling and the swelling pressures of black cotton soils is attributed to the pressure of montmorillonite or combination of montmorillonite and illite clay minerals.'

*(Page 1, clause 4.1, para 2, first sentence)* — Substitute 'The free swell index and swelling pressure tests should be done in accordance with IS 2720 (Part 40) and IS 2720 (Part 41) respectively.' for 'The swelling pressure and free swell index tests should be done in accordance with IS 2720 (Part 40) : 1977 and IS 2720 (Part 41) : 1977.'

*(Page 1, clause 4.2.1, line 1)* — Substitute 'Cohesive non-swelling soil' for 'They'.

*(Page 2, clause 5.2, line 4)* — Substitute 'IS 10430' for 'IS 10430 : 1982'.

*(Page 2, Table 1A, Title)* — Substitute '**Table 1A Thickness of CNS Layer for Canal Carrying Capacity of Less Than 2 Cumecs**' for the existing.

*(Page 2, Table 1B, Title)* — Substitute '**Table 1B Thickness of CNS Layer for Canal Carrying Capacity of 2 Cumecs and More**' for the existing.

*(Page 2, Table 1B)* — Substitute 'Thickness of CNS Layer in cm (*Min*)' for 'Thickness of CNS Materials, cm (*Min*)'.

*[Page 4, clause 7.1]* — Substitute 'IS 3872, for 'IS 3872 : 1966', 'IS 4515' for 'IS 4515 : 1993', and 'IS 11809' for 'IS 11809 : 1993'.

*(Page 4, Annex A)* — Substitute 'IS 2720 (Part 41) : 1977 Methods of test for soils : Part 41 Measurement of swelling pressure of soils' for the existing.

*(Page 4, Annex A)* — Substitute 'IS 3872 : 2002' for 'IS 3872 : 1966' and

**Amend No. 2 to IS 9451 : 1994**

substitute the following for the existing title:

'Lining of canals with burnt clay tiles — Code of practice (*first revision*)'.

(Page 5, Annex A) — Substitute 'IS 4515 : 2002' for 'IS 4515 : 1993' and substitute the following for the existing title:

'Stone pitched lining for canals — Code of practice (*second revision*)'.

(Page 5, Annex A) — Substitute 'IS 11809 : 1994' for 'IS 11809 : 1993' and substitute the following for the existing title:

'Lining of canals by stone masonry — Code of practice (*first revision*)'.

(Page 5, Annex A) — Substitute 'IS 10430 : 2000' for 'IS 10430 : 1982' and substitute the following for the existing title:

'IS 10430 : 2000 Criteria for design of lined canals and guidance for selection of type of lining (*first revision*)'

(WRD 13)

## FOREWORD

This Indian Standard ( Second Revision ) was adopted by the Bureau of Indian Standards, after the draft finalized by the Irrigation Canals and Canal Linings Sectional Committee had been approved by the River Valley Division Council.

Canals excavated in expansive soils, such as black cotton soil, pose several problems involving stability of slopes and shape of section. To have economical sections and prevent erosion due to design velocities, it is necessary to line the canal bed and slopes. Precast cement concrete slabs for side slopes and *in-situ* concrete for bed are common types of lining adopted for canals in cutting and embankment. However, it is often experienced that the lining materials directly placed against the expansive soils undergo deformation by heaving, disturbing the lining and throwing the canal out of commission. This deformation is traced to the characteristics of swelling and swelling pressure developed by expansive soils, when they imbibe water in their intra-layers. Adequate thickness of cohesive non-swelling soil ( CNS ) material is found to resist swelling pressure and prevent the heaving of underlying soil. From experiments in laboratory and field it is concluded that deformations may be correlated to the thickness of CNS layer and swelling pressure characteristics of expansive soil. This standard lays down guidelines for the treatment of expansive soils by introduction of a cohesive non-swelling soil layer of suitable thickness between the expansive soil mass and the lining material to counteract the swelling pressure and resultant deformation of the lining material on a scientific basis.

This standard was first published in 1980 and the first revision was taken up in 1985. The second revision has been taken up in view of the experience gained during the course of these years in the use of this standard. The following major changes have been incorporated in this revision:

- 1) Identification and properties of expansive soil have been referred to the relevant Indian Standard.
- 2) Instead of three types of treatment only one type of treatment has been provided.
- 3) Modifications have been incorporated in Table 1.
- 4) Construction procedure for canal in cutting and embankment has been added in detail.
- 5) Clauses on under-drainage arrangements and joints in lining have been elaborated.
- 6) Fig. 1 and 2 have been incorporated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*  
**GUIDELINES FOR LINING OF CANALS  
 IN EXPANSIVE SOILS**  
 ( *Second Revision* )

**1 SCOPE**

1.1 This standard lays down guidelines for lining of canals in expansive soils.

NOTE — Black cotton soils are a type of expansive soil.

**2 REFERENCES**

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

**3 TERMINOLOGY**

For the purpose of this standard the definition of terms given in IS 1498 : 1970 shall apply.

**4 GENERAL**

4.1 Expansive soils in side slopes and bed of canal in cutting or embankment when in contact with water swell, exerting a swelling pressure which may range from 50 to 300 kN/m<sup>2</sup> or more. This characteristic of swelling and the swelling pressures of black cotton soils is attributed to the pressure of montmorinolite or combination of montmorinolite and illite clay minerals. A wide range of properties of expansive soils are found in India ( see IS 1498 : 1970 for identification and properties ).

The swelling pressure and free swell index tests should be done in accordance with IS 2720 ( Part 40 ) : 1977 and IS 2720 ( Part 41 ) : 1977. Expansive soil met within the locality has to be analysed for swelling pressure before deciding the type of treatment.

For testing the expansive soil for determination of swelling pressure the expansive soil specimen should be remoulded at zero moisture content to the density obtainable at any time in the year in the field at a depth beyond 1.0 m ( in expansive soil ). The swelling pressure should be determined under no volume change condition when moisture content is increased from zero to full saturation level.

**4.2 Cohesive Non-swelling Soils ( CNS ) for Treatment**

4.2.1 They are soils possessing the property of cohesion of varying degree and non-expanding type clay minerals such as illite and kaolinite

and their combination with low plasticity with liquid limit not exceeding 50 percent.

4.2.2 Some of the soils which may be considered as cohesive non-swelling soils are all adequately compacted clayey soils, silty clays, sandy clays, gravelly sandy clays, etc, exhibiting cohesive properties and containing predominantly non-expanding type clay minerals.

4.2.3 CNS material should be non-swelling with a maximum swelling pressure of 10 kN/m<sup>2</sup> when tested in accordance with IS 2720 ( Part 41 ) : 1977 at optimum moisture content and minimum cohesion ( unconfined compression strength on saturated compacted soil, remoulded at OMC and compacted to standard proctor density ) should be 10 kN/m<sup>2</sup> when tested according to IS 2720 ( Part 10 ) : 1991.

4.2.4 If given CNS material is not available, designed mix to produce blended CNS may be used. The artificial CNS should satisfy all the requirements of CNS. If stabilized material is to be used, special mix design needs to be evolved.

4.2.5 Most murums of laterite, laterite type and siliceous sandy clays exhibit CNS characteristics, however some murums may be of swelling type. Unlike swelling soils, they do not exhibit cracking during summer, nor heaving and stickiness during rainy season. Structures constructed on such soil do not exhibit heave though they may sometimes settle. The CNS are generally red, reddish yellow, brown, yellow, white, whitish grey, whitish yellow, green and greenish grey in colour. Although, several soils containing non-expanding type clay mineral exhibit CNS properties, the following range helps in locating such types:

	<i>Percent</i>
Clay ( less than 2 microns )	15 to 20
Silt ( 0.06 mm-0.002 mm )	30 to 40
Sand ( 2 mm-0.06 mm )	30 to 40
Gravel ( Greater than 2 mm )	0 to 10
Liquid limit	Greater than 30, but less than 50
Plasticity index	Greater than 15 but less than 30

## 5 CRITERIA FOR FIXING THE THICKNESS OF CNS LAYER

5.1 Thickness of CNS materials is related to swelling pressure and the resultant deformation, the permissible deformation being 2 cm.

5.2 Guidelines for choosing the thickness of CNS materials required for balancing the different swelling pressures is given in Table 1. Slopes should be in accordance with IS 10430 : 1982.

Table 1A Thickness of CNS Layer, Carrying Capacity Less Than 2 Cumecs

Discharge in Cumecs	Thickness of CNS Layer in cm (Min)	
	Swell Pressure 50-150 kN/m <sup>2</sup>	Swell Pressure More Than 150 kN/m <sup>2</sup>
1.4-2	60	75
0.7-1.4	50	60
0.3-0.7	40	50
0.03-0.3	30	40

Table 1B Thickness of CNS Layer, Carrying Capacity of 2 Cumecs and More

Swelling Pressure of Soil kN/m <sup>2</sup>	Thickness of CNS Materials cm (Min)
50 to 150	75
150 to 300	85
300 to 500	100

NOTE — However, optimum thickness of CNS materials needs to be determined for different swelling pressures by actual experiments both in field and laboratory, if required.

## 6 CONSTRUCTION PROCEDURE

To counteract the swelling pressure and prevent deformation of the rigid lining materials, a CNS material of required thickness depending on the swelling pressure of expansive soil, is sandwiched between the soil and the rigid lining material. The thickness of CNS layer should be measured perpendicular to the surface of expansive soil.

### 6.1 Canal in Cutting

6.1.1 Long deep cuts in expansive soils should be avoided and where possible a detour should be considered.

In cutting special care will be necessary to compact the CNS materials against the excavated surface of the cuts. The material should be spread uniformly in their horizontal layers of specified thickness (15 cm thick). Care also is necessary in obtaining a good joint between the two materials, by thoroughly wetting the excavated surface, so as to avoid slips at the junction plane.

The construction should be carried out in the following steps:

- While excavating provision should be made for accommodating required thickness of CNS layer on bed and sides. The subgrade on which CNS layer is to be laid should generally not be kept exposed for more than four days, prior to the placement of the CNS layer.
- Serrations should be provided in expansive soil to prevent contact slides between CNS materials and expansive soil.
- Proper moisture should be added to CNS materials.
- CNS materials should be compacted in layers by appropriate equipment to ensure proper density.
- CNS on side slopes should be trimmed to the required thickness. The thickness is measured perpendicular to the surface of expansive soil.
- Suitable canal lining over CNS material should be provided depending on the site and economy condition.
- To avoid slipping and rain cuts during the rainy season, it is advisable to provide CNS right up to the ground level.
- In deep cuts CNS material should be provided not only behind the lining of the canal but also above the canal prism, all along the excavated surface, so as to prevent large scale heaving above the canal level. The CNS material above the canal prism may be of lesser thickness, say 15 to 20 cm. However, full design thickness behind the lining should be continued at least 100 cm above the top level of the lining (illustratory arrangement shown in Fig. 1).
- The stability of the slopes, particularly in the case of cuts, is very adversely affected by rain water finding its way into the tension cracks and exerting hydrostatic force on the slipping mass of the soil. Covering the surface of the slopes by CNS materials and proper surface drainage will reduce the chances of rain water finding its way into the cracks.
- It is necessary to stack the excavated soil away from the cuts to prevent it inducing slips by surcharge.

### 6.2 Canal in Embankment

The construction should be carried out in the following steps:

- Proper moisture should be added to CNS material and expansive soil.

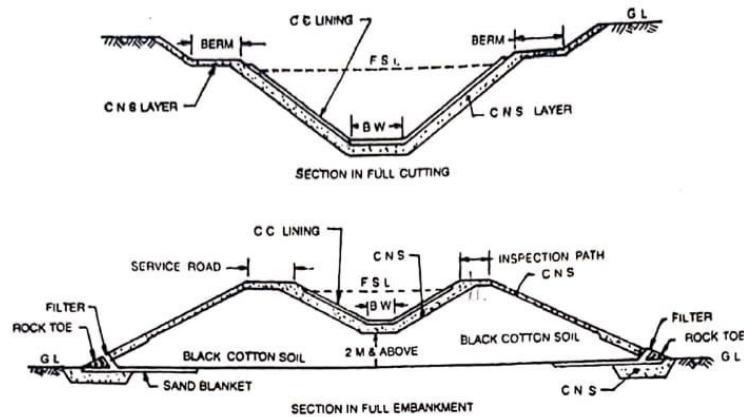


FIG. 1

- b) Expansive soil and CNS material above ground level should be compacted simultaneously, in layers, with appropriate equipment to ensure proper density.
- c) The CNS materials in embankment should be laid and compacted in layers simultaneously with the body of the banks, so as to obtain good compaction and to avoid any slippage plane being developed between the two materials. The compaction of CNS materials should also be to the standard proctor density with optimum moisture content. It may be done either with sheep foot rollers or 8 to 10 ton ordinary rollers.
- d) Provision of surface drain and internal drainage filter should be made to minimize external/internal erosion. A rock toe with inverted filter may be provided at either end of canal bank.
- e) Special care is required to be taken to provide internal drainage for the banks, having bed filling of 2 metres or more. A sand blanket is spread on the base of the bank and rockfills with regular inverted filters are also necessary at the outer toes.
- f) For both the cuts and banks, paved surface drains should be provided at the berms, etc, to avoid erosion of the finished surface. As far as possible, water from these drains should be drained away from the canal.
- g) The drainage properties of the CNS material itself need to be given due consideration as water locked up in this saturated layer is likely to cause pore pressures on the lining during canal draw-down conditions.
- h) Murum (gravelly soil) material on outer slopes of canal embankment should be trimmed to the required thickness.
- j) To protect outer slopes from erosion, proper turfing should be used.

6.3 Similar procedure should be followed for canals in partial cutting and embankment.

#### 6.4 Pride

6.4.1 The problem of effectively compacting the subgrade for side lining on slopes is very important in case of black cotton expansive soil zone in cutting or embankments, where backfill of CNS material is required to be placed for the sides and bed, in addition to design thickness. Twenty cm or so (perpendicular to side slope) of extra pride may be provided and compacted in horizontal layers to the required density. This pride should be removed only just prior to the placement of lining, thus making a fresh and well compacted surface available for bedding.

6.4.2 For cutting in soft material where the CNS backfilling is not required the best method is to leave the cutting 20 cm or so undercut (perpendicular to the canal slope) and remove this undercut only just prior to the placement of concrete lining. Similar procedure may be adopted in case of cutting in hard strata.

#### 6.5 Use of Polyethylene Sheets Below Concrete Lining

The use of polyethylene sheet below concrete lining could be either for achieving better ultimate imperviousness of the lining as a whole or it may be used only for limited purpose as an assistance, during construction, for avoiding the cement slurry from concrete escaping in the subgrade below. Use of LDPE sheets 200 gauge (50 micron) is to achieve only the latter limited purpose. If overall imperviousness is proposed to be achieved, it would be necessary to use HDPE-HM sheet of sufficient thickness, strength, toughness and durability.

IS 9451 : 1994

## 7 LINING

7.1 The lining may be cement concrete (IS 3873 : 1993), burnt clay tile (IS 3872 : 1966), stone pitched (IS 4515 : 1993), stone masonry (IS 11809 : 1993) or lime concrete (IS 7873 : 1975).

## 8 UNDER DRAINAGE ARRANGEMENTS AND JOINTS IN LINING

8.1 The drainage properties of CNS material itself need to be given due consideration as water locked up in this saturated layer is likely to cause pore pressure on the lining during canal draw down conditions. To release the same if holes are provided for drainage in concrete lining, care will have to be taken to provide inverted filters at the back of the holes so as to avoid the CNS material being washed away by fluctuating water levels in the canal.

Such drainage holes are, however, not advocated for general adoption.

8.2 It is recommended to provide regular drainage arrangements using porous concrete sleepers, 7.7 cm x 20 cm with 50 mm perforated G.I. pipes at 3 m centre to centre coming out through the sides of the lining. Two porous concrete sleepers on either side of the bed, below the side may be provided. A 50 to 75 mm thick sand mat below the bed and side cast *in-situ* lining (below the polyethylene sheet) should be provided.

Where the sand mat is not economically feasible additional porous concrete sleepers may instead be provided at right angles to the longitudinal rails (along the cross section of the canal) at 3 m centre to centre. The porous concrete sleepers have to be encased in filter material.

An illustratory arrangement is shown in Fig. 2.

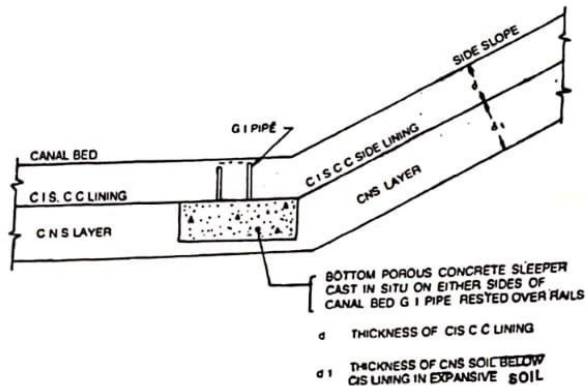


FIG. 2 ILLUSTRATORY DETAIL OF BOTTOM RAILS

## ANNEX A ( Clause 2.1 )

IS No.	Title	IS No.	Title
1498 : 1970	Classification and identification of soils for general engineering purposes ( <i>first revision</i> )	2720 ( Part 41 ) : 1977	Methods of test for soils : Part 41 Determination of swelling pressure of soils
2720 ( Part 10 ) : 1991	Methods of test for soils : Part 10 Determination of unconfined compressive strength ( <i>revised</i> )	3872 : 1966	Code of practice for lining of canals with burnt clay tiles
2720 ( Part 40 ) : 1977	Methods of test for soils : Part 40 Determination of free swell index of soils	3873 : 1993	Laying cement concrete/ stone slab lining on canals — Code of practice

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
4515 : 1993	Code of practice for stone pitched lining for canals	11809 : 1993	Code of practice for lining of canals by masonry
7873 : 1975	Code of practice for lime concrete lining for canals	10430 : 1982	Criteria for design of lined canals and guidelines for selection of type of lining

**IS 9451 : 1994**

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This Indian Standard has been developed from Doc: No. RVD 13 ( 49 )

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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## **SECTION – 4**

# **GENERAL RULES & DIRECTIONS**

**ODISHA PUBLIC WORKS DEPARTMENT (FORM P-1)**

**PERCENTAGE RATE TENDER AND CONTRACT FOR WORKS GENERAL RULES & DIRECTIONS FOR THE GUIDANCE OF CONTRACTORS**

1. The work proposed for execution by contract will be notified in a form of invitation to tender posted through Govt. website [www.tendersodisha.gov.in](http://www.tendersodisha.gov.in)

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

2. In the event of the tender being submitted by a firm it must be signed separately by each member thereof, or in the event of the absence of any partner, it must be signed on his behalf by a person holding a power of attorney authorizing him to do so.
3. Receipts for payment made on accounts of works, when executed by a firm must also be signed by the several partners, except where the contractors are described in their tenders as a firm in which case the receipts must be signed in the name of the firm by one of the partners, or by some other person having authority to give effectual receipts for the firm.
4. The memorandum of work tendered for and the memorandum of materials to be supplied by the Public Works Departments and their issue rates shall be filled in and completed in the office of the Sub-Divisional Officer/Superintending Engineer before the tender form is issued if a form is issued to an intending tenderer without having been so filled in and completed, he shall request the office to have this done before he completes and delivers his tender.
5. The amount of earnest money to be remitted will be 1% (online).
6. 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 tender rate he is willing to undertake each item of the work specified in the said form of invitation to tender or which they contain any other conditions of any sort, or omit to note the time within which the work can be finished or which are not accompanied by 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 works shall submit a separate tender for each tender.
7. The Engineer-in-charge 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.
8. The Engineer-in-charge shall have the right of rejecting all or any of the tenders.
9. In the event of a tender being selected for acceptance the Engineer who opened the tenders will, if he is competent to accept the tender, inform the tenderer of the selected

tender who shall there upon sign copies of the specification and other documents with the agreement. 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-in-charge 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 and 4 and shall deposit the required amount of the security money within the prescribed time. The tender with the specification and other documents signed by the tenderer will then be forwarded for acceptance to the Engineer who is competent to accept the same. If the said Engineer rejects the tender the security money deposited shall be refunded to the tenderer.

1. When a tender is selected for acceptance, the tenderer shall deposit the required amount
2. of the security money. No tender shall be finally accepted until the required amount of the security money has been deposited.
3. The amount of security money to be deposited by the tenderer whose tender is selected for acceptance shall be 2 (two) percent of the estimated value of the work, failing which tender shall be liable to rejection.

Taxes as per provisions of Government shall be deducted from the bills of tenderer.

4. 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 Tendered/quoted percentage in case of percentage 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 tenders or if he is not so competent to, shall send the form for signature of the acceptance to the officer competent to accept it.
5. All tenderers are required to submit a list of works, which are in hand at the time of submitting their tenders. The list of works are required to be submitted in the proforma by the Superintending Engineer under whom he has executed the work in order to judge their past performance (vide Works Department Circular No.15443dt.01.08.2005.)
6. If the tenderer backs out from the offer before acceptance of the tender by the competent authority then he/she will be suspended for a period of three years.
7. T.D.S (Tax Deducted at Source) towards GST will be deducted at the rate prescribed in the Odisha Goods & Service Tax Act-2017 or as amended from time to time.

## TENDER FOR WORKS

I / We hereby tender for the execution for the Government of Odisha for the work specified in the under written memorandum at the rates specified therein in a period of **08 (Eight)** calendar months from the date of written order to commence and in accordance in all respects with the specifications designs and other documents referred to in rules thereof and subject to the annexed conditions of contract and with such materials as are provided for by and in all other respects in accordance with such condition so far as applicable.

### MEMORANDUM

a) If several sub-works are included they should be detailed in a separate sheet.	(a)	Name of Work	:	<b>Improvement to Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project.</b>
	(b)	Estimated Cost (Bill of Quantity)	:	Rs.2,68,61,256.00
	(c)	E.M.D	:	<b>Rs. 2,68,613.00</b>
d) <b>This deposit Will be 2 percent Of the estimated Cost of the work.</b>	(d)	Initial security deposit (including earnest money) to Be deposited before the Commencement of the work.	:	<b>Rs.5,37,226.00</b>
e) This percentage from bills will be credited to the contractor's security	(e)	Percentage to be deducted from bill (As Security Deposit).	:	
	(f)	Time required for the work from date of written order		<b>08(Eight) calendar months including rainy season</b>
	(g)	Date of written order to commence	:	
	(h)	Total number of work tendered for	:	<b>10(Ten) items only</b>

Signature of contractor before submission of tender

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

Dated the .....Day of .....2026

Signature of witness to one tenderer's signature

Witness :

Address:

**CONTRACTOR**

Signature of Officer by whom accepted

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

Dated the .....Day of .....2026

Additional Chief Engineer  
Angul Irrigation Circle, Angul

Agreement No.....P1 Certified that this agreement contains .....Pages only  
(Schedule XLV-Form No.-61)

**Superintending Engineer  
Angul Irrigation Division,Angul**

**SECTION – 5**  
**CONDITION OF CONTRACT**

# CONDITION OF CONTRACT

**Clause 1-** All compensation or other sum of money payable by the contractor to Government under the terms of his contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due or may become due to the contractor by Government on any account whatsoever

and in the event of his security deposit being reduced by reason of any such deduction or sale

**Compensation for delay**

as aforesaid, the contractor shall within ten days thereafter make good in cash or Government securities endorsed as aforesaid any sum or sums which may have been deducted from or raised by, sale of the security deposit or any part thereof.

**Clause 2 (a)** The time allowed for carrying out the work as entered in the tender shall be strictly observed by the contractor and shall be reckoned from the date on which the written order to commence work is given to the contractor, The work shall throughout the stipulated period of the contract be carried on with all due diligence (time being deemed to be of the essence of the contract on the part of the contractor) and the contractor shall pay as compensation an amount as mentioned in clause 2.3.1 of OPWD Code of Volume-I, if the whole work as shown by the tender for every day that the work

remains un-commenced, or unfinished after the proper dates (The work should not be considered finished until such date as the

Superintending Engineer shall certify as the date on which the work is finished after necessary rectification of defects as pointed out by the Superintending Engineer, or his authorized agents are fully complied with by the contractor to the Superintending Engineer's

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

satisfaction). And further to ensure good progress during execution of the work the contractor shall be bound, in all cases in which the time allowed for any work exceeds one month, to complete one fourth of the whole work before one fourth of the whole time allowed under contract has elapsed one half of the work, before one half of such time has elapsed and three-fourth of the work before three-fourth of such time has elapsed. In the events of the contractor failing to comply with the condition, he shall be liable to pay as compensation as mentioned in clause 2.3.1 of OPWD Code of Volume-I on the said estimated cost of the whole work for every day that the due quantity of work remains incomplete, provided always that the entire amount of compensation to be paid under the provision of this clause shall not exceed 10% on estimated cost of the work as shown in the tender.

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

**Action when whole security deposit is forfeited**

- (i) To rescind the contract (of which rescission notice in writing to the contractor under the hand of the Superintending Engineer shall be conclusive evidence) 20% of the value of left over work will be realized from the contractor as penalty.
- (ii) To employ labour paid by the Public works Department 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 cost and price certificate of the Superintending Engineer shall be final and conclusive against the contractor) and crediting him with the value of work done, in all respects in the same manner and at the same rates as if it had been carried out by 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 may be deducted from any money due to him by Govt. 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 advances on account of or with a view to, the execution of the work or the performance of the contract. And in case the contract shall be rescinded under the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereto for actually performed under this contract, unless and until the Superintending Engineer shall

have certified in writing the performance of such work and the value payable in- respect thereof and he shall only be entitled to be paid the value so certified.

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

**Clause-3**

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

**Contractor remain liable to pay compensation if action not taken under clause-3**

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

market rates to be certified by the Executing Engineer whose certificate thereof shall be final; otherwise the Superintending Engineer may give notice in writing to the contractor or his clerk of the works, foreman or

other authorized agent required him to remove such tools, plants, materials or stores from the premises (within a time to be specified in such notice) and in

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

the event of the contractor failing to comply with any requisition to the Superintending Engineer may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects and the certificate of the Superintending Engineer as to the expense of removal and the amount of proceeds and expense of any such sale shall be final and conclusive against the contractor.

**Clause – 4**

If the contractor shall desire on extension of time for completion of the work, on the ground of his having been unavoidable hindrances in its execution or any other ground he shall apply in writing to the

**Extension of time**

Superintending Engineer within 30 days of the date of the hindrance on account of which he desires such extension as aforesaid and the Superintending Engineer shall, if in his opinion (which shall be final) reasonable be shown therefore, authorize such extension of time if any, as may in his opinion, be necessary or proper. The Superintending Engineer shall at the same time inform the contractor whether he claims compensation for delay.

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

floors or other parts of any building in upon or about which the work is to be executed, or of which he may

**Final Certificate**

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

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

**Clause – 6** A bill shall be submitted by the contractor each month on or before the date fixed by the Engineer-in-charge for all works executed in the previous month, and the Engineer-in-charge or his

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

subordinate shall take the requisite measurement for the purpose of having the

same verified and the claim as far as admissible' adjusted if possible before the expiry of ten day from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer-in-charge or his subordinate shall measure up the said work in the presence of the contractor whose countersignature to the measurement list will be sufficient warrant and the Engineer-in-charge or his subordinate shall prepare a bill from such list which shall be binding on the contractor in all respects.

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

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

**Clause – 8 DELETED**

**Clause - 9** The contractor shall execute the whole and every part of the work in the most substantial and workman like manner and both as regards materials and otherwise in every respect in strict accordance with

the specification. The contractor shall also confirm exactly fully and faithful to the design, drawings & instructions in writing relating to the work signed by

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

the Engineer-in-charge and lodged in his office and to which the contractor shall be entitled to have access at such office for the purpose of inspection during office hours and the contractor shall, if he so require be entitle at his ownexpense to make or cause to make copies of the specifications and of all such designs, drawings and instructions as aforesaid.

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

**Clause – 10** The Engineer-in-charge shall have power to make any alterations in or additions to the original specifications, drawing, designs and instruction that may appear to him to be necessary advisable during the progress of the work and

**Alteration in specification and designs**

the contractor shall be bound to carry out the work in accordance with any instruction which may be given to him in writing signed by

the Engineer-in-charge and such alteration shall not invalidate the contract and 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

**Extension of time in consequence of alterations**

contractor on the same conditions in all respect on which he agreed to do the main work, and at the same time rates as are specified in

the tender for the main work., The time for the completion of the work shall be extended in the proportion that the additional work includes bears to the original contract work

**Do not invalidate contract**

and the certificate of the Engineer-in-charge shall be conclusive as to such proportions. And if the additional work includes any class of work for which 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 being carried on and if such last mentioned class of work is not entered on the scheduled of rate 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 is it his intention to charge for such class of work, and if the Engineer-in-charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable.

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

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

The contractor shall be bound to submit his claim for any additional work done during any month on or before the 5<sup>th</sup> days of the following month accompanied by copy of the order in writing of the Engineer-in-charge for the additional work and that the contractor shall not be entitled to any payment in respect of such additional work if he fails to submit his claim within the aforesaid period.

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

**Clause – 11** If at any time after the commencement of the work the

Government of Odisha shall for any reason whatsoever not require the whole thereof as specified in the tender to be carried out the Engineer-in-charge

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

shall give notice in writing of the fact to contractor. Who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage, which he might have derived from the execution of the work in full but which he did not derive in consequence of the full amount of the work not having been carried out, neither shall he have any claim for compensation by reason of any alternations having been made in the original specification, drawing, designs and instruction which shall involve any curtailment of the work as originally contemplated.

**Clause – 12** If it shall appear to the Engineer-in-charge or his subordinate in charge of the work that

any work has been executed with unsound, imperfect or unskillful workmanship or with materials of any inferior description, or that any materials or articles provided by him for execution of the work are unsound

**Action and compensations payable in case of bad work.**

or of a quality inferior to that contracted for or other wise 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 not with standing that the same may have been inadvertently passed, certified and paid for forth with rectify or remove and reconstruct the work so specified in whole or part, as the case may require or as the case may be remove the materials or articles so specified and provided other proper and suitable materials or articles at his own proper charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in his demand aforesaid then the contractor shall be liable to pay compensation at the rate of one percent on the amount of the estimate for every day not exceeding 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 other

the materials or articles complained of as the case may be at the risk and the expense in all respects of the contractor.

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

**Works to be open to inspection**

**Contractor or responsible agents to be present**

**Clause – 14** The contractor shall give not less than five day’s notice in writing to the Engineer- in-charge or his subordinate in-charge of the work before covering up or other wise 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 placed beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in charge of work and if any work shall be cover up or placed beyond the reach of measurement without such notice having been given or consent obtained, the same shall be uncovered at the contractor’s expense, or in default thereof no payments or allowance shall be made for such work or the materials with which the same was executed.

**Notice to be given before work is covered up**

**Clause – 15** If the contractor or his work people or servants shall break, deface, injure or destroy any part of a work, in which they may be working or any building, road, enclosure or grass land, or cultivated ground continuous to the premises on which work or any part of it being executed, or if any damage shall happen to the work while in progress from any cause whatever or any imperfection become apparent in it within six Months from the date of final certificate of its completion shall have been given by the Engineer-in-charge, as aforesaid the contractor shall make the same good at his own expense, or in default the Engineer-in-charge may cause the same to be made good by other workmen, and deduct the expense( of which the certificate of

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

the Engineer-in-charge shall be final) from any sums that may be then or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof and the contractor shall be liable to pay any part of the expenses not so recovered by the Engineer- in-charge.

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

**Contractor to supply plants, ladders, scaffolding etc.**

**And is liable for damages arising from non provision of lights, fencing etc.**

**Clause – 17** No female labour shall be employed within the limits of a cantonment. The contractor shall not employ for the purpose of this contract any labour below the age of twelve year, and shall pay to each labourer; for the work done by such labour, wages not less than the wage paid for similar work in the neighborhood.

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

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

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

**Clause – 17 (b)** Special class Contractor shall employ under him one Graduate Engineer and Two Diploma Holders belonging to the State of Odisha. Like wise ‘A’ class contractor shall employ under him one Graduate Engineer or

Two Diploma holders under the contractor shall be full time & continuous and they should not be superannuated, retired, dismissed or removed personnel from any State Govt. or Central Govt.

**Employment of  
Graduate  
Engineers &  
Diploma Holders**

service/public Sector undertakings, private companies and firms or be ineligible for appointment to Government service. The contractor shall pay them monthly

emoluments which shall not be less than the emoluments of the personnel of equivalent qualification employed under the State Government of Odisha. The Chief Engineer, Roads Odisha may however, assist the contractor with names of such unemployed Graduate Engineer and Diploma holders if such help is sought

for by the contractor. The names of such Engineering personnel appointed by the contractor should be intimated to the tender receiving authority along with the tender. Each bill of the Special Class or 'A' class contractor shall be accompanied by an employment Roll of the Engineering personnel together with a certificate of the Graduate Engineer or Diploma holder is employed by the contractor to the effect that the work executed as per the bill has been supervised by him.

**Clause – 18**

The contract shall not be assigned or sublet without the written approval of the Superintending Engineer and if the contractor shall assign or sublet his contract or attempt so to do, or become insolvent or commence any insolvency proceedings or make any composition with his creditor or attempt so to do, or if any bribe gratuity, gift loan, perquisite reward or advantage pecuniary of other wise shall either directly or indirectly be given, promised or offered by the contractor or any of his servants to agents to any public officer or person in the employee of Government in any way relating to his office of

**Work not to be sublet.**

employment or if any such officer or person shall become in any way directly or indirectly in the contract, the Superintending Engineer may thereupon by notice inwriting rescind the contract and the security deposit of the contractor shall there upon stand forfeited and be absolutely at disposal of Government and the same consequences shall ensure as if the contract has been rescinded under clause 3 hereof and in addition the contractor, shall not be entitled to recover or be paid for any work therefore actually performed under the contract.

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

**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

**Sum payable by way of compensation to be considered as reasonable compensation with out reference to actual loss**

loss or damage sustained, and whether or not any damage shall have been sustained.

**Clause – 20**

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

In case of failure to notify the change in the constitution within fifteen days the Engineer-in-charge may be noticed in writing rescind the contract and the

**Changes in constitution of firm**

security deposit of the contractor shall there upon stand forfeited and be

absolutely at the disposal of Government and the same consequences shall ensure as if the contract had been rescind under clause 3 hereof and in addition the contractor shall not be entitled to recover or be paid for any works therefore actually performed under the contract.

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

**Clause – 22**        **DELETED**

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

**Lump sums in estimates**

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

**Action where no specification**

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

**Definition of works**

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

**Clause – 27** That for the purpose of jurisdiction in the event of dispute if any, the contract should be deemed to have been entered into within the State of Odisha and it is agreed that neither party to the contract or agreement will be competent to bring

a suit in regard to the matters covered by this contract at any place outside the State of Odisha.

**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 arrangement will be made by the contractor at his own cost for his labour camp.

**Clause – 30** The contractor shall bear all taxes including sales tax, income tax, royalty, fair weather charges and tollage, where necessary.

## **Clause-31: Price Adjustment**

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

(a) The price adjustment shall apply for the work done from the start date given in the contract data up to end of the initial intended completion date of extensions granted by the Engineer and shall not apply to the work carried out beyond the stipulated time for reasons attributable to the contractor.

(b) The price adjustment shall be determined during each month from the formula given in following Paras.

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

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

: To the extent that full compensation for any rise or fall in costs to the contractor is not covered by the provisions of this or other clauses in the contract, the unit rates and prices included in the contract shall be deemed to including amounts to cover the contingency of such other rise or fall in costs :

The formula (e) for adjustment of prices are :

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

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

$$V_M = 0.85 \times P_m / 100 \times R \times (M_1 - M_0) / M_0$$

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

$M_0$  = The all India wholesale price index (all commodities) on 28 days preceding the date of opening of Bids, as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$M_1$  = The all India wholesale price index (all commodities) for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, NewDelhi.

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

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

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

$$V_C = 0.85 \times P_C / 100 \times R \times (C_1 - C_0) / C_0$$

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

$C_0$  = The all India wholesale price index for Ordinary Portland Cement (OPC) on 28 days proceeding the date of opening of Bids as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$C_1$  = The all India wholesale price index for Ordinary Portland Cement (OPC) for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$P_C$  = Percentage of Cement Component of the work.

### **31(a) (iii) : Adjustment for Steel Component**

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

$$V_S = 0.85 \times P_S / 100 \times R \times (S_1 - S_0) / S_0$$

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

$S_0$  = The all India wholesale price index for steel (Mild Steel long products) on 28 days proceeding the date of opening of Bids as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$S_1$  = The all India wholesale price index for steel (Mild Steel long products) for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$P_S$  = Percentage of steel component of the work.

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

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

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

$$V_b = 0.85 \times P_b / 100 \times R \times (B_1 - B_0) / B_0$$

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

$B_0$  = The official retail price of bulk bitumen at the IOC / BPCL depot at nearest center on the day 28 days prior to date of opening of Bids.

$B_1$  = The official retail price of bulk bitumen at the IOC / BPCL depot at nearest center for the 15<sup>th</sup> day of the month under consideration.

$P_b$  = Percentage of bitumen component of the work.

### **31(a) (v) : Adjustment towards differential cost of pipes**

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

$$V_{pi} = 0.85 \times P_{pi}/100 \times R \times (P_{i1}-P_{i0})/P_{i0}$$

$V_{pi}$  = Differential cost of pipe i.e. amount of increase or decrease in rupees to be paid or recovered during the month under consideration.

$P_{pi}$  = Percentage of pipe component of the work.

$P_{i1}$  = All India wholesale price index of pipe for the period under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$P_{i0}$  = The all India wholesale price index of pipe on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

### **31(b) : Adjustment of Labour Component**

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

$$V_L = 0.85 \times P_l/100 \times R \times (L_1-L_0)/L_0$$

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

$L_0$  = The minimum wages for unskilled labour as Notified by Government of Odisha as prevailed on the last stipulated date of receipt of tender including extension, if any.

$L_1$  = The minimum wages for unskilled labour as Notified by Government of Odisha as prevailed on the last date of the month previous to the one under consideration.

$P_l$  = Percentage of labour component of the work.

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

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

$$V_f = 0.85 \times P_f/100 \times R \times (F_1-F_0)/F_0$$

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

$F_0$  = The official retail price of High Speed Diesel (HSD) at the existing consumer pumps of IOC / BPCL / HPCL at nearest center on the day 28 days prior to the date of opening of Bids.

$F_1$  = The official retail price of HSD at the existing consumer pumps of IOC / BPCL / HPCL at nearest center for the 15<sup>th</sup> day of the month under consideration.

$P_f$  = Percentage of fuel and lubricants component of the work.

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

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

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

$$V_p = 0.85 \times P_p / 100 \times R \times (P_1 - P_0) / P_0$$

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

$P_0$  = The all India wholesale price index for manufacture of machinery for mining, quarrying and construction on 28 days preceding the date of opening of Bids as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

$P_1$  = The all India wholesale price index for manufacture of machinery for mining, quarrying and construction for the month under consideration as published by the Ministry of Commerce and Industry, Government of India, New Delhi.

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

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

Regarding wholesale price index (WPI) for appropriate commodity for payment of price adjustment, due to change of base year of WPI from 1993-94 to 2004-05 & 2011-12, it is observed that, the commodity 'Bars and Rod', 'Cement', 'Heavy machinery and parts' included in the list of WPI 1993-94 series are not mentioned as such in the WPI 2004-05 & 2011-12 series. Therefore, the following items in the WPI 2004-05 & 2011-12 series shall be considered corresponding to items in WPI 1993-94 series :

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

## **31(e) : APPLICATION OF ESCALATION CLAUSE :**

The contractor shall for the purpose of availing reimbursement / refund of differential cost of steel, bitumen, cement, pipe, POL and wages, keep such books of account and other documents as are necessary to show that the amount of increase claimed or reduction available and shall allow inspection of the same by a duly authorized representative of Government and further, shall at the request of the Engineer-in-Charge, furnish documents to be verified in such a manner as the Engineer-in-Charge may require any document and information kept. The contractor shall within a reasonable time of 15 days of his becoming aware of any alternation in the price of such material, wages of labour and / or price of POL give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition along with information relating to there to which he may be in position to supply.

### **Percentage Table**

Sl. No.	Category of Works		% Component (cost wise)		
			Labour (P <sub>l</sub> )	POL (P <sub>f</sub> )	Steel (P <sub>s</sub> ) + Cement (P <sub>c</sub> ) + Bitumen (P <sub>b</sub> ) + Pipes (P <sub>pi</sub> ) + Plant & Machinery Spare & Component (P <sub>p</sub> ) + Other Materials*
1.	R & B works (% of component)	Road Works	5	5	90
		Bridge Works	5	5	90
		Building Works	5	5	90
2.	Irrigation works (% of component)	Structural Work	5	5	90
		Earth, Canal & Embankment work	5	5	90
3.	P.H. Work	Structural Work	5	5	90
		Pipeline Work	5	5	<u>Pipe - 70%</u> * Machinery + Other material-20%
		Sewer Line	5	5	<u>Pipe - 70%</u> * Machinery + Other material-20%

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

## **Appendix to Bid Schedule of Adjustment Data**

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

Cl. No.31 of F2/P1 Contracts Sl. No.	Index Description	Source of Index	Base Value*	Base Date*	Weightage of Item**
31 (a) (i)	Other Materials	All India wholesale price index (all commodities) as published by the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			46.40%
31 (a) (ii)	Cement	Wholesale price index for Cement (Ordinary Portland Cement) as published by the office of the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			13.30%
31 (a) (iii)	Steel	Wholesale price index for steel (Mild Steel-Long Products) as published by the office of the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			26.89%
31 (a) (iv)	Bitumen (VG-30)	The official retail price of bulk bitumen at the nearest IOC / HPCL depot.			0%
31 (a) (v)	Pipes	Whole sale price index for the type of Pipe under consideration, as published by the office of the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			0.03%
31 (b)	Labour	Minimum Wage notified by the Labour and Employee's State Insurance Department of Government of Odisha, India.			5.0%
31 (c)	POL	Official retail price of HSD at nearest IOCL / HPCL / BPCL Consumer Pump Depot.			5.0%
31 (d)	Plant and Machinery	Wholesale price index for manufacture of machinery for mining, quarrying and construction as published by the office of the Economic Advisor to the Govt. of India, Ministry of Commerce and Industry.			3.38%
			Total		100.00%

\* Values to be filled up at the time of drawal of contract.

\*\* Values to be filled up in the bid document.

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

## **FAIR WAGE CLAUSE**

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

Explanation: “Fair wages” means wages, whether for time or 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” (W.D. No.22059 dt.16.8.77)

- (b) The contractor shall, notwithstanding the provisions of any contract to contrary cause to be paid a fair wage to labourers indirectly engaged on the work including any labour engaged by his sub contractors in connection with the said work, as if the labours had been immediately employed by him.
- (c) In respect of all labour directly or indirectly employed in the works for the performance of the contractor’s part of this agreement, the contractor shall comply with or cause to be complied with all regulation made by Government in regard to payment of wages, wage period deductions from wages, recovery of wages not paid and deductions unauthorisedly made, maintenance of wages register, wage cards, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of a like nature.
- (d) The Superintending Engineer or Sub-Divisional Officer concerned shall have the right to deduct, from the money due to contractor, any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non fulfillment of the conditions of the contract for the benefit of workers non payment of wages or of deductions made from his or their wages, which are not justified by their terms of the contract” or non-observance of the regulations, money so deducted should be transferred to the workers concerned.
- (e) Vis-à-vis the Government of Odisha, the contractor shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim indemnity from his sub contractor.
- (f) The regulations aforesaid shall be deemed to be part of this contract and any breach there of shall be breach of this contract.
- (g) The contractor shall at his own expense provide or arrange for the provision of foot wear for any labour doing cement mixing work and black topping of roads (The contractor has undertaken to execute under this contract) to the satisfaction of the Engineer-in-charge and on his failure to do so Government shall be entitled to provide the same and recover the cost from the contractor.
- (h) The contractor shall submit by the 4<sup>th</sup> & 10<sup>th</sup> of every month, to the Engineer-in-charge a true statement showing in respect of the Second half of the preceding month and the first half to the current month respectively (1) the number of labours employed by him on the work (2) their working hours (3) the wages paid to them (4) the accident that occurred during the said fortnight showing the circumstances under which they happened and the content of damage and injure caused by them and (5) the number of female workers who have been allowed maternity benefit according the clause [K] and the amount paid to the Government a sum not exceeding **Rs.472.00** for each default of materially incorrect statement. The amount levied as fine decision of the Superintending Engineer shall be final in deducting from any bill due to contractor.

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

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

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

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

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

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

**Clause 34** Incentive should be paid in respect of individual project for new construction / substantial additional or improvement works, the minimum value of which is mentioned below.

<u>Name of Work</u>	<u>Minimum Value</u>
1. Building work / PH work	Rs.40.00 lakhs
2. Road work	Rs.3.00 crores
3. Irrigation work	Rs.10.00 crores

Incentive will be paid with approval of next higher authority of tender accepting authority on completion of original work before original time schedule. Incentive need not be included in the estimate. Specific budget provision may be made under State Plan out of which the incentive shall be met.

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 concerned SE, CE & 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 works 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

**Clause 35** The royalty of materials will be recovered from the work bill in case failure of production of proper receipt from quarry holder or Revenue Department after proper verification from concerned Tahasildar.

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

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

2. **Definitions :**

- (i) "Work Place" means a place at which an average of fifty or more workers are employed in connection with construction work
- (ii) Large work place means a place at which an average of 500 or more workers are employed in connection with construction work.

3. **First Aid :**

- (a) At every work place there shall be maintained in a readily accessible place first aid appliances including and adequate supply of sterilizer dressing and sterilized cotton wool. The appliances shall be kept in good order and in large work places they shall be readily available during working hours.
- (b) At large work places where hospital facilities are not available within easy distance of the workers, first aid posts shall be established and run by a trained compounder.
- (c) Where large work places are remote from regular hospitals an indoor ward shall be provided with one bed for every 250 employees.
- (d) Where large work places are situated in cities towns or in their suburbs and no beds are considered necessary owing to the proximity of city, town hospitals, an ambulance shall be provided to facilitate removal of urgent cases to these hospitals. At the work place some conveyance facilities such as a car shall be kept readily available to take injured persons or person to the nearest hospitals.

4. **Drinking Water :**

- (a) In every work places, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of water fit for drinking.
- (b) Where drinking water is obtained from an intermittent public water supply each work place shall be provided with storage where such drinking water shall be stored.
- (c) Every water supply of storage shall be at a distance of not less than 50 feet from any latrine, drain or other sources of pollution where water to be drawn from an existing well which is within such proximity of latrine drain or any other sources of pollution the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be

entirely closed in and be provided with tray door which shall be dust and water proof.

- (d) A reliable pump shall be fitted to each covered well the tray door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.
- (e) The temperature of drinking water supplied to workers shall not exceed 90<sup>0</sup> F.

**5. Washing and Bathing Place :**

- (i) Adequate washing and bathing places shall be provided separately for men and women.
- (ii) Such places shall be kept in clean and drained condition

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

- (a) Where the number of persons employed does not exceed 50. No. of seats 1
- (b) Where the number of persons employed exceeds 50 but does not exceed 100 No. of Seats 3
- (c) For every additional 100 No. of seats 3 per 100(in  
particulars cases the Superintending Engineer shall  
have the power to vary the scale where necessary)

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

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

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

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

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

- turn in to manure).
11. **Provision of shelters during rest** : At every work place, there shall be provided free of cost two suitable sheds one for females and the other for rest for the use of labourers. The height of the shelter shall be less than 11 feet from the floor level the lowest part of the roof.
  12. **Creche** : At every work place at which more than 50 women workers are employed, there shall be provided only one hut for the use of children under the age of 6 year , belonging to such women and shall be used for infant's games and play and their bed room. The huts shall not be constructed on a lower standard than the following.
    - i) Thatched huts
    - ii) Mud floors and walls.
    - iii) Planks spared over the mud floor and covered with matting.

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

    - a) Where the number of women workers is more than 50 the contractor shall provide one hut and Dhai to look after the Children of women workers.
    - b) The size of creche shall vary according to the number of women workers.
    - c) 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.
  - 14.

### CONTRACTOR'S LABOUR REGULATIONS

1. **Short title** :- These regulation may be called " The Odisha Public Works Department / Electricity Department Contractor's Regulations".
2. **Definition** : In these Regulations, unless otherwise expressed or indicated the following words and expressing shall have the meaning hereby assigned to them respectively, that is say:
  - (a) "Labour" means workers employed by a contractor "**Improvement of Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project**" directly or indirectly through a sub-contractor or other person, by an agent on his behalf.
  - (b) Fair wages means wages whether for time or piece work prescribed by the **Superintending Engineer, Angul Irrigation Division, Angul** provided that where high rates have been prescribed under the minimum wages Act 1948 wages at such higher rates would constitute fair wages (W.D. No.22059 dt,16.8.77)
  - (c) "Contractor" shall include every person whether a sub-contractor or headman or agent employing labour on the work taken on contract.

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

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

The contractor shall:-

- (a) Before he commences his work on contract display, and correctly maintain and continue to display and correctly maintain, in a clean and legible condition in a conspicuous places on the work, notice in English and in the local Indian language spoken by the majority of the workers giving the rate of wage prescribed by State Public Works Department/ **Angul Irrigation Division, Angul** for the district in which the work is done.
- (b) Send a copy of such notices to Engineer-in-charge of the work.

## **4. Payment of Wages :-**

- (a) Wages due to every worker shall be paid to him direct.
- (b) All wage shall have to be paid in cash in current coin or currency or in both.

## **5. Fixation of wages periods :-**

- (a) The contractor shall fix the wage period in respect of which the wages be payable.
- (b) No wage period shall exceed one month.
- (c) Wage of every workman employed on the contract shall be paid before the expiry of ten days, after the last day of the wage period in respect of which the wages are payable.
- (d) When the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the day succeeding the one on which his employment is terminated.
- (e) All payment of wages shall be made on a working days

## **6. Wage book and wage cards etc.**

- 1) The contractor shall maintain a wage book of each worker in such forms as may be convenient, but the same shall include the following particulars:-
- a) Rate of daily or monthly wages.
- b) Nature of work on which employed.
- c) Total number of days worked during each wage period.
- d) Total amount payable for the work during each wage period.
- e) All deductions made from the wages with an indication in each of the ground for which the deduction is made.
- f) Wage actually paid for each wage period.
- 2) The contractor shall also maintain a wage card for each worker employed on the work.

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

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

- 1) The wages of a worker shall be paid to him without any deductions of any kind except the following.
  - a) Fines.
  - b) Deduction for absence from duty, i.e. from the place or places where by terms of his employment he is required to work. The amount of deductions shall be in proportion to the period for which he was absent.
  - c) Deduction for damage to or loss of goods expressly entrusted to the employed person for custody' or for loss on money for which he is required to encount where such damage or loss is directly attributable to his neglect or default.
  - d) Any other deduction which the Odisha Government may from time to time allow.
- 2) No fines shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing abuse against such fines or deduction.
- 3) The total amount of fines which may be imposed in any one wage period on a works shall not exceed a amount equal to Five paise in a rupee of the wages payable to him in respect of that wage period.
- 4) No fine imposed on any worker shall be recovered from him by installments after the expiry of 60 days from the date on which it was imposed.

## **8. Register of fines, etc.**

- 1) The contractor shall maintain a register of fines and of all deduction for damage or loss. Such register shall mention the reason for which fine was imposed or deduction for damage or loss was made.
- 2) The contractor shall maintain a list in English and in the local Indian language clearly defining acts and omissions for which penalty of fine can be imposed. It shall display such list and maintain it in a clean and legible condition in conspicuous place on the work.

## **9. Preservation of register:**

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

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

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

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

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

## **12. Appeal against the decision of Labour Welfare Officers.**

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

## **13. Inspection of registers:**

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

## **14. Submission of return:**

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

## **15. Amendment**

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

### **Clause - 36 Departmental supply of materials**

Before issue of Departmental materials to the contractor, he shall furnish Bank Guarantee of any of the Nationalized Bank equal to the cost of materials. The Bank Guarantee shall be valid for the entire period of agreement. The same may be refunded to the contractor only after the materials supplied to him are fully utilized in the works and cost thereof recovered from his bill (s) in full or if the materials are partly utilized in the unutilized materials are returned by him to the Department in full and in good condition and receipt thereof duly acknowledged by the concerned Department Officer.

(Works Department OM No. Codes-M-19/92-13653 dt. 5.6.93)

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

1. **ADDENDUM TO CONDITION OF CONTRACT:**

The bidder / Tender whose bid has been accepted will be notified of the award by the Engineer-in-Charge prior to expiration of the validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the conditions of contract called the (“Letter of Acceptance”) will state the sum that the Engineer-in-Charge will pay the contractor in consideration of the execution, completion and maintenance of the works by the contractor as prescribed by the contract (hereinafter and in the contract called the “Contract Price”).

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

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

- a) The notice inviting bid, all the documents including additional conditions specifications and drawing, if any, forming the bid as issued at the time of invitation of bid and acceptance thereof together with any correspondence leading thereto & required amount of performance security including additional performance security.
- b) Standard P.W.D. Form P1.

## 2. TIME CONTROL

Progress of work and Re-scheduling programme

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.

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 3 showing the general methods, arrangements, and timing for all the activities in the works along with monthly cash flow forecast.

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, 1/4<sup>th</sup> of the whole of the work before 1/4<sup>th</sup> of the whole time allowed under the contract has elapsed, 1/2 of the whole of the work before 1/2 of the whole time allowed under the contract has elapsed, 3/4<sup>th</sup> of the whole of the work before 3/4<sup>th</sup> of the whole time allowed under the contract has elapsed.

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

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

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

Extension of the completion date.

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

law, be at liberty to forfeit the earnest money and performance guarantee / security deposit absolutely.

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

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

For

- i. Abnormally bad weather, or
- ii. Serious loss or damage by fire, or
- iii. Civil commotion, local commotion of workmen, strike or lockout, by officers any of the heads employed on the work, or
- iv. Delay on the part of other contractors or trademen engaged by Engineer-in-Chief, 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 Data without the Contractor taking steps to accelerate the remaining work and which would cause the contractor to incur additional cost, or.
- vi. Any other cause, which in the absolute discretion of the authority mentioned, in contract data is beyond the contractor's control.

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

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.

## **Compensation for delay.**

If the contractor fails to maintain the required progress in terms of clause 2 or to complete the work and clear the site on or before the contract or extended date of completion he shall without prejudice to any other right or remedy available under the law to the Government on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the Superintending Engineer (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clauses 2 or that the work remains incomplete.

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

The existing relevant provision in the original documents shall stand modified accordingly. Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the Tendered Value of work or to the Tendered Value of the item or group of items of work for which separate period of completion is originally given. The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case the contractor does not achieve a particular milestone mentioned in contract data, or the rescheduled milestone

(s) in items 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 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 each milestone missed subsequently also shall be withheld. However, no interest whatsoever, shall be payable on such withheld amount.

### **Management Meetings**

Either the Engineer or the Contractor may require the other to attend a management meeting.

The business of a management meeting shall be review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

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

**Signature of witness**

**signature of contractor**

# Grant of EOT and imposing penalty in EOT / Deviation:-

As per the letter no. 699, dated. 07.01.2021 of DoWR, Odisha, following decision has been taken regarding grant of EOT and imposing penalty in EOT / Deviation.

(i) **Basis of imposing of penalty in EOT/Deviation.**

1. In case of completion of the work in all respect, the EOT may be granted with imposition of penalty amounting to 0.2% (amount to be rounded off to the next higher value of Rs.100/-) of the value of works executed during the extended period (EOT period), subject to minimum penalty of Rs10,000/-.
2. In case of incomplete works /to rescind the contract, the contract to be closed as per the provision contained in Clause-2(b) of F2 agreement, 20% of the value of left-over work will be realised from the Contractor as penalty.

The suggestions / recommendations of the CE/CCE with respect to imposition of penalty is to be examined by the Technical Committee of EIC, W.R and considered views may be forwarded to Government for necessary action.

(ii) Reason of hindrances for sanction of EOT attributable to the agency/not attributable to the agency)

- Reasons of hindrances for sanction of EOT attributable to the agency.

1. The local festivals like Makar Sankranti, Raja Sankranti, Chaiti Parba, Danda Nata or any such festivals which may affect the work schedule.
2. In the peak summer season, working hour is curtailed by the Labour Department to avoid exposure to personnel to the scorching sun and heat. It is the duty of the agency to increase the number of work force and to employ the existing work force during morning and afternoon hours as per Government orders.
3. Rainfall is a normal occurrence during monsoon in Odisha. So, unless there is unusually heavy rainfall resulting in a declared calamity, the Contractor is not eligible for any extension of time. The Contractor should plan the deployment of workforce and machinery, so as to complete the work as per schedule considering ordinary vagaries of the nature.
4. The same applies for borrow areas ponding. The Contractor should foresee possible ponding of borrow area in monsoon and likewise lift more quantity of soil/ other material during dry period so as to complete the work as per schedule.
5. The Contractor should take up the work with due diligence in the acquired land without waiting for acquisition of the entire land. This should be completed in proportionally less period depending on the quantum of available work front.
6. The Agency should plan his work programme and mobilize men and machineries considering the canal closure programme of a particular system or area. Khariff / Rabi closure can't be imposed arbitrarily on the farmers as per the convenience of the agency. Closure of canal for the interest of work will be solely at the discretion of the Engineer-in-charge and can't be claimed as a matter of right.
7. There will always be standing crop before harvesting season as per crop schedule and this fact has to be clearly understood by the agency. Extension of time on this ground may not be considered by Divisional Officers.

- Reasons of hindrances for sanction of EOT not attributable to the agency.

1. Only the day(s) of elections to the Local Bodies/Assembly/Parliament will be treated as a non-working day(s)
2. Unless there is unusually heavy rainfall resulting in a declared calamity, the Contractor is not eligible for any extension of time.
3. Force majeure.
4. Abnormally bad weather, cyclones etc.
5. Civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work.
6. Delay on the part of other contractors engaged by the Engineer-in-charge in executing work not forming part of the contract.
7. In case a variation/additional work 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 cause the contractor to incur additional cost.
8. Any other cause, which in the absolute discretion of the authority mentioned, contract data is beyond the contractor's control.

(iii) Application for EOT as per Codal provision (Para 3.5.30 of OPWD Code)

The application for Extension of Time for completion of the work on the grounds of unavoidable hindrance or any other grounds shall be positively submitted by the contractor within 30 days of such hindrance. This should be strictly followed.

**SECTION-6**

**TECHNICAL SPECIFICATION**

## TECHNICAL SPECIFICATION

### CHAPTER – 1

#### 1.0 GENERAL INFORMATION

**1.1** The work under specification pertain “**Improvement of Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project**” .The information and data relating to work and site conditions described hereafter represents the site condition in a general way. It shall be presumed that the contractor satisfies himself as to nature and location of work in general, land, local conditions particularly on the power and handling, storage of materials, disposal of soil, foundation data and bore hole data and etc., before arriving at his rate. The department therefore will not bear any responsibility for any inference on the site condition and consequence thereof.

#### **1.2 Availability of labour:**

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

#### **1.3 Towns**

**Angul is a developed town with Bus facilities is about 10 kms (avg) distance from working site.**

#### **1.4 Access to site:**

The site is accessible by all weather existing roads.

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

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

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

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

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

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

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

### **Tariff Rate:**

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

### **Observance of Rules**

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

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

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

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

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

The Contractor shall permit the department to draw power required for the departmental works, if any from the contractor's L.T. lines as and when required by the department. The department will pay the contractor for such consumption at the prevailing tariff rate of TPCODL.

### **Housing**

Private houses may not be available at project site but available at **Angul**.

Land for the construction of temporary houses for the labour may be arranged by the agency at his own costs.

### **Medical Aid**

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

### **Post, Telegraph & Telephones**

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

### **Local Roads**

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

### **Dump Areas.**

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

### **Other Contractors.**

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

### **Use of Site.**

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

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

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

### **Floods**

In case of flash and untimely floods in the river/nalla during the working season resulting in

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

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

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

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

## **CHAPTER – II**

### **2. GENERAL SPECIFICATION**

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

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

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

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

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

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

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

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

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

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

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

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

Providing blocks outs (for second stage embedded metal parts of gates) with reinforcement

projecting into the block outs.

Fixing first stage embedded metal parts in the block outs.

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

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

#### **Coffer Dam and its Maintenance.( Applicable if necessary )**

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

#### **Equivalency of Standard and Codes.**

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

#### **Quality Control**

Before collecting materials required for execution of the respective items of work and laid down in the schedule of quantities and in the detailed specifications described hereafter in the subsequent sections, the contractor shall ensure that samples of materials proposed to be

used are first approved by the Engineer-in-charge. When directed the samples of materials proposed to be used should be furnished to the **Departmental Quality Assurance Division , Samal** for testing.

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

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

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

A quarry chart indicating possible sources of materials may be seen in the office of the **Superintending Engineer, Angul Irrigation Division, Angul**.The contractor must however satisfy himself that the materials as required as per specifications and quantity are available in those quarries. No extra payment will be made due to non-available in those quarries. No extra payment will be made due to non-availabilitymaterials as per required specification and quantity in the quarries shown in the departmental quarry chart. The quarry chart is only an indication of source of materials and the department does not accept the responsibility if the materials are not available in full quantity and quality.

No claim for carriages of water whatsoever will be entertained .

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

## CHAPTER- III EARTH WORK

### **Scope of work : This section covers item**

#### **Description of the Item:**

Refer item No.

of Bill of Quantity.

#### **Excavation Foundation.**

##### **Excavation.**

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

##### **Disposal of Materials**

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

banks shall be located where they will not interfere with the natural flow of the river or will not obstruct any drainage arrangement.

##### **Measurement.**

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

of excavated materials Including loading, unloading and stacking as directed by the Engineer-in-charge.

### **Dewatering**

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

### **Excavation in all kinds of Hard Rock & Disposal.**

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

### **Line Drilling and Broaching**

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

### **Blasting**

Blasting shall be permitted only when proper pre calculation are taken for the protection of persons, work and property & on receipt of permission from civil authorities of the district. Any damages done to the work or property by blasting shall be repaired immediately. Blasting may be done only to depth and extent approved by the Engineer-in-charge with explosives of approved quality and charge and in such locations are made no damage to the rock outside the prescribed limits of excavations. Explosives shall be stored in a safe place at a sufficient distance from the work and under special care of a watch & ward so that in case of accidents, no damage occurs to the other parts of works. All storing, handling, transport and use of explosives, detonators and the equipment there of shall be strictly in accordance with the Indian Explosives act and the explosives Rules-1940 and as amended from time to time.

The blasting where required shall be permitted only when proper precaution have been taken for the protection of persons and property in accordance with I.S. 40-81-1976 (Indian Standard specification for safety code for blasting and related drilling operations.) While carrying out excavation adequate precautions in accordance with I.S 3761-1966 (Indian standard Specification for Safety code for excavation work) shall be taken. Holes shall be drilled not exceeding two thirds of the depth of rock to be excavated from the elevation at which the hole is started. The holes shall not be larger than as necessary to permit easy passage of whole sticks of explosives to the bottom of the holes. As the excavation approaches its final limits, the depth of holes shall be reduced

progressively. When ever inthe opinion of the Engineer-in-charge, further blasting may injure the rock upon or against which

concrete is to be placed, the use of the explosives shall be discontinued and the excavation shall be completed by wedging, barring, Chiseling, drilling or broaching or by other suitable methods. Care should be taken to remove all loose slabs before masonry/concrete is placed for the spillway. Rock bolting compared to excavation of rock may be useful at places in excavation of foundation. The engineer-in-charge will direct where to locate rock bolt and where to excavate by wedging barring. The final prepared foundation shall roughly present a saw tooth out line and shall have at least 50% horizontal or nearly horizontal area to give resistance against sliding or as per direction.

### **Blasting with Powder**

Blasting operations shall be under charges of competent persons specifically for this purpose and be carried out during fixed hours of the day preferably during early hours midday. Lunch hour or at the close of the working day in the presence of competent persons. Prominent sign-board indicating the blasting timings should be put at a number of places. The Engineer shall see that the safety precautionare taken and observed. Red flags shall be prominently displayed and all the people except those who have actually to light the fuse must evacuate to a safe distance from the blast not less than 150 meters as a rule. Sirens shall be sounded five minutes prior to the blast with waiting note and an all clear shall be given with a long blast at the end of the operation. These sirens should be kept at different locations so as to identify the danger zones. All fuses must be cut to the required before being insertedinto the holes. The safety fuses of the charged holes are to be lighted in the presence of the superior who must see that the fuses of all holes charged have properly ignited. The number of blasts to be fired and the actual number of shots heard must be compared and the person responsible must satisfy himself by examination that all blasts have exploded before work people are permitted to approach the site. Withdrawal of a charge, which has not exploded, is not to be permitted under any circumstances, but the tamping and charge should be drilled at a distance of about 23cm. from the old hole and fired in the usual way. The result shall be carefully examined by the all persons in charge of blasting and the operation continued until the original blast is exploded.

### **Blasting with Dynamite & other High Explosives:**

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

60% Special gelatin for softer rock strata. 70%

special gelatin medium hard rock strata80%

special gelatin for hard rock strata

Before holes must be such a size that the cartridges can easily be passed through,and the responsible man in charge of blasting (Supervisor) shall take particular note of these positions and check them again after holes are drilled. The supervisor himself must supervise preparation of all charges necessary for thebore holes. Blasting plans shall be evolved after trial blasting at the site. The first few rounds blasted at the work site shall be considered as test/trial blasting to find the most economic and efficient drilling and firing pattern consistent with limiting the blast induced peak particle velocity (PPV) within permissible range. He shall adjust the drilling pattern, hole depth, number of holes, charge per hole and firing sequence including the types and number of

delay of ensuring most favorable angle of breakage. The blasting plan, so evolved and approved by the Engineer-in-charge will restrict the development of crack zone beyond the drilled contour and limit the PPV's influencing the damage prone features/ structures range. Through tail blasting and vibration measurement, the value of variable shall be determined from the following equation.

$$V=K (Q^{1/2})^{17/D}$$

Where V=Peak particle velocity in mm/sec

Q=Cooperating charge in 1 kg.

D= Distance from the blasting zone in meters.

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

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

### **Explosives and Blasting**

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

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

The provision detailed in the specifications are supplementary the above laws, rules and regulations, and are also applicable except where they conflict with the above mentioned laws. Further the Engineer-in-charge may issue modification alternation and new instructions from time to time. The contractor shall comply with the same without these being made a cause for any claims. All these materials such as explosives, detonators, fuse coils tamping materials etc. that are proposed to be used

in blasting operations shall have the required make and strength. The use of fuse with only on protective coat is prohibited. The fuse shall be sufficiently water resistant as to be unaffected when immersed in water for thirty minute. Rates of burning of the fuse shall be uniform and not less than 4 (four seconds per 35 millimeters of length with 10 percent (ten percent) tolerance on either side. The fuse known as instantaneous fuse shall not be used. Before use, the fuse shall be inspected and most damaged or broken ones discarded. The rate of burning of all new types of fuse or when they have been in stock for long shall be checked before use. The detonators used shall be capable for giving an effective blasting of the explosive.

## **Personnel**

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

## **Storage of Explosives**

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

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

- i. Not to put their magazine shoes to touch ground outside the clean floor.
- ii. Not to allow the magazine shoes to touch ground outside the clean floor.
- iii. Not to allow any dirt of grit to fall on the clean floor.

Persons with barefoot shall before entering the magazine dip their feet in water and then step directly over the barrier (if there be one) on the clean floor. A brush or broom shall be kept in the lobby of the magazine for the cleaning out the magazine on each occasion it is opened for the receipt, delivery or inspection of explosives, No matches or inflammable material shall be allowed in the magazine. Light shall be obtained from an electric storage battery lantern. No person having articles of steel or iron on him shall be allowed to enter the

magazine Oily cotton , rags waste and article liable to spontaneous ignition shall not be allowed inside the magazine workmen shall be examined before they enter the magazine to see that they have none off the prohibited articles on them. No tool or implements other than those of copper, brass, gun metal or wood shall be allowed inside the magazine. All tools shall be used with extreme gentleness and care. Boxes of explosive shall not be thrown down or dragged along the floor and shall be stacked on wooden trestles. Where there are white ants, the legs, of the trestles shall rest in shallow copper, lead or brass bowls containing water.

Open boxes of dynamite shall never be exposed to

the direct rays of the sun. Empty box or loose packing materials shall not be kept inside the magazine. The magazine shall have lightning conductor, which should be got tested at least once a year. The contractor shall within 15 days comply with all the recommendation made by the officer testing the lightning conductor, failing which the Engineer-in-charge shall entitle to comply the same at the contractor's expense which shall not open to question or the Engineer-in-charge may consider any action that he may consider fit. The following shall be hung in the lobby of the magazine.

- i) A copy of rules both in English and Oriya.
- ii) A statement showing: the stock in the magazine at the particular time.
- iii) A certificate showing the last date of testing of the lightning conductor.
- iv) A notice that "Smoking is strictly prohibited"

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

#### **Transport and Strong of Explosives:**

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

#### **Disposal of Deteriorated Explosives.**

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

#### **Preparation of Primers:**

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

### **Charging of Holes**

The work of charging of holes shall not commence before all the drilling work at the site is completed and the contractor's Supervisor be satisfied himself to the effect by actual inspection. While charging open laps shall be kept away. For charging with powdered explosives, a naked flame shall not be allowed. Only wooden tamping rods, without any kind of metal on the rod shall be allowed. The tamping rods shall have cylindrical ends. Before hole must be of such size that the cartridge can easily pass down & they shall not however be too big. Only one cartridge shall be inserted at a time and gently pressed into hole with the tamping rods, the sand, clay other tamping material used for the holes completely shall not be tampered too hard.

### **Blasting.**

Blasting shall be carried out during fixed hours of the day which shall have the approval of the Engineer-in-charge. The hours once fixed shall not be altered without prior written approval of the Engineer-in-charge. The site blasting operations shall be prominently demarcated by red danger flag. The order of the fire shall be given only by the contractor's Supervisor in charge of the work and his order shall be given by only after giving the warning signal three times, so as to be enable all the labourers, watchman, etc. to reach safe shelters. All the roads and foot paths leading to the blasting areas shall be watched. Road closing barriers should be provided to close the traffic on these roads at

least 400m away when the firing is to take place. In special case suitable extra precaution shall be taken. The Engineer-in-charge may however permit blasting for underground excavation, without restriction of fixed time provided that he is satisfied that proper precaution are taken to give sufficient warning to all concerned and that work of other

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

### **Electrical firing.**

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

### **Precaution after Blasting**

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

### **Misfires**

If it suspected that part of the blast has failed to fire and delayed, sufficient time shall be allowed to elapse before entering the danger zone. When fuse and blasting caps are used a safe time should be allowed and then the contractor's Supervisor alone shall leave the shelter to see the misfire. None of the drillers are to work nearer this hole under one of the two following operations have been carried out by the supervisor. Either (i) the supervisor should very carefully extract the temping with wooden scraper or jet of water or compressed air using pipe of soft materials and withdraw the fuse with the primer and detonator attached after which a fresh prime and detonator with fuse should be placed in this hole and fired out (ii) the hole may be cleared of 300m of capping & the direction be ascertained

by placing a stick in the hole. Another hole may be drilled at least 225mm. away and parallel to it.

This hole should then e-charged and

fired. The balance of the cartridge and detonators found in the muck shall be removed. Before leaving this work the contractor's supervisor should inform the supervision of the relieving shift of any case of misfires and should point out the position with Red Cross denoting the same also stating what action if any he has taken in the matter. A register of misfires and their location and how they were dealt with shall be maintained by the contractor. The contractor's Supervisor should also at one report at the contractor's office all cases of misfires, the cause of the same and what steps were taken in connection there with. The name of the day and night shift supervisor of the contractor must be noted daily in the contractor's office if misfire has been found to be due to defective detonator or dynamite the whole quantity of box from which the defective article was taken must be returned to the contractor's office for inspection and shall be disposed off as per rules & regulation of the act. Blasting operation when considered necessary shall be restored to only with written permission of the Engineer-in-charge. Prior inspection shall be carried out for the safety & stability of the public and property. Blasting operation in the proximity of overhead power line, communication line utility lines or other structures shall not be carried on until the operator or the owner of both such lines have been notified and precautionary measures deemed necessary have been taken. Any damage to the neighboring building properties, standing crops and life due to blasting shall be made good by the contractor at his cost.

### **General**

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

### **Common Excavation**

Measurement for all works done should be on the level sections initial levels and final levels will be taken at every 3m square grid and the contractor shall accept such levels, either in the book or graph sheets, or in both as directed by the Engineer-in-charge. If the dumps the excavated materials in an irregular way or not confirming

to the dumping specifications, the department will withhold 20% (of the rate) and the same can only be released after the work is completed up to the foundation grade. No allowance shall be made for over excavations beyond the specified minimum lines of excavations except where specifically authorized. No extra payment for any over breakage and subsequent repairs shall be payable and deemed to have been included in the applicable item of schedule of bid.

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

### **Excavation of Soil and Disintegrated (D.I) Rock**

Excavation of soil shall comprise of all kinds of soil such as vegetable or organic soil turf, sand, silt, loam, clay mud, peat, black cotton soil, loose or compact moorum, soft stiff/heavy/hard shale, stony earth mixed with gravel having 300mm maximum diameter in one direction. Excavation of D.I. shall comprise of soling of roads/paths, hard core, macadam surface, lean, concrete, stone masonry, brick work, soft conglomerate, lime stone, sand stone, laterite, hard conglomerate and types of D.I. rock, which does not require blasting 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 the materials shall not be classified in higher grade. Excavation for canal shall conform to provisions of relevant I.S codes, Sides slopes are to be provided as per the approved drawings, specification and provision of I.S code.

### **Excavation of Medium Hard Rock**

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

### **Over Excavation**

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

### **Rock Excavation**

Measurement for payment of medium hard rock and sheet rock excavation in open cut as required by this section shall be made of the total volume of rock in cubic meters contained, within the minimum lines for such excavation shown on the drawings or as specifically directed. The profile of the original rock surface, prior to excavation shall be established by taking levels of 3M. square grid. The final levels on finished surface shall

similarly be taken on a 3M square grid on concurrent points as that of initial grid. With these profiles, the quantities on rock excavation shall be worked out. In case hard rock boulders met during excavation for which blasting is restored, the contractor is required to take

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

### **3.4.23 Dewatering:**

#### **General:**

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

### **3.4.24. Dewatering by Electrical/Diesel Pumps**

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

#### **Anchor Bars in Rocks**

#### **Drilling Holes for**

#### **Anchor Bars**

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

#### **Placing Anchor Bars and Grouting**

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

All water shall be removed from the hole when the anchor grout is placed. The anchor bars shall be forced into

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

### **Measurement and Payment**

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

### **Refilling with Sand in Foundation**

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

### **Embankment (Afflux bund & Guide bund)**

#### **General.**

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

#### **Foundation preparation subsequent to stripping and excavation.**

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

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

## **Borrow area**

### **GENERAL**

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

### **PREPARATION OF BORROW AREAS**

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

### **STRIPPING OF BORROW AREAS**

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

### **HAUL ROADS AND APPROACH ROADS**

Construction and maintenance of approach roads and haulage roads will be the responsibility of the Contractor, as per the direction of Engineer-in-charge. The department will have full left of use to those roads for inspection purposes. Proper road sign as required have to be provided for safety. For haulage of earth, the contractor shall construct ramps and haulage of sufficient width along the shortest but most practical route and shall maintain

and illuminate them in a satisfactory manner. Watering of the haul road shall be done by the contractor as often as necessary to prevent rising of dust, formation of cuts and consequent deterioration of the surface. Whenever service roads meant for public through fare traverse through or run close to the borrow area, the Contractor shall direct his excavation and haulage operation in such a manner as to ensure uninterrupted use of the service road and safety to the public. At the haul road and service road crossing the contractor shall install necessary check gates and road signs. No Extra payment for haul road is admissible as this is deemed to have been included in the unit bid price for earth work item of schedule of quantities being contingent to the man work.

### **Earth Fill Material.**

#### **HOMOGENEOUS EARTH FILL**

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

after compaction shall not be more than 10 cm if compaction is performed by mechanical tampers and not more than 15 cm if compaction by sheep foot rollers. Initially the earth in the embankment fill will be laid in a greater width than the designed section. Adequate extra width of about 0.6 m on either side of the embankment shall be provided so that the earth fill up to lines of the finished slopes shall have the required compaction as per the drawing and specification. Such extra width shall be removed and utilized in the upper layers of embankment along with slope dressing for which no additional payment will be made as it is deemed to have been included in bid price for respective item. (iii) No fresh layer shall be laid the previous layer is properly watered and compacted as per the requirement. If in the opinion of the Engineer-in-Charge, the surface of the prepared foundation or the rolled surface of any layer of earth fill is too dry or smooth to bind properly with the layer of materials to be placed thereon. It shall be moistened or worked with harrow, scarifier or other suitable equipment in an approved manner to a sufficient depth to provide a satisfactory binding surface with the next succeeding layer of earth fill. If a layer is found to be too wet for proper compaction of the layer of earth fill materials to be placed there on, it shall be 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. (iv) The materials shall be deposited in row parallel to the axis and spread in the uniform layers and breaking clods maximum up to 5 cm. sizes. Loads shall be dumped and spaced so that the progress of spreading shall produce adequate blending resulting in uniform layers not exceeding 22.5 cm. The work of spreading and compaction shall be so adjusted as not to interfere with each other and in such a way that neither of the operations is held up because of non-completion of rolling and watering. The excavation and placing operations shall be such that the material when compacted shall be blended sufficiently to secure the best practicable degree of compaction, impermeability and stability. The surface of banking shall at all time of construction be maintained true to required cross section.

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

### **3.10.3. 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% to (-)2% of the optimum moisture content. Moisture determination of soil as well as determination of needed moisture shall be carried out as per designations of Earth Manual (July '74 second reprint 1985) and IS 2720-1983. Flooding at borrow area for preconditioning of moisture is preferable and effect only correction for moisture in the embankment. As far as possible the moisture content of the material shall be conditioned prior to its delivery on the embankment. It is preferable to use sprinkler for moisturing earth fill over the embankment use of jet of water for moisturing should be avoided. In order to have proper control of moisture content in the earth fill, no earth work will be done during rainy days. No compensation will be made to the contractor due to held up of work for rain, fog and high moisture content in the working process.

#### **Compaction**

##### **General**

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

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

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

### **Rolling.**

When each layer of materials has been prepared so as to have the proper moisture content uniformly distributed throughout the material it shall be compacted by passing the tamping roller. The exact number of passes for each layer to obtain specified density shall be designed by the field laboratory after necessary test. The layers shall be compacted in strips overlapping not less than 0.6m. Rolling shall commence at edges and progress towards center longitudinally. The rollers of loaded vehicles shall travel in a direction parallel to the axis of the embankment. Turns shall be made carefully to ensure uniform compaction. Rollers shall always be pulled. Density tests shall be made after rolling and dry density attained shall satisfy the specified compaction standards. Standard proctor density test shall be carried out at regular interval to account for variations in the borrow area materials as well as that in-situ excavated materials. The locations where compactions of the earth fill materials by means of the roller is impracticable or undesirable the earth fill in that locations shall be specially compacted by means of pneumatic tampers.

### **COMPACTION OF COHESIONLESS MATERIALS:**

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

### **Dressing slopes**

The outside slopes of the embankment shall be neatly dressed to lines and grade as shown in the drawing as the placing of fill progresses. Compaction shall extend over the full width of the embankment and material in slopes shall be compacted as for the rest of the bank. To ensure proper compaction of the edges, the cross section of the fill during construction shall be kept suitably wider as directed by Engineer-in-charge and cross section shall be dressed to the designed requirement after compaction for which no extra payment shall be made

as it is deemed to have been included in unit bid price for item of schedule of quantities. Material used to fill depression shall be of same type as used in the embankment and shall be thoroughly compacted and bonded to the original surface. Slopes shall be maintained till final completion and acceptance. Any material, that is lost by rains, weathering or other causes shall be replaced at the cost of the contractor till completion of the works and taking over by the Department.

**Settlement Allowance:**

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

**Measurement and Payment (Earth fill):**

**MEASUREMENT FOR PAYMENT.**

- (a) All works shall be measured by levels.
- (b) For payments the level books, field book, the cross section sheets and calculation sheets shall be treated as adjuncts to the measurement books. (c) All linear measurements shall be in meters, correct to 0.01 meter, area worked out in square meter correct to 0.01 M<sup>2</sup> and volume worked out in cubic meters correct to 0.01 M<sup>3</sup>.
- (d) The quantities between the levels taken after stripping and cross sectional levels taken after construction of consolidated embankments under OMC conditions with the available useful excavated soils within the designed section shall be worked out excluding riprap, rock toe and filters etc. It shall be clearly understood that construction of embankments to extra widths as specified above and extra height formed for settlement allowance as specified earlier will not be included for payment.
- (e) The measurement for construction of consolidated embankments with the materials obtained from the borrow area shall be the difference between the net quantities of the final compacted embankment section under OMC and net quantities of compacted embankments constructed with the suitable materials from all excavations as specified above and in earlier paragraphs. Final measurements and levels shall be taken at the cross sections of the completed compacted bank design section after the slopes dressed to ensure that the work is completed as shown on the drawings plus settlement allowances. The measurements for computation of quantities shall not include the extra section provided for compaction of earth fill up to lines of finished slope and for settlement height.

## **RATE FOR PAYMENT:**

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

### **Fine Dressing and Turfing on the outside slopes.**

The outside slope of the embankment as per line, grade and dimensions of the drawing shall be protected by turfing the entire slope including the berms. After the slope has been fine dressed to the line, it shall be roughened or packed evenly without any additional cost. The entire surface shall then be covered with a layer of dub grass sods consisting of blocks or strips of dense living grass growth as approved. The sods shall include a mat of root and earth at least 5 cm. thick. Sods containing an excess amount of obnoxious growth shall be excluded. Sods shall be carefully handled in transportation and transplantation so that minimum amount of earth will be lost from the root mass. The strips of blocks of sods shall be laid on the slope in close contact and then tamped firmly in place so as to fill and close joint between the blocks. Interval of time between collecting and laying shall be kept to a practical minimum and sods shall not be permitted to dry out. Immediately after placing the sods slopes shall be periodically moistured and if necessary for a sufficient period to re-establish the plant growth. Sods shall be transplanted generally from July to November. Arrangement of suitable sods is the responsibility of the contractor. The contractor will maintain the earth fill at his own cost till the items of turfing is completed. The measurement is to be made on the covered area basis and item will be paid at the bid price for finished item after survival of the turf for reasonable period as determined by the Engineer-in-charge. The unit bid price shall be for the finished item including the collection transportation within all lead, all lifts and de-lifts, loading, unloading, surface preparation, transplantation, tamping, watering till survival of sods, all labour, materials, taxes, tools, equipments and all incidental operations necessary to complete the work as per specification and as per direction of Engineer-in-Charge.

### **Inspection and Tests**

#### **GENERAL**

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

#### **SCOPE OF TESTING AND INSPECTION REQUIRED.**

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

#### **EMBANKMENT TEST SECTION.**

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

- a) Layer thickness of fill materials.
- b) Optimum Practicable moisture content.
- c) Number of passes of sheep foot roller or weight of laboratory rollers vis-à-vis number of passes for effective compaction.
- d) For pneumatic tyred compaction equipment, the test required will be such as to determine the most suitable loading, tyred pressures, moisture contents and number of coverage for compaction of the materials. Using the available data from borrow pits, investigations of the materials to be used in the test section, the optimum moisture content as determined by laboratory tests will be known and 3 percent less than this moisture content should be used in the first 3 or 4 layers rolled. After 3 or 4 layers have been placed at 3 percent less than the laboratory optimum moisture content, field density tests should be made throughout the section. These tests should be made for at least each 100 sq. meter of test section area, and should be distributed over the area that they will depict the effects of different compacting conditions encountered during construction. For example, if the section is located near an abutment, certain parts of the area will receive more compaction from track travel than other, hence some tests should be made in the portion compacted early by the rollers and so restored. The next step is to compact another 3 or 4 layers at the moisture content slightly higher (1 percent or 2 percent) than the moisture content previously used, maintaining the same rolled thickness of layer and number of roller passes as in above. Field density tests are again made over the test section. If the resulting field dry densities (of material passing the No.4 sieve) show an increase with increase of moisture, then increase the moisture again by another 1 percent or 2 percent and repeat the test. If an increase in moisture results in a decrease in field density, then place the next layer slightly dry of the original moisture content used and repeat the test. This procedure is nothing more than developing on the embankment a moisture density relation or compaction curve for certain roller, thickness of layer and a given number of roller trips. If special studies during investigations have indicated that material being tested should be placed within certain moisture limits or if the moisture limits to be used have been specified, the procedure outlined above should include test at these moisture contents or at moisture contents.

#### **BEFORE COMPACTION.**

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

#### **DURING COMPACTION**

It is intended that the checks on operations during compaction shall verify : i) That the layer thickness of the materials is specified. ii) That the fill is compacted to required standard proctor density or relative density by

the specified number of passes of specified machinery. iii) That no excessive rutting, weaving or a scaling of the fill occurs during compaction.

### **AFTER COMPACTION.**

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

### **FREQUENCY OF TESTING**

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

### **RECORDS AND REPORTS.**

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

### **Protection**

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

### **Applicable Standard.**

Publication of Bureau of Indian Standards (BIS) Indian Standard

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

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

- (iii) IS: 2131-1981 Methods for standard penetration test for soils (First revision).
- (iv) IS: 4332-1967 Method of sampling and preparation of established soils for testing (Part-I)
- (v) IS: 4558-1983 Code of practice for under-drainage of lined canals (First revision)
- (vi) IS: 4701-1982 Earth work on canals (First revision)
- (vii) IS: 5529-1969 Test in Over burden (Part-I)
- (viii) IS: 7894-1975 Code of practice for stability analysis of earth dams.
- (ix) IS: 8414-1977 Guidelines for design of under seepage control measures for earth and rock fill dams.
- (x) IS: 8419-1977 Filtration media – sand and gravel (Part-I)
- (xi) USBR Earth Manual by United State Bureau of Reclamation. Earth Manual.
- (xii) Quality control Irrigation & Power Dept., Govt. of Odisha. & Field instruction. Manual (1989)

**ANNEXURE – I**

**(See Clause 3.5.10.7)**

**TESTING FREQUENCY**

**Material Volume or Time between Tests Remarks before compaction After compaction**

**Gradation**

**Moisture content**

**Field Density**

**Permeability**

**Triaxial shear tests**

**Consolidation test**

**1 2 3 4 5 6 7 8**

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

**General**

- a) The type of material used for back fill, and the manner of depositing the material shall be subject to approval by the Engineer-in-charge. As far as practicable, back fill material shall be obtained from the excavation for structures or from excavation of other ancillary works. Back filling shall be restricted until structure is completed. The back fill materials shall only be procured from the site other than excavated pit of the structure when the quality of excavated materials is found unsuitable or the quantity insufficient. The decision of Engineer-in-charge is binding regarding the disposal of excavated material in the dumping yard or to be utilized as back fill materials. The schedule of construction of components of civil works should be prepared such that the maximum amount of excavated material if found suitable should be utilized as back fill materials.
- b) Back fill materials shall contain no stones large than 7.5 mm size.

c) The previous materials (sand) with profuse watering used for back filling in the back of abutment flank-wall shall be placed as shown on drawing or as directed by Engineer-in-Charge. d) Back fill shall not be placed against retaining walls until the retaining wall is cured adequately and is strong enough to take lateral pressure of the back fill. e) The back fill material shall be placed carefully and spreaded in uniform layers not exceeding 15 cm. The back fill shall be brought up as uniformly as practicable on both sides of walls and all sides of structures to prevent unequal loading. The back fill material shall be placed at about the same elevation on both sides of the structure and difference in elevation shall not exceed 15cm at any time. Black cotton soil should never be used as back fill material. Tamping to be used for compaction of the back fill immediately adjoining the structure.

**Measurement and Payment.**

Measurement for payment for back filling around structures will be made according to the pay line given or the drawings and the back fill outside of those pay lines will be at the cost of the Contractor.

The payment shall be made on cubic meter basis under relevant items of schedule of quantities.

## **CHAPTER -IV** **CONCRETE WORKS**

### **SECTION 4.1 CONCRETE STRUCTURES.**

#### **4.1.1. CONCRETE IN STRUCTURES.**

- a. Concrete in structures shall conform to the requirements of paragraphs 4.2.1 through 4.2.23
- b. Measurement and payment for concrete in structures shall be made as prescribed in paragraphs 4.2.22 and 4.2.23.

#### **4.1.2. CONSTRUCTION OF STRUCTURES:**

The item of the schedules for concrete in the structures including all cast in place concrete in the structure.

Cast in place concrete for the structures include all cast in place concrete in the structure.

Cast in place concrete for the structures shall conform to the requirement of section 6.2 pipe and fitting miscellaneous metal work, mechanical and electrical equipment and other items forming a part of the structures are provided for elsewhere in these specification.

The structures will be located at various points along the canal as shown on the drawings or as otherwise designated.

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 adopt the structure to the conditions disclosed by the excavation or to meet other conditional. Where the thickness of any portion of a concrete structure is variable it shall vary uniformly between the dimensions shown.

Where necessary as determined by the Engineer-in-charge the contractor shall furnish additional details drawings of the structures to be constructed.

The cost of furnishing 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 price bid in the schedule for the work to which such items are appurtenant.

### **SECTION 4.2 GENERAL CONCRETE REQUIREMENTS:**

#### **4.2.1. COMPOSITION:**

##### **A GENERAL:**

Concrete shall be composed of cement, sand, coarse aggregate, water admixtures (if any) as specified and all well mixed in batching plant by weight or by concrete mixture by volume derived from conversion of weight in to volume according to design mix and brought to the proper consistency. Batching plant shall conform to IS Code No. 4925-1968

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

##### **MIXING:**

Concrete shall be mixed in a mechanical mixer and shall be as dense 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 color and consistency. The time of mixing shall be as shown table 1 of IS 457-1957 reproduced below.

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

**B. NOMINAL MAXIMUM SIZE OF AGGREGATES.**

For sizes of aggregates IS 383-1970 shall apply. 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. Smaller coarse aggregates than specified shall be used where in the opinion of the Engineer-in-charge that proper placement of concrete is impracticable with the size of the aggregate specified in the drawings.

**A. MIX PROPORTIONS:**

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 calibrate tanks or weighed. Batching plant shall conform 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 15 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 as determined and ordered by the Engineer-in-charge. Admixture of Pozzolanas, if ordered, shall conform to the requirements specified in IS 9103-1979 (Indian Standard Specification for Admixtures for concrete).

**D. 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 brat ions.	Medium	25mm to 75mm slump for 20 aggregate.

II. For plain concrete work, slump requirements mentioned in item 1 above are applicable.

III. Lining with slip form machine 60 to 70 mm slump for concrete paver finish.

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 equipments which will not readily handle and place concrete of the specified slump will not be permitted.

To maintain concrete at proper consistency, the amount t of water and sand batched for concrete shall be adjusted 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 but 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 CONCRETE QUALITY ASSURANCE TEST PROGRAMME.**

**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 confirm to IS 516-1959.

**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 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. or part thereof.

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

**TEST FACILITIES:**

The contractor shall furnish free of cost samples of all ingredients of concrete for testing. He should also supply 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. The testing charges shall be borne by the contractor.

**CONTRACTOR TO FURNISH DRAWINGS AND DATA:**

Not less than 30 days prior to start of installation of the contractors plant and equipment for processing, handling, transporting, storing and proportioning concrete, the contractor shall submit it 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**

#### **A. GENERAL**

Cement shall conform to clause 4 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. Ordinary or low heat Portland cement conforming to IS 269-1976
- b. Rapid hardening Portland cement conforming to IS 8041-1978
- c. Portland slag cement conforming to IS 455-1976
- d. Portland pozzolana cement conforming to IS 1489-1976
- e. High strength ordinary Portland cement conforming to IS 8112-1976
- f. Hydrophobic cement conforming to IS 8043-1978

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 store 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 month. Each other 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 4082-1977 (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.

#### **B. ACCEPTANCE OF CEMENT.**

Portland cement shall be supplied by the contractor according to clause 10.1 of IS 269-1976.

The cement of the companies having their own manufacturing units in the state of Odisha is to be used in all works.

#### **C. ACCEPTANCE OF POZZOLANA:**

Pozzolana added to the concrete as an admixture shall be sampled and tested as per IS 9103-1979.

#### **D. RECOVERY OF COST OF CEMENT IN WASTED CONCRETE ETC.**

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

### **4.2.4 ADMIXTURES:**

The contractor shall use Air entraining admixtures as directed by the Engineer. 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 objectionably quantities of silt, organic matter, injurious amounts of oils, acids, salts and other impurities etc. as per IS specification No.456-2000.

The Engineer-in-charge will determine whether or not 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.

##### **PERMISSIBLE LIMITS FOR SOLIDS IN WATER.**

1. Organic Maximum permissible limit 200 mg/ltr.
2. Inorganic 300 mg/ltr.
3. Sulphate (as SO<sub>4</sub>) 500 mg/ltr.
4. Chlorides ( as CL ) 2000 mg/ltr for plain concrete work and 1000 mg/ltr for RCC work.
5. Suspended matter 2000 mg.ltr.

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 AGGREGATES):**

##### **A. GENERAL**

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

All sand shall be furnished by the contractor from any approved sources specified in the contract.

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 (IS 456-2000)

##### **B. QUALITY**

The sand shall consist of 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.

##### **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 TEST 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 from natural source for concrete) when tested in accordance with IS 2386-1963.

**C. 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 / ones. I, II, III and IV. Sand complying with the requirements of any of the four grading zones is suitable for concrete. But sand conforming to the requirements of grading zone IV shall not be used for reinforced cement concrete work.

**4.2.7. COARSE AGGREGATES:****A. 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 furnished by the Contractor from the approved quarries specified in the contract documents. The contractor shall, unless otherwise specified in the tender notice and subsequently on this basis in the contract, be responsible for payment of storages, 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.

**B. 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 will be rejected if it fails to meet any of the following requirements.

**1. LOS ANGLES ABRASION TEST.**

The abrasion value of aggregates when tested in accordance with the method specified in IS 2386 (Part IV) 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.

**2. 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 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.

**3. SOUNDNESS TEST.**

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

**4. SPECIFIC GRAVITY:**

The coarse aggregates shall have specific gravity of 2.60 minimum.

**5. DELETERIOUS 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

**C. SEPARATION.**

The coarse aggregates shall be separated into nominal sizes during production of the aggregate. Just prior to batching, the coarse aggregates shall be rewashed 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 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 be 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 will not be over loaded and will 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:**

**A. GENERAL.**

Sand and coarse aggregate for concrete and sand for mortar and grout shall be obtained by the contractor from the approved sources shown in the contract documents. The approval of deposits by the Engineer-in-charge shall not be construed as consisting 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 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.

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

**B. DEVELOPING AGGREGATE DEPOSITS:**

If the deposits 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 depositor any other property of the Govt. And so as to preserve in so far as practicable, the future usefulness or valueof the deposit. The contractor shall carefully clear the area of deposit from which the aggregates are to be produced of trees, root, bush, sod , solid unsuitable sand and gravel and other objectionable matter. Materials including stripping, removed from deposits owned by the Government and controlled by the Director of Mines and Geology. Government of India and not used in the work covered by these specifications shall be disposedoff as directed.

Due to the overall construction programme, it is quite likely that more than one contractor may elect touse 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 contractor who are also using any given source.

**C. 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 given 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.

**D. COST.**

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

#### **4.2.9. BATCHING.**

The contractor shall notify the Engineer-in-charge 24 hours before batching 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 weighted /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 I.S. 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 4 of I.S. 456-2000.

Cement and aggregates are hauled from a central batching plant to the mixture 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 expressed to moisture and delays occur between batching and mixing extra cement shall be added to each batch. The extent of such extra cement will be so as to attain the required quality. No separate payment for this addition of extra cement shall be made.

#### **4.2.10. MIXING.**

##### **A. GENERAL.**

The concrete ingredients shall be thoroughly mixed in mechanical mixers designed to positively insure uniform distribution of all the component materials through out 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 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. If there is aggregation after unloading the concrete should be remixed.

After 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.

##### **B. CENTRAL 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. Each mixer shall be controlled with a timing device which will indicate the mixing period and assure compliance of the required period of mixing.
4. The batch plant shall be equipped with an interlocking mechanism which will prevent concrete batches from entering mixers which are not empty.

**4. TRUCK MIXERS:**

Each truck mixer shall be equipped with accurate water meter located between the supply tank and mixers and having 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 from each batch. Each mixer shall have affixed there to a metal plate on which the drum are plainly marked.

Mixing shall be continued for the minimum period specified and may be increased and no of revolutions speed of the drum may be such that the mixer as delivered from the mixer has uniform in 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° C to 30° 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:**

**a. 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 line form positions and immediately correct 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 loss of mortar from the concrete. Chamfer strips shall be placed to produce beveled edges on permanently exposed concrete surfaces. Interior angle of inter setting concrete surfaces and edges of construction joints shall not be beveled except where indicated on the drawings.

**b.** Suitable struts or stiffeners or ties shall be used for the form work 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 form work 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.

**b.** The form work 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 or 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 form

**c.** Work and supports shall be submitted to the Engineer-in-charge and got approved before erection.

**c.** In case of columns, retaining walls or deep vertical component the height of the column shall facilitate 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 form work shall be left exposed of the face of the finished work.

**d.** Suitable inserts for block outs for electrical and other service fixtures where necessary shall be provided in the required locations as specified.

**e.** Cleaning and oiling of forms:-. 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.

**f.** *Removal of forms*

The steeping of formwork shall conform to clause 10.3 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 upper sloping faces of concrete such as forms on the water sides of wrapped transitions shall be removed as soon as the concrete has attained sufficient stiffness 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 4.2.21.

**g.** *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 item of form work provided in the bill of quantities.

**4.2.13 TOLERANCES FOR CONCRETE CONSTRUCTION.**

**A. GENERAL.**

Tolerances are defined as allowable variations from specified lines, grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades and dimensions are listed as given under sub paragraph (b) below.

The intent of this paragraph is to 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 are 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 with in the limit necessary to insure 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 b and c.

**B. 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 with in the tolerance specified in the table below.

Variation is defined as the distance between the actual position of the structure or any element of the structure and the specified position in plan for the structure or the particular element. Plus 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.

**TABLE**

Variation from specified lines, grades and dimensions

**A. TOLERANCE FOR CANAL LINING, EXCAVATION:  
EXCAVATIONS:**

1. Departure from Established alignment.  
± 20mm straight sections.  
± 50mm on tangents and  
± 100 mm on curves.
2. Departure from Established grade.  
+ 20 mm

**LINING**

1. Departure from Established grade.  
± 20 mm straight reaches.  
± 50 mm on practical curves on tangents.
2. Departure from Established grade ± 20 mm

**B. TOLERANCE FOR CANAL STRUCTURES.**

1. Deviations from specified dimensions of cross section of columns, beams, piers and slabs [(-6 mm to (+) 12mm]  
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.

**C. CONCRETE SURFACE IRREGULARITIES.**

**A. 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.

**B. ABRUPT SURFACE IRREGULARITIES:**

Abrupt surface irregularities are defined herein as offsets such as those caused by misplaced or loose forms, loose knots in form 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.

**C. GRADUAL SURFACE 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.

**D. REPAIR OF 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 6.2.21 and shall be accomplished in a manner approved by the Engineer-in-charge. Concrete repair to bring concrete within the tolerance 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 cement by two parts of coarse sand as an abrasive, the mortar at the same time filling the voids. A neat cement wash 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 can not be satisfactorily dealt with in this manner due to bad work or for other reasons, a coat of cement plaster of 1:2 of thickness as ordered by engineer shall be applied. No extra payment will be given for finishing concrete surface as instructed above in this clause.

**e. PREVENTION OF REPEATED FAILURE TO MEET TOLERANCES:**

When concrete placements result in hardened concrete that does not meet the specified tolerance the contractor shall submit to the Engineer-in-charge an outline of all prevention actions such as modification to form, modified procedure for setting screeds and different finishing techniques to be implemented by the contractor to avoid repeated failure.

The Engineer-in-charge reserves the right to delay concrete placement until the contractor implements such preventive actions which are approved by the Engineer-in-charge.

#### **4.2.14. REINFORCING BARS:**

The contractor shall make his own arrangement for procurement of steel of required specification of for the work. Transportation from the place of supply to work site and all incidental charges will be borne by the contractor. All reinforcement steel & structural steel shall be procured and used as per specifications mentioned in BIS's documents-IS:1786 & IS:2062 respectively. Independent tests shall be conducted, where ever required, to ensure that the materials procured confirms to the specifications. These steel shall be procured only from those firms which are established, reliable, indigenous & primary producers of steel, having integrated steel plants (ISP), using iron ore as the basic raw material as per Ministry of Steels guidelines. No rerolled steel shall be permitted in works. All other specifications & guidelines of MORTH shall be complied. All reinforcement steel & structural steel shall be procured from primary producers of steel, such as SAIL/RINL/TATA/JINDAL STEEL/SHYAM STEEL. In case of exigency other brands (primary producers) of steel may be used with proper justification & prior approval of competent Authority satisfying the tests as required by "BIS" Codes.

Reinforcing bars shall be placed in the concrete as shown in the drawings or as directed. For concrete canal lining the reinforcement rods as provided for in the drawing shall be placed. For anchoring the concrete canal lining to the hard rock provision of anchor rod is made in the drawing and contractor shall place these anchor rods to the spacing and depth shown in the drawings.

#### **B. MATERIALS:**

Unless shown otherwise on the drawings the reinforcement to be used shall be High Yield strength deformed bars of grade conforming to IS 1786-1985 specification for high yield strength deformed steel bars and wire for concrete reinforcement. The grade of steel should be same or higher grade as specified in the drawing.

#### **C. PLACING:**

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 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, splice bars at additional locations other than those shown on the drawings. In order to meet design and space limitation on placing some bent bars may exceed usual clearance cutting and bending of such bars from stock lengths maybe required at the site.

Unless otherwise prescribed, placement dimensions shall be to the center line of the bars. Reinforcement will be inspected for compliance with requirement as to size, shape, length, splicing.

Before reinforcement is embedded in concrete the surface of the bars shall be cleaned of heavy flaky Rusk, 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 bar lap or equivalent treatment in considered objectionable.

As specified in clause 11.3 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 11.4 of IS 456-2000. Chairs, hangers, spacers and other supports for reinforcement shall be of concrete metal or other approved material. Concrete cover shall be as shown on the drawings.

#### **D. REINFORCEMENT DRAWINGS:**

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

#### **E. 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 securing and maintaining in position reinforcing bars as shown in the drawings. (The binding wire, overlapping, wastage, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire for binding and placing shall not be considered for measurement & payment in any shape at all).

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 IR 1786-1985) of that size of rod.

#### **4.2.15. DOWELS:**

The dowels shall be of same HYSD bars of grade same as main reinforcement bars conforming to IS 1786- 1985 as used for reinforcement. Details of dowels shall be as shown on the drawings or as directed by the Engineer-in-charge. Dowels shall be placed in the concrete where shown on the drawings or where directed and will be inspected for compliance with requirements as to size shape, length position and amount after they have been placed but before being covered by concrete.

Before the dowels are embedded in concrete, the surfaces of dowels are cleaned of all dirt grease or other foreign substances which in the opinion of the Engineer-in-charge are objectionable. The dowels shall be accurately placed and secured imposition so that they will not be displaced during the placing of the concrete.

Measurement for payment of dowels will be made only on the weight of the dowels placed in concrete in the accordance with the drawings or as directed.

Payment for furnished and placing of dowels will be made at the unit price bid in the bill of quantities for furnishing and placing of reinforcing bars which unit price shall included the cost of furnishing all the materials and for placing the dowels as required.

#### **4.2.16. PREPARATION FOR PLACING:**

No concrete shall be placed until all form work installation of items to be embedded and preparation of surface involved in the placement have been approved.

##### **A. GENERAL:**

The department shall supply concrete placement checkout cards (Placement Register) at a 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. Engineer 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 completed, until the contractor or his representative and above authorized Engineer have approved by signature all applicable, items for the placement.

All surfaces of forms and embedded materials shall be free from curing compound, dried mortar from previous placements and other foreign substance before the adjacent or surrounding concrete placement is started.

Prior to beginning of 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-in-charge’s representative at the placement may delay the start of the concrete placement until the number of working vibrators available is acceptable.

##### **B. FOUNDTION SURFACES:**

All surfaces upon or against which concrete is to be placed shall be free from frost, ice water mud and debris.

1. Rock surface shall be free from oil, objectionable coatings, and loose semidetached 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 in dry condition.
2. Earth foundation surfaces shall be wet to a depth of 15cm. or to impermeable material whichever less before concrete placement is.

**C. CONSTRUCTION JOINTS:**

Construction joints defined as concrete surfaces upon or against which concrete to be placed and to which new concrete is to adhere but which have become so rigid that the new concrete can not be incorporated integral with that previously placed. The provision of construction joints shall conform to clause 12.4.1 and 12.4.2. of IS 456-1978

When the work has to be resumed on a surface which has hardened such surface shall be roughened. It shall then be swept clean thoroughly wetted. For vertical 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 15mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing of the concrete.

Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the set surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry. On this surface a layer of concrete not exceeding 150 mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots, and work thereafter shall proceed in the normal way.

**D. CONTRACTION JOINTS:**

Contraction joints 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 of wax based curing compound to contraction joints, the surfaces of all joints shall be cleaned thoroughly of accretion of concrete oil 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.

**E. EXPANSION JOINTS & BEARING:**

In case of bridge works, expansion joints and bearings are to be procured from only specified manufacturing units approved by MORTH.

**4.2.17. PLACING:**

**A. 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 authorized Engineer's representative. Placement shall not begin until 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 placement.

All surface upon or against which concrete is to be placed shall be prepared in accordance with paragraph 4.2.16.

Re tampering of concrete will not be permitted. Any concrete which has become so stiff that proper placing cannot be assured shall be wasted.

Concrete shall not be placed in standing water except with written permission of the Engineer-in-charge and the method of placing shall be subjected to approval. Concrete shall not be placed in running water and shall not be subjected to running water until after the concrete has hardened.

Concrete shall be deposited as neatly as practical in its final position and shall not be allowed to flow in such a manner that the lateral movement will cause segregation of the coarse aggregate from the concrete mass. Methods and equipment employed in depositing concrete in forms shall minimize clusters of coarse aggregates, clusters that occur shall be scattered before the concrete is vibrated.

Forms shall be constantly monitored and their position adjusted as necessary during concrete placement in accordance with paragraph 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 decide for 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 with the 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 456-2000.

If concrete is placed monolithically around openings having vertical dimensions greater than 60 cm as in decks, floor slabs, or other similar parts 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 be delayed to accommodate settlement of fresh concrete. If levels are specified beneath nearly horizontal structural members such as decks floor slabs, beams and graders or the levels being between the nearly horizontal members and the vertical supporting concrete below concrete shall be placed to the bottom of the levels before delay of placement.

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

In placing concrete on unformed slopes so steep as to make internal vibration of the concrete impractical without footing the concrete shall be placed ahead of non vibrating slip form 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 forms.

A cold joint in 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 breakdown or other unavoidable prolonged interruption of continuous placing. If such unavoidable delays in placing occur which make it appear that unconsolidated concrete may harden to the extent that later vibration will not fully consolidate it, the contractor shall immediately consolidate such concrete to a stable and uniform slope. If delay of placement is short enough to permit penetration of the underlying concrete,

Placement shall resume with particular care being 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 that the concrete placed with the 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.

The contractor shall not be entitled to any additional payment over the unit price bid in the scheduled for concrete by reason of any limitation in the placing of concrete required under the provisions of this paragraph.

**B. TRANSPORTATION:**

The transportation of concrete shall conform to IS 456-2000.

The methods and equipment used for transporting concrete from the batching 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 cm.

Concrete shall be deposited as near as practical to its final position. The use of Aluminum pipe or Aluminum 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 placed concrete of the specified slump. The contractor shall when directed replace inadequate transporting equipments with acceptable equipments.

**C. COMPACTION:**

The compaction of concrete shall conform to IS 456-2000.

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.

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 on previously placed 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 of 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 his cost 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.

#### **4.2.18. 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-in-charge's representative is present. Concrete surface 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 4.2.21.

Interior surface shall be sloped for drainage where shown on the drawings or as directed. Surfaces which will be exposed to the weather and which would normally be level shall be sloped for drainage.

Floating may be performed by use of hand or power driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently and shall be the minimum necessary to produce a surface that is free from screened marks and is uniform in texture. Joints and edges shall be tooled where shown on the drawing or as directed.

After the surface of road way 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 completed before the concrete is in such condition that the surface will be torn or unduly roughened by the operation. The finished surfaces shall have a uniform appearance and shall be free of corrugations exceeding 1.5 millimeters in depth. Broom shall be of a quality size and construction and be so operated as to produce a surface finish satisfactory to the Engineer-in-charge.

The finishing in lining shall be in accordance with clause 6.7. of IS 3873-1978. 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 a lining machine meets the specified requirements no further finishing operations will be required.

The top portion of side slopes of the canal lining extending 1-1/2 meter vertical below the top of the lining shall receive a nonskid. Longitudinal brisk finish as approved by the Engineer-in-charge.

#### **4.2.19 PROTECTION:**

The contractor shall protect all concrete against damage until final acceptance by the Engineer-in-charge.

The contractor shall provide protection to prevent erosion to fresh concrete whenever precipitation either periodic or sustaining is imminent or occurring.

When precipitation appears imminent, the contractor shall immediately make ready at the placement site all materials which may be required for protection of fresh concrete. The Engineer-in-charge may delay placement of concrete until adequate provisions for protection against weather are made.

All fresh concrete surfaces shall be protected from contamination and from foot traffic until the concrete has hardened. Hardened concrete surfaces which have to receive finish shall be protected against damage from foot traffic and the construction activity by covering with protective mats, plywood or by other effective means. Methods of protection shall be subject to approval by the Engineer-in-charge.

#### **4.2.20 CURING:**

##### **A. GENERAL.**

The contractor shall furnish all materials and perform all work required for curing concrete. All

concrete including bed and sides of canal lining shall be cured by water curing.

The precast 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, hessain 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 expire of the curing period.

All concrete surfaces shall be treated as specified to prevent loss of moisture from the concrete until the required curing period elapsed or until immediately prior to placement of other concrete or 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 and 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.

##### **B. 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 Engineer-in-charge.

##### **C. COST:**

The cost of furnishing all materials and performing all work for curing concrete shall be included in the price bid in the bill of quantities for the concrete on the particular curing methods are required.

#### **4.2.21 REPAIR OF CONCRETE:**

Concrete shall be repaired in accordance with the clause 5.7 of IS 3873-1978. Imperfections and irregularities on concrete surface shall be corrected in accordance with paragraph 6.3.13 and clause 5.7 of IS 3873-1978.

##### **TYPE OF REPAIR :**

All repairs shall be made with concrete. Repairs to concrete surfaces and addition where required shall be made by cutting regular opening into concrete to the required lines. The chipped openings shall be sharp and shall not be less than 70 mm in depth. The fresh concrete shall be reinforced and chipped and troweled to the surface of the openings. The mortar shall be placed in layers not more than 20 mm in thickness after being completed and each layer shall be compacted thoroughly. All exposed concrete surfaces shall be cleaned of impurities lumps of mortar or grout and unsightly stains.

##### **COST:**

The cost of furnishing all materials and performing all work required for the repair of concrete shall be borne by the contractor.

#### **4.2.22 MEASUREMENT OF CONCRETE :**

Measurement for payment of concrete required to be placed directly upon or against surfaces of excavation will be made to the lines for which payment for excavation is made.

Measurement for payment of concrete in canal lining shall be made to the lines shown on the drawing. The unit of measurement will be in square meter to the thickness shown in the drawing measurement for payment of all other concrete will be made to the neat lines of structures unless otherwise specifically shown on the drawings prescribed in the specification. The unit measurement will be cubic meter. In measuring concrete for payment the volume of all opening, fixtures embedded pipes and metal work each of which is larger than 0.1 square metre in cross section will be deducted.

#### **4.2.23 PAYMENT FOR CONCRETE:**

Payment for concrete including temporary centering and shuttering in the various parts of the work shall be made at the applicable unit price in thereof 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 outline form work shall be made at the respective unit price's bid thereof in the schedule.

### **SECTION 4.3 SPECICAL REQUIREMENTS FOR CONCRETE STRUCTURES:**

#### **4.3.1 P.V.C.STRIPS:**

The finished P.V.C. strips shall be manufactured with shapes conforming to dimensions shown on the drawings and shall be extruded from virgin, pigmented, plasticized P.V.C. The finished P.V.C.strip shall meet the requirement of Table I and II of IS 9766-1981.

The P.V.C. water stops conforming to the above requirements shall be placed in the joints where shown in the drawings. The contractor shall furnish an ISI test certificate for P.V.C. he proposes to use.

#### **4.3.2.**

#### **4.3.3. CONTRACTOR**

#### **4.3.4. ELECTROMETRIC BEARING PADS.**

The contractor shall furnish and place electrometric bearing pads at the location shown on the drawings and in accordance with this paragraph. Electrometric bearing pads shall be fastened to one concrete surface with rubber cement recommended by the manufacturer of the electrometric bearing pads. Electrometric bearing pads shall be stored at 750 F or less. Electrometric bearing pads shall not be stored in open place or where they will be opened to the direct rays of the sun.

The Electrometric compound shall be 100 per cent virgin polychloroprene (neoprene)

The contractor shall furnish an I.S.I. Test Certificate for the Elastomeric Bearing pads he proposes to use.

#### **4.3.3. PLACEMENT OF KRAFT PAPER.**

The top surface of the masonry piers and abutments should be leveled and painted with brush, with asphalt emulsion of 20/30 grade such that the bearing surface is perfectly smooth and uniform. Over this surface Kraft paper of approved quality should be placed and the top painted with asphalt emulsion of 20/30 grade. The unit price bid in the bill of quantities for this item shall include the cost of all materials and labour involved in the operations.

#### **4.3.4. EMBEDMENT IN CONCRETE:**

In some of the locations of structures as shown on the relevant drawings a few conduits or openings shall have to be provided through R.C.C./ P.C.C/ Masonry work. Construction of the surface for either placement of concrete or for laying of masonry shall have to be suitably carried out so as to meet with the placement of such conduits or openings. No extra claim for such improvidence in construction shall be entertained.

#### **4.3.5 Providing and fixing R.C.C. Non pressure NP2/NP3 pipe as per drawings with spigot & socket ends.**

#### **SUPPLY OF PIPES:**

Pipes shall be of specified diameter non pressure type conforming to IS 458-1971 Maximum length of the pipe shall not be less than 2.5 m. or otherwise directed by the Engineer-in-charge. The contractor shall order the pipes required for the work on the basis of the construction drawings supplied to him by the Engineer-in-charge. Pipe marked with the following information on each type shall only be accepted for work.

- A. Class of Pipe
- B. Date of Manufacture
- C. Name of Manufactures or his trade mark or both.
- D. IS Specification mark.

**HANDLING AND LAYING OF PIPES.**

Work shall be done as per IS 783-1956 or its latest edition. Reasonable care shall be exercised in loading, transporting and unloading of concrete pipes. Handling shall be such as to avoid impact. All pipes shall be inspected thoroughly before being laid. Broken or defective pipes shall not be used. Trench shall be of sufficient width to provide for free working space in minimum 30 cm on either side of the pipe. Pipes shall be lowered into the trenches by use of standards appliance. Pipe shall be laid true to line and as specified on the construction drawings. Laying of pipes shall be along proposed grade of the slopes. The socket ends of pipe shall face upstream. The connections of the pipes shall be joined together in such a manner that these shall produce perfect even surface along the inside of the pipe. In no case pipes shall be laid directly on rock or other hard material.

**JOINING PIPES:**

Semi flexible type spigot and joint as per IS 783-1959 and as shown on the construction drawing shall be provided. The rubber sealing rings used in the joining shall conform to para 1A of IS 383-1962. A rubber ring shall be placed on the spigot which shall be forced into the socket of pipe already laid. This shall compress the rubber ring as it fills in to the annular space formed between the two surfaces of the spigot and socket so as to form a flexible and water tight joint. The recess at the end of pipes shall be filled with cement mortar 1:2 every joint be kept wet for above fourteen days.

**BACK FILLING TRENCHES:**

A. Trenches shall be kept free from water until the materials in the joints has hardened. Walking or working on the completed pipe shall not be permitted until the trench has been back filled to a height of at least 45 cm. over the pipe except as may necessary for back filling and compaction.

B. Trenches shall be back filled after pipe has been laid subject to the condition that jointing has hardened. Only selected materials shall be used for backfilling. Filling of the trench shall be carried out simultaneously on both sides of pipe in such manner that unequal pressure does not occur.

**MEASUREMENT AND PAYMENT:**

Measurement for payment shall be on running meter basis on the pipe line laid including joints the rate in bill of quantities shall include the cost of pipes including loading, unloading hauling, handling, storing, laying in position cost of rubber rings, jointing ,curing and other operations to complete the work as per the specification.

## CHAPTER-V

### CEMENT CONCRETE LINING

#### 1.1 SCOPE OF WORK :

a) (i) Canal lining shall be done with concrete paving and finishing machines, which will place, compact and finish the concrete lining in bed and slopes. The grade, specification & dimensions of lining should be in accordance with the approved drawing. If during construction it is found necessary to alter the canal section and side slopes & specifications of lining, the Contractor shall be informed in writing of such changes.

(ii) 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 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 lapsed time following trimming, consolidation of concrete, finishes, joints and other requirements specified therein.

(iii) The equipment and operation for foundation trimming, sub-grade preparation, concrete production, concrete delivery joint production curing compound placement and other association 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 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.

(iv) 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 in Para (a.i) above.

b) Near structures where fluming is involved, lining shall be provided as per approved drawing or as directed by the Engineer-in-Charge.

c) 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.

d) 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 SITE:

Area proposed for lining 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. The cost of clearing is deemed to be included in the item rates of the contract and the contractor shall not get any extra payment towards this operation.

### **5.3. TRIMMING THE CANAL SECTION AND PREPARATION OF SUB-GRADE FOR CONCRETE LINING.**

#### **5.3.1. GENERAL.**

(a) Provision of this paragraph shall apply to the preparation of sub-grade 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 filled 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 borrow 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 shall be 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 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 conform to clauses 4.1, 4.2., 4.3., 4.4. and 4.5. of IS 3873-1978 (Indian code of Practice for laying in situ cement concrete lining on canal)

### 5.3.2. TOLERANCE 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 for payment for the trimming and preparation of sub-grade shall be made on area basis of the number of square meters of the canal prism trimmed over which concrete lining is to be placed. Payment shall be made at the unit price bid 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 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 expensive 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 be used as per relevant IS Codes/ as mentioned in the approved drawing, which may generally be as per the following gradation and index properties.

#### GRADATION:

1.	Clay (less than 2 microns)	15 to 20 %
2.	Silt (0.06 mm - 0.002 mm)	30 to 40 %
3.	Sand (2mm - 0.06mm)	30 to 40 %
4.	Gravel (greater than 2mm)	0 to 10 %

#### INDEX PROPERTIES:

Liquid limit	Less than 50% but greater than 30 %
Plasticity Index	Less than 30% but greater than 15%

The thickness of CNS layer given in table 1 of IS 9451-1985 (reproduced below ) shall apply in general.

SWELLING PRESSURE OF SOIL	THICKNESS OF CNS MATERIALS
Kg/M <sup>2</sup>	Millimeters.
50 to 150	750 to 850
200 to 300	900 to 1000
350 to 500	1050 to 1250

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 or from borrow pits approved by the Engineer-in-charge.

### **5.3.5. UNDER DRAINAGE :**

For a lined canal where the ground water level is higher or likely to be higher than the water level inside the canal so as to cause damage by differential pressures on the lining or where the sub-grade is sufficiently impermeable to prevent free drainage of the underside of lining in case of rapid draw down condition under drainage shall be provided with suitable pressure relief arrangements as indicated in the drawings or directed by the Engineer-in-charge.

#### **I) FILTER DRAINS:**

Wherever necessary longitudinal and / or transverse filter drains shall be laid in the concrete lining true to the canal grade as shown in the drawings or as directed by the Engineer-in-charge. The number of layers comprising the filter thickness of each layer and the materials to be used shall be as shown in the drawings. The filter material shall be clean round well graded sand or coarse aggregate the requirements of grading of which shall be established in the field laboratory on the basis of a mechanical analysis of adjacent material. Particles of decomposed rock debris rock, vegetable matter or the deleterious materials shall not be permitted in the filter. Before placing the filter the bed shall be prepared as specified in earlier paragraph.

The longitudinal drains shall be laid to the grade of the canal while the transverse drains in bed shall have a slope towards the center of the canal bed from the edges as shown in the drawing

Payment of filter drains described above shall be made at the unit price per linear meter provided in the bill of quantities whose unit price should include the cost of all above operations as well as defined in the nomenclature of the item.

#### **II. LOCAL FILTER.**

In addition to the above filter drains, local filters of the size and type as shown in the drawing shall be provided. The cost of these local filters shall be included in the unit price bid for various pressure relief arrangements described below.

### **5.3.6. PRESSURE RELIEF ARRANGEMENTS:**

Wherever necessary pressure relief arrangements, consisting of flap valves or porous concrete plugs with local filters shall be provided in the bed and sides as shown in the drawings or as directed by the Engineer-in-charge.

#### **I. FLAP VALVES:**

Flap valves consisting of 40 mm internal diameter polyvinyl chloride (P.V.C) pipe with P.V.C. flange and rubber flap shall be fabricated with all accessories as shown in the drawings. The flap valve shall be designed as to open automatically at differential head of not more than 100 mm of water the contractor shall arrange for performance tests of all the flap valves and those that do not confirm to the specified functioning shall be rejected. Installation of flap valves shall not be permitted without the acceptance of test report of the same.

The flap valves shall be installed in position in the filter drains in the bid and normal to the canal slopes in the local filter in the side at the location shown in the drawings or as directed by the Engineer-in-charge.

The tendered unit price bid for this item shall be inclusive of the cost of manufacture, handling, testing and installation in position complete and shall be inclusive of all those operations as well as those defined in the nomenclature of the item.

## **II. POROUS PLUGS:**

Wherever shown in the drawings porous concrete pre-cast cylinders 100 mm diameter and of specified lengths shall be provided, the porous concrete shall be composed of one part of cement and 4 parts of uniformly sized aggregate by volume of not more than 20 mm size. In placing porous concrete in moulds, care shall be taken to ensure that it is not over tamped or compacted so as to reduce its porosity.

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 and kept moist for at least 14 days. The compressive strengths of porous concrete at 7 days as determined by the tests on 15 cm. diameter 30 cm. height cylinder should not be less than 70 Kg/sq.cm and the porosity at 7 days be such that water shall pass through slab of concrete 30 cm. thick at a

minimum rate of 500 liters/min./ square meter of the plug with a constant 10 cm. of water on the slab. The

porous plug shall be so inserted into the lining that their porosity is not lost or reduced.

The tendered unit price bid for these items of schedule shall be inclusive of the manufacture, handling and installation in position complete and shall be inclusive of all these operations as well as those defined in the item.

## **III. POROUS CONCRETE PANELS:**

At the slopes of the canal lining porous no fines concrete panels composed of 1 part of cement and 4 parts of aggregate of not more than 20 mm size by weight or as specified shall be provided at interval shown in the drawings or as directed by the Engineer-in-charge. The fines in the aggregate may be permitted up to 10% of total weight of aggregate.

### **5.3.7. MEASUREMENT AND PAYMENT:**

Measurement and payment for the pressure relief valves shall be made on the basis of numbers at the unit rate in schedule of quantity. The rate shall include the cost of providing and fixing pressure relief valves, including cost, carriage, royalty, taxes of materials as per the specifications and as directed 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.

### **5.5. CAST IN SITU CONCRETE LINING:**

### **5.5.1. GENERAL.**

The work shall generally conform to IS 3873-1978.

### **5.5.2 BATCHING OF CONCRETE:**

Batching shall be done as per para 4.2.9.

### **5.5.3 MIXING OF CONCRETE.**

Mixing shall be done as per para 4.2.10.

### **5.5.4. 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.

### **5.5.5. 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.

### **5.5.6. MECHANICAL PLACING.**

a. For efficient placing and finishing of the concrete lining on slopes and in bed concrete lining machines such as slip form pavers or concrete pavers 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.

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.

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 weight 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.

b. Concrete when deposited shall unless otherwise specified have placement temperature of not less than 4.5 degree C and not more than 32 degree C.

c. 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.

### **5.5.7. 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.

### **5.5.8. CURING.**

#### **5.5.8.1 GENERAL.**

The concrete lining on slopes including curvatures portion at junction of slope and bed lining shall be cured with specifications given in para 4.2.20. The concrete lining in canal bed shall be cured with water in accordance with the specifications given in Para 4.2.20. 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 spraying procedures and specifications as per IS 456-2000 and clause 5.8. of IS 3873 of 1978.

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.

#### **5.5.8.2 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 quality 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 one

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<sup>2</sup> of exposed surface 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 fulfill the requirement of drying time when tested in accordance with ASTM C 309-81. The compound applied shall be dry to touch in not more than 4 hours. After 12 hours it shall not be tacky or track off (peel off) concrete where walked upon nor it shall impart a slippery surface.

**g. TESTING.**

i. The liquid membrane forming curing compound to be brought in the manufacturer's original clear containers. Such container shall be legibly marked with the name of the manufacturer, 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.

ii. 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. The testing charges shall be borne by the contractor.

**h. METHOD 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 manufacturer or at the rate of 4 to 5 m. per liters. Field trials shall be conducted to decide effective coverage rate which depends upon surface finish. With a view to ensure thorough and complete coverage, approximately one 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/cm<sup>2</sup>) with provision of continuous agitation. A curing jumbo with multiple traveling 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 bristled brush. Such compounds shall be used on the work only after production of test results and approval of the schematic plan on spraying 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 circumstance 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.

The concrete lining on slopes including curvature portion at junction of slope and bed lining shall be moist cured with Hessian cloth tied and spread over the slope and soon after that, the concrete shall be kept moist with light water spray. The Hessian cloth shall be kept continuously wet for at least 21 days by supplying water through perforated pipe laid along the top edge of the canal lining or by any other method approved in writing by the Engineer-in-Charge. Adequate care shall be taken to ensure that the perforations in the pipe do not get choked.

#### **5.5.8.3 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 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. All the testing charges shall be borne by the contractor.

#### **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 M2	Number of samples.
1 to 5	1
6 to 15	2
16 to 30	3
31 to 50	4
51 to above	4 plus one additional sample for each additional 50 M3 or 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 maybe 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 change immediately.

### **5.7. INSERTION OF PVC CRACKS INDUCING JOINTS.**

**5.7.1. (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 ( 7 days )		
	a) Weight measure	%	0.25 Maximum
	b) Weight decreased	%	0.10 Maximum
	c) Hardness change	Point	1.50
	Effective of alkali (28 days)		
	a) Weight increase	%	0.4 Maximum
	b) Weight decrease	%	0.3 Maximum
	c) Dimension change	%	1.1

Weight of the PVC strip shall be a minimum of 460 gm/meter for the longitudinal strip and a minimum of 420gm/meter for the transverse strip.

b) 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.

c) 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 inducing joints in 30 cm. length reel, free of cost. Department shall bear testing 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.

d) 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 dispatch 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** (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 neatly continuous weak end and in plan normal to the lining surface in both directions through the intersections.

### 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 TOLERANCE.

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.<br>50 mm on tangents.<br>100 mm on curves.                |
| ii) Departure from established grade        | 20 mm on straight reaches.   |
| iii) Variation in concrete lining thickness | 10% of lining thickness provided<br>average thickness is not less than<br>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:**

#### *i) 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 shall be determined 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 providing and fixing PVC crack inducing joints to specified depth in panels as directed by the Engineer-in-charge costs, 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, approval of Engineer-in-charge 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.

#### *ii) 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.**

a) The contractor shall furnish and install safety ladders along both sides of all canal on up stream of the structures as directed and in accordance with this paragraph and so shown on the drawings. If the distance between two consecutive structures is more than one Km, safety ladders shall be provided as directed by the Engineer-in-charge.

b) The canal safety ladders shall be fabricated from carbon steel, aluminum or corrosion resistance (stainless) steel. Carbon steel or aluminum safety ladders shall be coated with fusion epoxy. All materials shall be of best commercial quality and shall be approved by the Engineer-in-charge.

c) The canal safety ladders shall be anchored to the canal lining with 16 mm diameter. 100 mm long corrosion resisting (stainless) steel expansion anchors, PVC sleeves shall be placed between expansion anchors and the canal safety ladders fabricated of carbon steel or aluminum PVC washers shall be placed at all expansion anchors or both sides of the canal safety ladders fabricated of carbon steel or aluminum. PVC sleeves shall be of 18 mm inside diameter. 10mm long with 1.5mm wall thickness PVC washers shall have be 16.5 mm inside diameter and 30mm outside diameter.

d) Expansion anchors shall be installed in holes drilled with carbide tipped drills, Minimum installation depth and method of expansion shall be as recommended by the anchor manufacturer. The nuts holding ladders on the anchors shall be tack welded to the anchors as approved by the Engineer-in-charge.

e) Holes drilled in concrete canal lining for expansion anchors which failed shall be repaired with epoxy bonded mortar and the expansion anchors reset in their original position.

#### **5.11.2 MEASUREMENT AND PAYMENT:**

Safety ladders shall be measured by number. Payment therefore shall be made at the unit rate in schedule of quantities. The rate shall include the cost, carriage, taxes of providing and fixing the ladders as indicated on the drawings.

### **SECTION 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 in places as shown in the drawings or as directed by the Engineer-in-charge.

#### **5.12.2 PREPARAING FOUNDATION:**

The provision detailed in the Para 5.3 shall apply.

#### **5.12.3 MODEL 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 position. 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 section constructed with cement concrete M 15 or shall be plastered with cement mortar 1.4 as shown in the drawing or as directed by the Engineer-in-charge. The dimensions of the model section will be 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, finishing the lining of the required grade and profile. It should be constructed within a tolerance limit of 30 mm in a length of 3 meters. Model sections beyond the permissible tolerance will be removed and redone by contractor at his own expenses.

#### **5.12.4 MATERIALS.**

All materials cement, sand aggregates water shall conform to specifications given section.

#### **5.12.5. PRECAST SLABS :**

Mix for the slab shall be 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 cms x 30 cms x 5 cms or 22.5 cms x 30 cms x 5 cms . Toe wall blocks shall be 15 cms x 20 cms x 30 cms 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  $\pm 2.0$  mm the slabs shall be either with all its sides at right angles to the faces or with two of its sides beveled at a particular angle to the faces or as directed by the Engineer-in-charge. The beveled slabs shall be provided with tongues and grooves as per Para 6.1.2.1. of IS 3860-1966

The slabs shall have minimum flexure as specified in IS 4060-1968.

#### **5.12.6 CASTING OF SLAB.**

##### **I. 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 IS 1791-1968.

The table vibrators to be used shall conform to IS 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 frequency of vibration for the table operating at its maximum load capacity shall be between 3000 to 6000 cycles per minute.

The vibration acceleration of the table operating at its maximum load capacity shall not 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 minutes.

The reduction in amplitude of the table while operating from zero loads to full loads 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.

**ii. 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 into 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 plat form 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 cycle per minute and the vibrating time shall not generally be less than 20 minutes for 10 sqm. of slab of size of 5 cms thick and 30 minutes for 10 sqm in the case of 7.5 cms thick slab.

After the specified vibration period is completed, the slab shall after finishing the top surface be allowed to cure under polythene sheet on 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. LYING OF SLABS.**

The slabs shall be removed to the canal site for lying only after 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 lying of 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 Para 5.12.2 and 5.12.3.

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 full depth of joint and the width of the joint shall not exceed 12mm.

The joints 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 contractors cost.

**iv. MEASUREMENT AND PAYMENT.**

The lining with pre-cast slabs shall be measured in sqm. The unit price bid in the bill of quantities shall include cost of all materials including water, labour and charges for manufacture, conveyance, lying and finishing.

## **DETAILS SPECIFICATION OF EXPANSION JOINTS/CONSTRUCTION JOINT (EJ/CI) FOR CANAL STRUCTURE.**

### **1. 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 vulcanizing 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 brazed 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 brazed, water tight and should be capable of withstanding the hydraulic pressure exerted on it. M.S. anchor rods of 6 mm to 8mm dia 30cm long with hook on outer side and should be brazed 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 of water stops 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 so as to form continuous water tight diaphragm in the joints unless otherwise shown. Adequate provision shall be made to completely 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-7  
FORMS**

## NO RELATION CERTIFICATE

Certified that I / We am / are not related to any officer of Water Resources Department of the rank of Assistant Engineer and above or any officer of the rank of Assistant Secretary above.

### CONTRACTOR

List of Relatives of the tender serving in Water Resources Department.

Sl No.	Name of the relatives	Rank	Place of present posting with office / Division / Department
1	2	3	4

- 1.
- 2.
- 3.
- 4.
- 5.

### CONTRACTOR

CONTRACTOR

**FORM – A STRUCTURE AND ORGANISATION**

Name of Tenderer.

Nationality of Tenderer. ....

Office Address. ....

Telegraphic Address ....

Telephone No: .....

Mobile No: .....

Telex Number .....

Location of establishment .....

The tenderer is

1. An individual
2. A proprietary firm.
3. A limited company or limited corporation
4. A member of a group of companies (If yes, give names, address and present description of other companies.)
5. A subsidiary of large organization

(If yes, give names, address of the present organization)

6. if the company is subsidiary, state what involvement if any, will the parent company have in the project.

Attach the organization chart showing the structure of the organization including the names of the Directors position of officer.

7. Number of year of experience
  - a. As a prime contractor
    - I. In own country
    - II. Other country (specify country)
  - b. In a Joint venture
    - I In own country
    - II Other country (specify country)
8. Name of the address of any associates the tenderer has in India who are knowledgeable in the procedure of customs, immigration takes and other information necessary to do work.
9. How many years has your organization been in business under your present name? Add what were your fields were and when you established your organization. When did you add new field (if any)?
10. Were you ever required for suspending construction for a period of more than six months continuously after you started? If so, give the names of project and reason of failure.

11. Have you ever not completed any work awarded to you? If so give name of project and reasons for not completing the work.

12. In how many projects were imposed penalties for delay? Please give details.

13. In which fields of Civil Engineering construction do you claim specialization and Interest.

14. Give details of your experience in modern concreting / Earth work and quality control.

15. Give details of your material testing laboratory.

Signature of tenderer

## **FORM-B FINANCIAL STATEMENT**

(Must be given separately for each partner in case of joint venture )

1. Name of Firm.
- 2 Name of partner /Directors
- 3 Capital
  - a. Authorized
  - b. Issued and paid-up
- 4 a. Details of the work completed and tenderer's performance record for last five years.( Vide Annexure-A )
  - b. Details of work on hand and tenderer's performance record for last five years.  
( Vide Annexure-B )
- 3 Furnish Balance sheet and profit & loss statement with auditor's reports for the
4. Last five years , it should include the following information.
  - i Working capital
  - ii Foreign investment.
    - a. Turnover for 2020-2021
    - b. Turnover for 2021-2022
    - c. Turnover for 2022-2023
    - d. Turnover for 2023-2024
    - e. Turnover for 2024-2025
  - iii
  - iv Gross income
    - a Turnover for 2020-2021
    - f. Turnover for 2021-2022
    - g. Turnover for 2022-2023
    - h. Turnover for 2023-2024
    - i. Turnover for 2024-2025

- V Total liabilities
- Current ratio.
- a Current assets to current liabilities
- b Total liabilities to net work.
- 6 What is the maximum annual value of work that you can handle ?
- 7 Have you ever been denied tendering facilities by any Government Department/  
Public sector undertaking ?
- (Give details )
- 8 List your sources of finance?
- a Own resources
- b Bank credit.
- C Other sources-specify if any?
- 9 Certificate of financial soundness by Bank ( To be signed by Senior manager  
of a Nationalized Bank )
- 10 Name and address of Bank from whom reference can be obtained.
- Name :
- Address :
- Telephone No:
- Fax No :
- 11 Have you ever been declared bankrupt?  
(if yes , please give details)

Signature of tenderer

## ANNEXURE – A

### FORMAT FOR PERFORMANCE RECORD OF CONTRACTORS

1. Name of the Contractor :
2. Registration No. and Date :
3. Class of Contractor :
4. Licensing Authority :
5. License valid up to :
6. Details of works executed :

Sl. No.	Jobs under execution	Agreement amount	Date of Commencement	Stipulated Date of Completion	Whether work is progressing as per programme	Reasons for delay ,if any
1	2	3	4	5	6	7

7. Whether the Contractor has requisite machineries & personnel deployed (details of machinery and personnel deployed) :
8. Whether the quality of construction is satisfactory :
9. Whether he has capability to make good the loss in time :
10. Whether the Contractor has abandoned any work in the past three years, if yes, the details thereof.
11. Whether the Contractor has entered in to any litigation in the past if yes, the details thereof.

Name of the Certifying Officer

With official seal

Signature of Contractor

CONTRACTOR

## **ANNEXURE – B**

Details of the works on hand and performance for last five years as on the date of submission of pre-qualification documents in the following proforma.

*( Separate form for each work )*

1. Name of work \_\_\_\_\_
2. Place and Country \_\_\_\_\_
3. Total tendered cost of work \_\_\_\_\_
4. Brief description of works including principal features and quantities of main items. \_\_\_\_\_  
\_\_\_\_\_
5. Details of works in hand
  - i. Percentage of physical completion and amount billed for the work completed.
  - ii. Cost of work remaining to be executed.
  - iii. Stipulated date of completion.
  - iv. Anticipated date of completion.
6. Explain for non-completion of work within stipulated time limit if so.
7. Were there any penalties /fines / stop notice / compensation /liquidated damages imposed ?Yes or No.  
If yes , give amount and explanations
8. Were there any fines, claims or stop notice filed by the employer ? (Yes or No.)/  
( If yes, give amount and explanation )

Signature of Tenderer

**ANNEXURE-‘E’**

**(AFFIDAVIT)**

(To be submitted in original in legal stamp paper)

I, Sri..... Aged..... year,  
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 possess a valid license for execution of works contract issued by \* ..... belongs to .....Class & is valid upto \*\*.....

I am submitting tenders before the Additional Chief Engineer, Angul Irrigation Circle, Angul for execution of **“Improvement to Barsingha Distributary in between RD 0.00km to 6.25km and Bentapur Minor from RD 0.00km to 1.20km of Derjang Irrigation Project”** response to ‘e’ procurement notice No.

**ACEAIC- 02 /2026-27 (On-line).**

I am the authorized signatory on behalf of contractor for the tender for the work mentioned above.

ii) I am swearing this affidavit that all tender documents and accompanying papers those being submitted by me before the Additional Chief Engineer, Angul Irrigation Circle, Angul including E.M.D. in any shape are all authentic and bonafide documents in the eyes of the law of the land.

That the fact 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

**VI. CHECK LIST SUBMITTED OR NOT**

1	Form A Structure and Organization	Yes/No
2	Form B Financial position	Yes/No
	a) Balance sheet of last five years	Yes/No
	c) True copies of Income Tax & Sales Tax clearance certificate for the last five years for domestic contractors.	Yes/No
3	Certificate of registration for execution of contract attached	Yes/No
4	Documentary evidence in support of statement 4 A,B,C,D & E-a of General Statement attached. (Refer Page No. 21 & 22)	Yes/No
5	Certified copy of power of attorney in case of partnership firm, limited or Corporation attached.	Yes/No
6	Documentary evidence as required in minimum pre-qualification criteria.	Yes/No
7	Affidavit for authenticity of document, EMD & Tender	Yes/No

**Annexure-I**

**DETAILS OF OTHER WORKS TENDERED FOR AND WORKS IN HAND  
ON THE DATE OF SUBMISSION THE TENDER**

SI No.	Name of works with No. & Date of agreement & Division & Dept. concerned	Place & Country	Work in Hand			Work Tendered for			Remarks
			Tendered cost	Cost of work remaining to be executed	Anticipated date of completion	Estimated cost	Date when decision is expected	Stipulated date & period of completion	
1	2	3	4	5	6	7	8	9	10

CONTRACTOR

SUPERINTENDING ENGINEER  
ANGUL IRRIGATION DIVISION, ANGUL

**DETAILS OF WORK SIMILAR TYPE AND MAGNITUDE CARRIED ON BY THE CONTRACTOR IN THE PAST**

<b>Sl No.</b>	<b>Name of works with No. &amp; Date of agreement &amp; Division / Dept. concerned</b>	<b>Place &amp; Country</b>	<b>Tendered cost</b>	<b>Time in which completed</b>	<b>Date of completion</b>	<b>Principal Features</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>

**SECTION-8  
DRAWINGS**

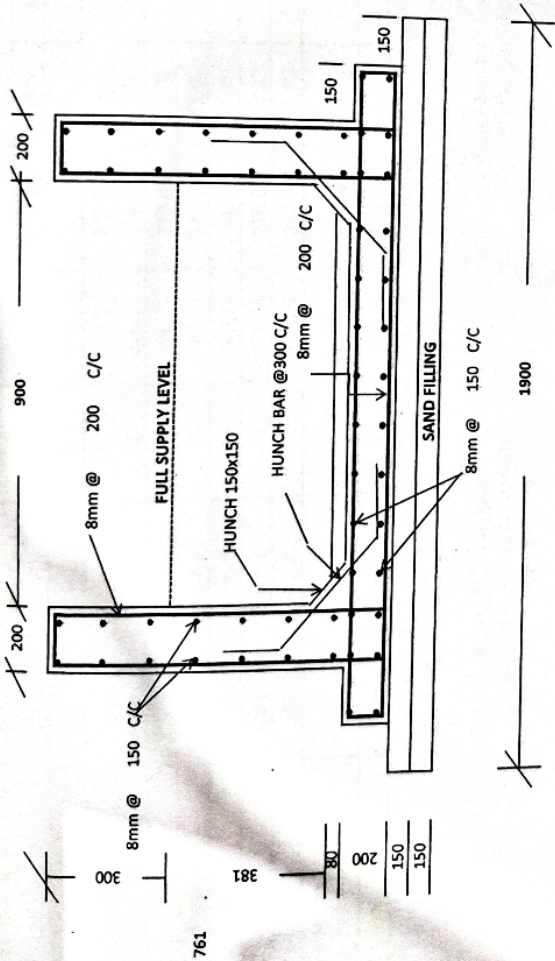
**HYDRAULIC PARTICULARS**

**CANAL DATA**  
 DESIGN DISCHARGE : 0.133 Cumecs  
 F.S.D. : 0.38 M  
 BED WIDTH : 0.90 M  
 FREE BOARD : 0.3 M  
 VELOCITY : 0.388 M/Sec  
 W.S.SLOPE : 0.0004  
 RUGOSITY CO-EFFICIENT : 0.018

**SPECIFICATIONS**

- 1 COMPACTED SAND FILLING
- 2 PLAIN CEMENT CONCRETE M20 WITH HARD GRANITE CRUSHER BROKEN COARSE AGGREGATE NOMINAL SIZE OF 20MM(20MM & DOWNGRADED)
- 3 PLAIN CEMENT CONCRETE M20 WITH HARD GRANITE CRUSHER BROKEN COARSE AGGREGATE NOMINAL SIZE OF 20MM(20MM & DOWNGRADED)

UNLESS OTHERWISE SPECIFIED, ALL THE DIMENSIONS ARE IN MM



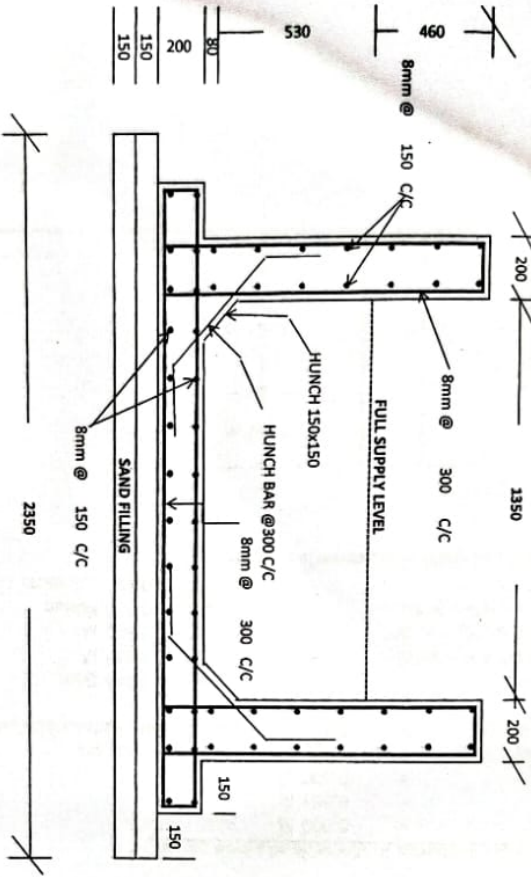
<b>GOVERNMENT OF ODISHA DEPARTMENT OF WATER RESOURCES</b>	
DERJANG IRRIGATION PROJECT	
ANGUL IRRIGATION DIVISION, ANGUL	
Name of work :- Improvement to Barsingha Distributary In between RD0.00 to 6.25Km & Bentapur Minor from RD0.00 to 1.20Km of Derjang Irrigation Project.	
DESIGNED	RECOMMENDED
ADDITIONAL CHIEF ENGINEER, ANGUL IRRIGATION CIRCLE, ANGUL	APPROVED
FILE NO :-	YEAR:-2025
	DRG:-

*Signature*  
14/5/26

*Signature*  
14/5/26  
A.E.

*Handwritten signature and initials*  
A-E.

*Handwritten signature and initials*  
14/5/26



**HYDRAULIC PARTICULARS**

CANAL DATA	
DESIGN DISCHARGE	: 0.35 Cumecs
F.S.D.	: 0.53 M
BED WIDTH	: 1.35 M
FREE BOARD	: 0.46 M
VELOCITY	: 0.488 M/Sec
W.S.SLOPE	: 0.00039
RUGOSITY CO-EFFICIENT	: 0.018

**SPECIFICATIONS**

- 1 COMPACTED SAND FILLING
- 2 PLAIN CEMENT CONCRETE M20 WITH HARD GRANITE CRUSHER BROKEN COARSE AGGREGATE NOMINAL SIZE OF 20MM(20MM & DOWNGRADED)
- 3 PLAIN CEMENT CONCRETE M20 WITH HARD GRANITE CRUSHER BROKEN COARSE AGGREGATE NOMINAL SIZE OF 20MM(20MM & DOWNGRADED)

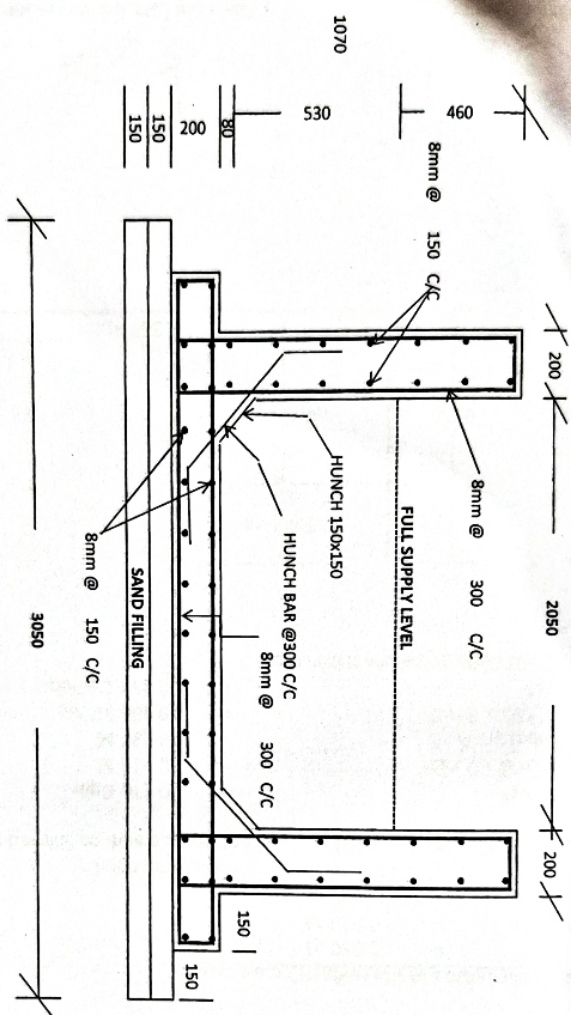
UNLESS OTHERWISE SPECIFIED, ALL THE DIMENSIONS ARE IN MM

<b>GOVERNMENT OF ODISHA DEPARTMENT OF WATER RESOURCES</b>	
DERJANG IRRIGATION PROJECT ANGUL IRRIGATION DIVISION, ANGUL	
Name of work :- Improvement to Barsingha Distributary In between RD0.00 to 6.25km & Bentapur Minor from RD0.00 to 1.20km of Derjang Irrigation Project.	
DESIGNED	APPROVED
ADDITIONAL CHIEF ENGINEER, ANGUL IRRIGATION CIRCLE, ANGUL	DRG:-
YEAR:-2025	

CONTRACTOR

*14/5/26*  
A.F.

*14/5/26*



**HYDRAULIC PARTICULARS**

CANAL DATA	
DESIGN DISCHARGE	: 0.569 Cumecs
F.S.D.	: 0.53 M
BED WIDTH	: 2.05 M
FREE BOARD	: 0.46 M
VELOCITY	: 0.523 M/Sec
W.S.SLOPE	: 0.00036
RUGOSITY CO-EFFICIENT	: 0.018

**SPECIFICATIONS**

- 1 COMPACTED SAND FILLING
- 2 PLAIN CEMENT CONCRETE M20 WITH HARD GRANITE CRUSHER BROKEN COARSE AGGREGATE NOMINAL SIZE OF 20MM(20MM & DOWNGRADED)
- 3 PLAIN CEMENT CONCRETE M20 WITH HARD GRANITE CRUSHER BROKEN COARSE AGGREGATE NOMINAL SIZE OF 20MM(20MM & DOWNGRADED)

UNLESS OTHERWISE SPECIFIED, ALL THE DIMENSIONS ARE IN MM

<b>GOVERNMENT OF ODISHA DEPARTMENT OF WATER RESOURCES</b>			
DERJANG IRRIGATION PROJECT			
ANGUL IRRIGATION DIVISION, ANGUL			
Name of work :- Improvement to Barsingha Distributary in between RD0.00 to 6.25km & Bentapur Minor from RD0.00 to 1.20km of Derjang Irrigation Project.			
DESIGNED	RECOMMENDED	APPROVED	
ADDITIONAL CHIEF ENGINEER, ANGUL IRRIGATION CIRCLE, ANGUL	YEAR:- 2025	DRG:-	
FILE NO :-			

CONTRACTOR

